The effect of sensory processing on the work performance of call centre agents in a South African context

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Declaration

I, Annemarie Lombard, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise), and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree at this or any other university.

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Table of Contents

List of Tables

List of Figures

Abstract

Background:

Call centres are thriving and expanding commercial enterprises providing cost-effective ways for organisations to connect with new and existing clients through telecommunication channels. Call centre agents perform this function telephonically for 75% of the day in large open-plan office environments characterised by workloads that are demanding, repetitive and highly scripted. Verbal abuse by clients is prevalent adding to a work experience that is potentially emotionally draining and stressful. Agents are under constant surveillance and monitoring to abide with commercial regulations but also to ensure high call volume and quality engagement with clients, these being the most important performance indicators. High staff absenteeism and attrition levels account for large financial losses in the industry. To date no studies have been found considering the impact of sensory processing of call centre agents on their performance, absenteeism and attrition. Sensory processing considers the neuro-physiological and behavioural components of individuals in the interactions with their daily work occupations and life environments. Although predominantly applied in paediatric clinical populations in occupational therapy, sensory processing provides universal truths about human behaviour which can add value to promoting wellness amongst healthy adults in work environments.

Design:

A quantitative, non-experimental and correlational study design was used to measure and compare demographic, sensory processing and performance data from 459 call centre staff within four fully operational call centres, which varied in type of operation, employer and geographical area in South Africa. The standardised and validated 60-item Adolescent/Adult Sensory Profile (Brown, Tollefson, Dunn, Cromwell & Fillion, 2001) was used to measure sensory processing as neurological thresholds and potential propensity for individuals to cope with high sensory stimulating work environments. Agent performance data in each of the four centres were recorded daily, in real time, using sophisticated information technology systems, and included details about absenteeism. Attrition data were collected after the initial data intake to reflect true attrition.

Results:

Data were analysed using statistical methods to obtain locality (e.g. means, medians), dispersion (e.g. standard deviations and interquartile ranges) and associations (e.g. Spearman Rank correlations). Results showed strong, consistent and significant correlations between agents who displayed sensation avoiding processing and poor performance. Agents who exhibited sensation seeking processing had higher performance ratings. To a lesser, yet still significant, degree agents with low registration and sensory sensitivity also had lower performance ratings. Sensory sensitive agents were absent less often than other workers and sensation seeking agents showed a tendency for higher attrition. Results differed between service inbound call centres to sales and

collections outbound ones. Team leaders, who are high performing agents promoted into these positions, had less sensory sensitive and sensation avoiding processing styles. A novel subset structure was designed to account for the multidimensional capacity of the AASP, and this was correlated with all the performance data. It provided a preliminary method for use in further research studies. The study strengths were the innovative sample in measuring sensory processing of healthy populations at work and the compilation of performance data through sophisticated computerised systems, which minimised the margin of error. Study limitations were the use of a self-questionnaire format for profile data collection and small sample sizes in subsequent data collection stages.

Recommendations:

The AASP has the potential to be used by call centre human resource practitioners for recruitment and performance management. Improved sensory environmental considerations and adaptations supportive of a more successful and healthier agent-job-environment fit are provided. The study findings support knowledge transfer into other general human resource management, education and training, occupational health management and occupational therapy practises. It expands the application of sensory processing theories and informs future research.

Glossary of Terms

Absenteeism:	This is the habitual pattern of absence from work. In the contact centre industry, absenteeism refers to the average number of days absent from work as a percentage of the total number of days available for work. The total number of days available for work excludes public or bank holidays and scheduled annual leave (Dimension Data, 2011).
Adolescent/Adult Sensory Profile:	A 60-item standardised and validated assessment tool that describes sensory processing patterns measured across different sensory systems of individuals from 11 years to 65+years (Brown, Tollefson, Dunn, Cromwell & Filion, 2001).
Agreeableness:	Is a personality trait which contrasts a pro-social orientation towards others with antagonism and includes lower order traits such as altruism, compliance, trust, and modesty. Most work with the personality trait of agreeableness focuses on antisocial or aggressive behaviour on the negative end and trust on the positive (Roberts, Jackson, Duckworth, & Von Culin, 2011).
Attrition:	Also referred to as churn or staff turnover. The annual average number of staff that leave an organisation as a percentage of the total staff complement (number of staff). It can be calculated for the organisation as a whole or for a particular role (Dimension Data, 2011).
Auditory defensiveness:	Refers to a set of behaviours occurring due to discomfort to auditory stimuli. Irritation and/or discomfort and aversive reactions occur with noise and sounds such as vacuum cleaners and sirens, music, people talking, etc. (Goldsmith, Van Hulle, Arneson, Schreiber, & Gernsbacher, 2006).
Automatic call distributor (ACD):	Is a telephone switch capability that allows sophisticated queuing and routing of phone calls to call centre agents. It can be a specially designed ACD system or an optional feature of a PABX (private automated branch exchange) system (Dimension Data, 2011).
Back office staff:	These people are dealing with specialist, administrative, and/or managerial tasks that are less restricted. They tend to focus on administrative processes, such as email, data capturing and/or follow up procedures. These employees do not interact with customers, so they are not directly controlled by them. Consequently they might have more timing and task control related task than front office staff (Zapf, Isic, Bechtoldt, & Blau,

	2003).
Behavioural self-regulation:	Capacity of an individual to control emotional and behavioural reactivity. It describes the continuum of an individual's ability to modulate or manage behavioural responses to demands within a context. For example, an individual with a strong ability to self-regulate or adjust behaviours can focus on a task despite the presence of distractions within the context (Diamant, 2011).
BIS/BAS: behavioural inhibition and activation:	The behavioural activation system (BAS) is active during appetitive motivations, responding to signals of reward and non-punishment conditions. It is linked with goal-directed pursuits and positive feelings. The behavioural inhibition system (BIS) is engaged under conditions signalling threat and punishment, and acts to inhibit behaviour that may lead to negative states such as anxiety, which might lead to pain or negative affect (Reich & Williams, 2003).
Call centre agent:	Person working primarily on the telephone within a call centre. Also known as a telephone agent, human agent, telephone operator, telephone communicator, telephone sales representative, customer service representative or front line employees. Agents may work on one channel only or on multiple channels – for example, e-mail, telephone and physical correspondence (Ashill, Rod, Thirkell, & Carruthers, 2009; Dimension Data, 2011; Zapf et al., 2003).
Call centre:	This is an older, more universal and a traditional description of a contact centre. The term call centre has a bad reputation in many circles and, called “21st century sweatshops”, among other ill-researched, yet snappy phrases beloved by the national media. Contact centres speak more of a future industry, as yet undefined, but one certainly where the internet and mobile devices play an integral part. For the purpose of this study, the older, more familiar term “call centre” is used (Russell, 2008).
Captive/in-house call centre:	Usually occurs in medium or large sized companies which house their own call centre environment within their current premises and manage all the business, management and staff processes themselves. They use in-house communication channels and resources to service or sell to their clients (Russell, 2008).
Chemosensory perception/	Includes olfaction, gustation and trigeminal perception as considered the evolutionarily ‘oldest’ senses (Croy, Springborn, Lötsch, Johnston, &

responsivity:	Hummel, 2011). Strong negative reactions, physical symptoms, and behavioural disruptions due to environmental odours are common in the adult population and defined as environmental chemosensory responsivity (Kärnekull, Jönsson, Larsson, & Olofsson, 2011).
Coaching	Developing the skills and knowledge that will help a person to improve their job performance, and lead to their achievement of organisational objectives. It targets high performance and improvement at work, though it may also have an impact on an individual's private life. It usually lasts for a short period and focuses on specific skills and goals (Dimension Data, 2011).
Conscientiousness:	As a personality trait it describes the tendency to be controlled, task- and goal-directed, norm following, responsible, planned , and organised (Roberts et al., 2011) and concerns being careful, responsible, and organised (Zuckerman, 1993).
Contact centre:	Is a dedicated department or section of an organisation specifically tasked with multi-media operations such as taking or making of calls or other forms of contact such as e-mail, internet video or fax. Contact centres have procedures, supervision and technology aimed at supporting this task. (Russell, 2008). In the South African context most large companies use a 086 number for clients to access their particular contact centre.
Cost centres:	An accounting term that refers to a department or function in the organisation that does not generate profit (Dimension Data, 2011).
Electro-encephalography:	Records the electrical activity of the brain via electrodes placed on the scalp and provides continuous measures of brain processing in real time (Davies, Chang, & Gavin, 2010; Davies & Tucker, 2010).
Emotional exhaustion:	Is the first and most obvious manifestation of burnout, and depersonalisation is the corresponding coping strategy. Since having to engage too intensively and too often with others is the source of emotional exhaustion, mechanisms to reduce this involvement are likely responses. Depersonalisation is a way of reducing involvement while still being with people in time and space, as the job requires (Mahesh & Kasturi, 2006).
Emotional stability:	The personality trait considered as the opposite or lower end of neuroticism and associated with not being anxious, nervous or depressed (Van Vianen, Feij, Krausz, & Taris, 2003; Zuckerman, 1993). Individuals low in emotional stability tends to experience distress, depression, anger, fear, sadness, and

	guilt. In contrast, individuals who are high in emotional stability tend to be generally relaxed and calm (Lebreton, Binning, Adorno, & Melcher, 2004).
Event-related potentials:	Electroencephalography (EEG) and event-related potentials (ERPs) provide an important bridge in studying the relationship between behavioural performance and brain structure and function. ERPs are characterised by an intricate series of components following the event or stimulus presentation (Davies, Chang & Gavin, 2010).
Extraversion:	Refers to an energetic approach toward the social and material world and includes lower order traits such as sociability, activity, assertiveness, and positive emotionality (Roberts et al., 2011).
FFM (Five Factor model), also called the Big Five:	Is called the five factor taxonomy of personality factors consisting of Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness and originally designed by Norman in 1963 and emerged from daily explanations of traits. It was modernised by the EPQ (Eysenck Personality Questionnaire) and Goldberg in 1981 designated the term "Big Five". Various version of the FFM have been designed over the years: *NEO[1]-PI* (NEO personality inventory Costa & McCrae, 1985, 1989; Costa, McCrae, & Dye, 1991), *NEO-PI-R* (Neuroticism, Extraversion, and Openness Personality Inventory, Revised Costa & McCrae, 1992) and the *NEO-FFI* (NEO-five factor inventory Costa & McCrae, 1992), (Lebreton et al., 2004; McCrae, 1992; Skyrme, Wilkinson, & Abraham, 2005; Smolewska, McCabe, & Woody, 2006).. *The Zuckerman-Kuhlman Personality Questionnaire* is an alternative five-factor model (Developed by Zuckerman, Kuhlman, Thornquist, & Kiers, 1991) and adds Impulsive Unsocialised Sensation Seeking, Aggression-Hostility, and Activity, to Sociability and Neuroticism-Anxiety (Zuckerman, 1993). These instruments described do not encompass all relevant personality tools in psychology but were the main ones used in the literature reviewed for the current study.
Front office staff:	Staff involved in a call centre environment that focus more on incoming and outgoing calls from customers (Russell, 2008).

[1]Referring to Neuroticism, Extraversion and Openness.

Goodness of fit:	Is a term well described and originated in statistical studies.[2] It is also applied in the occupational therapy and psychology fields. The concept of goodness- of- fit is applicable when examining the match between an individual's sensory-processing behaviour patterns and the sensory experiences and demands of the context (Dunn, 2007). Goodness of fit also describes the extent to which an individual's temperament matches or is complementary to the expectations and opportunities of the context or situation (Diamant, 2011).
Gustatory perception:	Is activated during eating, so that the potentially dangerous nature of the food (often associated with the bitterness of the food), and also the nutrition value of food (sweetness) can be estimated (Croy et al., 2011).
Homeworking:	Homeworking in relation to contact centres refers to a work arrangement where agents enjoy flexibility in working location and hours. These agents are referred to as home agents and they have the technology to connect to the contact centre and access both telephony and data functions, as their work is conducted from home. A home agent generally has access to all the functionality that an agent within the centre has and can also be remotely managed by a supervisor from within the contact centre (Dimension Data, 2011).
Hot-desking:	Is where desks are available to any worker as and when required within established open-plan workspaces. This is often used when people work shifts. This can allow organisations to reduce the total number of desks (and concomitant office space) as they no longer have to provide or assign desks to each individual. (Davis, Leach & Clegg, 2011)
Human resource structures (HR):	Refers to the processes put in place by companies to address the needs of staff within call centres with regard to performance metrics, training, staff support, work environment, leave, salaries, etc. HR is also responsible for recruitment and retention strategies for call centres (Kuruvilla, 2010)
Inbound contacts:	There are 2 major categories of inbound contacts: those that must be handled when they arrive (e.g. inbound telephone calls) where the

[2]Review on Goodness of Fit Tests for Ergodic Diffusion Processes by Different Sampling Schemes: Negri, Ilia; Nishiyama, Yoichi. *Economic Notes*, Feb2010, Vol. 39 Issue 1/2, p91-106, 16p; DOI: 10.1111/j.1468-0300.2010.00221.x

performance objective is the service level, and those that can be handled at a later time (e.g. customer e-mail) where the performance objective is the response time (Dimension Data, 2011).

Inhibitory ability: The Stroop test (1935) administered in inhibitory ability involves a two colour-identification tasks. For the first task (no inhibition required), participants were instructed to name the colour of blocks listed on a page. For the second task (inhibition required) participants are instructed to name the colour of the ink of a list of printed words that are also the names of colours, but different from the colour of the ink (e.g. the word *blue* written in red ink). Here participants have to inhibit the word meaning (blue) in order to name the colour of the ink (red). The difference in reading times between the colour blocks and the colour words indicates how well the participant can inhibit distractions (Maher & von Hippel, 2005).

Job resourcefulness: An important personality trait that is applicable in the context of call centre front office work yet remains to be explored is the situational trait of job resourcefulness, which refers to the enduring disposition to garner scarce resources and overcome obstacles in the pursuit of job-related goals (Ashill, Rod, Thirkell, & Carruthers, 2009; Dimension Data, 2011; Zapf et al., 2003).

Key Performance Indicators (KPIs): Is a quantifiable measures (agreed to beforehand) that reflect the critical success factors of either the company, a department or a defined project (Dimension Data, 2011).

Lexicographical ordering: An ordering array similar to that of a dictionary (Study statistician, 2011).

Locus of control (LOC): Refers to the degree to which people believe that they have control over a wide range of factors in their lives. People can be divided into internals and externals. Internals, or those with an internal LOC, tend to feel a strong link between their actions and their consequences. These individuals also believe in their ability to control the external environment. Externals by contrast use a more passive approach in dealing with their environment. They believe that outcomes are quite often the result of luck or fate (Sawyerr, Srinivas, & Wang, 2009).

Low Registration: Refers to patterns of passive behavioural responses associated with high neurological thresholds. This group of people will tend to miss information, or respond slowly, may appear lethargic, uninterested but often are

contentious (Brown et al., 2001; Brown & Dunn, 2002).

Neurological thresholds: Refers to the amount of stimuli required for a neuron or neuron system to respond. At one end of the continuum thresholds are very high; this means it would take a lot of stimuli to meet the threshold and fire the neurons. At the other end of the continuum, thresholds are very low; this means it takes few stimuli to meet the threshold and fire the neurons. Central nervous system thresholds are the product of genetic endowment and personal life experiences. People with atypical sensory processing may display exceedingly high thresholds (i.e. habituation, hyposensitivity) or exceedingly low thresholds (i.e. sensitisation, hypersensitivity). If thresholds are too high, people react less readily to stimuli, take a longer time to respond, and appear lethargic. If thresholds are too low, people react too quickly and too frequently to stimuli, and appear to be overly excitable and hyperactive (Brown et al., 2001; Brown & Dunn, 2002; Dunn, 1997).

Neuroticism: This personality trait contrasts emotional stability and even-temperedness with negative emotionality, such as feeling anxious, nervous, sad, and tense. Many studies examine the neurobiology of neuroticism because of the overlap with anxiety and many psychiatric disorders (Roberts et al., 2011).

NYSL (New York Longitudinal Scales Adult Temperament Questionnaire): The subscale descriptors are: APPROACH/WITHDRAWAL: a high score indicates withdrawal from new situations, MOOD: a high score indicates a serious or negative mood; SENSORY THRESHOLDS: a high score indicates more sensitivity to sensory stimuli; ADAPTABILITY: a high score indicates slowness to change behaviour (Brown & Dunn, 2002).

Openness: The personality trait of openness to experience or new situations is defined as preferring depth, originality, and complexity in an individual's mental and experiential life (Roberts et al., 2011) and also defined as curious, original and broad-minded (Zuckerman, 1993).

Outbound work: Refers to those from a dedicated outbound telesales centre or a customer service operation in the form of quality calls, call backs, collections or telemarketing sales; with the agent initiating the client contact (Russell, 2008).

Outsourcing/ Business Process Outsourcing (BPO):	Contracting with an external company to provide / handle some or all contact centre services, usually in order to reduce costs. It is an arrangement in which one company provides services to another company, where those services may have been provided in-house (Dimension Data, 2011). Business Process Outsourcing (BPO) is also the term used in the industry with regard to companies taking their call centre business to another service provider rather than doing it internally as a captive process.
Performance:	Performance in this thesis is regarded as the success rate of agents in making as many calls, as fast as possible and as accurately as possible (Perspective call centre managers for Sites 1, 2, 3 and 4).
Personality:	Are defined as the relatively enduring patterns of thoughts, feelings, and behaviours that differentiate individuals from one another and are elicited in trait affording situations. It also includes higher-level cognitive functioning relatively unique to human beings (Evans & Rothbart, 2009).Currently, most personality psychologists accept the Big Five (Extraversion, Agreeableness, Conscientiousness, Emotional Stability/Neuroticism, and Openness to Experience) as an adequate working taxonomy of personality traits (Roberts et al., 2011).
Product moment correlation:	Also called Pearson correlations as numerical measures that quantify the extent of statistical dependence between pairs of observations (Study statistician, 2011).
Rank correlations:	Also called Spearman correlations, these are non-parametric measures of statistical dependence between two variables. It assesses how well the relationship between two variables can be described using a monotonic function. A perfect Spearman correlation of +1 or −1 occurs when each of the variables is a perfect monotone function of the other (Study statistician, 2011).
Recruitment and selection processes:	The process that a company goes through in order to recruit the correct person to fill a call centre agent position. Outsourced recruiters are often used, or often large companies have key people in place for recruitment only (Russell, 2008).
Sampling:	Sampling is concerned with the selection of individuals from within a population to estimate the characteristics of the whole population. It is used in statistics and survey methodology to lower costs, collect data faster and to improve the accuracy and quality of the data. Random sampling is

the preferred method of sampling in quantitative studies (Study statistician, 2011).

Sensation Avoiding: Refers to patterns of active behavioural responses associated with low neurological thresholds. This group of people will tend to feel overwhelmed by sensory stimuli, and actively try to avoid input and limit sensory experiences (Brown et al., 2001; Brown & Dunn, 2002).

Sensation Seeking: Refers to patterns of active behavioural responses associated with high neurological thresholds. This group of people will tend to enjoy or pursue sensory stimuli, and find sensory input pleasurable (Brown et al., 2001; Brown & Dunn, 2002)

Sensory defensiveness: A person is sensory defensive when he or she experiences the fight/flight reaction to a sensation that other people do not experience as harmful. Sensory defensiveness can occur in one or more or all of the sensory systems, with varying degrees of severity. Like other disorders, the symptoms of sensory defensiveness are changeable, depending on stress and other environmental factors (Abernethy, 2010).

Sensory gating: Sensory gating is the brain's natural response to attenuate redundant or irrelevant sensory stimuli. The gating response is conceptualised as the brain's capacity to selectively regulate its sensitivity to sensory stimuli. Sensory gating is a critical underlying psycho-physiological and protective mechanism of brain function which directs processing resources to important environmental stimuli (Davies, Chang, & Gavin, 2009).

Sensory integration: Is defined as the neurological process that organises sensation from one's own body and from the environment and makes it possible for use in daily occupation (Ayres, 1979). With the theory evolvement, sensory integration theory refers to constructs that discuss how the brain processes sensation and the resulting motor, behaviour, emotion, and attention responses. Sensory integration assessment is the process of evaluating persons for problems in processing sensation. Sensory integration treatment is a method of intervention. Ayres's original term, *sensory integration dysfunction,* refers to the disorder as a whole. Sensory integration is now being referred to as the work of Ayres, ASI® (Miller, Anzalone, Lane, Cermak & Osten, 2007)

Sensory modulation: Sensory modulation is defined as both physiological reactions and behavioural responses. Behaviourally, the term refers to the ability of an

	individual to regulate and organise responses to sensations in a graded and adaptive manner, congruent with situational demands. Physiologically, the term refers to cellular mechanisms of habituations and sensitisation that alter the structure and/or function of nerve cells, affecting synaptic transmission (Miller et al., 2001).
Sensory overload:	When an individual has been exposed to accumulation of sensory input, the thresholds have been met and sensory input continues to occur, arousal levels and responses will increase, facilitating a stress response, or fight-flight-fright response to signal alert. In a sensory overload state, individuals find it difficult to function and perform adequately, which results in stress (Lane, 2002).
Sensory processing:	The ability of the central nervous system to receive, organise, and understand internal and external sensory input from contextual experiences in order to respond to contextual demands. Sensory processing involves the interaction between neurological thresholds for alerting to sensory input and the ability to self-regulate and to manage the sensory input that is being experienced (Dunn, 2001). It has been proposed as the umbrella term covering various sensory functions: sensory modulation, sensory discrimination and sensory based motor output (Miller et al., 2007).
Sensory Sensitive:	Refers to patterns of passive behavioural responses associated with low neurological thresholds. This group of people will tend to over-respond to sensory input, as they are more vigilant of the environment, often associated with irritability (Brown et al., 2001; Brown & Dunn, 2002).
Standardised regression coefficient (β):	Is used in statistics, as the estimates resulting from an analysis carried out on variables that have been standardised so that their variances are 1. The beta is measured in units of standard deviation. For example, a beta value of 2.5 indicates that a change of one standard deviation in the predictor variable will result in a change of 2.5 standard deviations in the criterion variable. Thus, the higher the beta value the greater the impact of the predictor variable on the criterion variable (Study statistician, 2011).
Startle responses:	Rapid, reflexive and relatively responses independent of conscious control or voluntary manipulation and used to study emotion and attention processes (Temple & Cook, 2007).
State anxiety:	Refers to a transitory emotional response to a particular stressful situation and can fluctuate, i.e. stage fright (Engel-Yeger & Dunn, 2011b; Vuust,

	Gebauer, Hansen, Jørgensen, Møller, & Linnet, 2010.
Stimulus screening ability:	Stimulus screening is operationalised as the degree to which people are able to effectively reduce the stress of environmental stimuli. A sample item from Mehrabian's (1977) Stimulus Screening Scale is: ''I am strongly moved when many things happen at once'', with a high score indicating poor screening ability (Maher & von Hippel, 2005).
Supervisor:	Person supervising agents in a contact centres. A supervisor may handle difficult calls, but taking or making calls is not his or her primary function (Dimension Data, 2011).
Tactile defensiveness:	Refers to a set of behaviours occurring due to discomfort to tactile stimuli. Children (or adults) may fuss about stiff new clothes, turtleneck sweaters, and labels sewn inside collars. They may be bothered by the seams of socks, dislike being touched lightly on the face, dislike fingernail trimming and tooth brushing, and demonstrate general irritation and discomfort with touch (Goldsmith, Van Hulle, Arneson, Schreiber, & Gernsbacher, 2006).
Team leader:	Person working as an agent taking or making calls, but with supervisory or managerial responsibilities for a team of agents (Dimension Data, 2011)
Temperament:	Defined as individual differences in emotional, motor, and attentional reactivity measured by latency, intensity, and recovery of response, and self-regulation processes such as effortful control that modulate reactivity. These differences are biologically based and are linked to an individual's genetic endowment (Rothbart, 2007). Aspects of human personality extend beyond temperament to include attitudes, beliefs, goals, and values, developing out of evolutionarily conserved temperament systems. Personality also includes higher-level cognitive functioning relatively unique to human beings (Evans, 2009).
The Adolescent/Adult Sensory Profile (AASP):	Refers to a standardised 60-item self-report questionnaire of testing adolescent and adult behaviours and performance in relation to sensory processing. It is based on the conceptual model of sensory processing that proposes an interaction between neurological thresholds (a person's responsivity) and behavioural responses (a person's responses or self-regulation strategies). (Brown et al., 2001; Brown & Dunn, 2002)

The HSPS (The Highly sensitive person scale):	The HSPS is a standardised and validated 27- item questionnaire to measure high sensitivity as a temperament construct (Aron & Aron, 1997). It was later expanded into a three-factor structure; EOE = Ease of Excitation (external demand related) ; AES = Aesthetic Sensitivity (related to aesthetic awareness) and LST = Low Sensory Threshold (internal demand related) which all positively inter-correlated as part of a general, higher-order construct of Sensory processing sensitivity (Smolewska et al., 2006).
The Sensation seeking scale (SSS):	Zuckerman's Sensation Seeking Scale (Z-SSS; Zuckerman, 1978, 1994) is a well-known measure of Sensation Seeking which assesses intrinsic drive to seek out environmental stimuli that are novel, complex and varied so as to maintain optimal levels of cortical arousal. Forty force choice (yes/no) items measure Sensation Seeking across four domains: Thrill and Adventure Seeking (TAS), Experience Seeking, (ES), Disinhibition (Dis) and Boredom Susceptibility (BS) (Jackson, 2011). The sensation seeking scale measures: TAS refers to the desire to engage in extreme sports and/or risky and dangerous activities. ES is the desire to seek novel experiences through travel, music, art and unconventional friends and lifestyles. *Dis* refers to a lack of inhibited social behaviour involving promiscuity and substance use. *BS* describes intolerance for repetitive, or routine, work and/or boring people (Wymer, Self, & Findley, 2008; Zuckerman, 1994).
Trait anger:	Is defined as an enduring disposition to experience anger more frequently, more intensely, for a longer period of time, and to express anger in less adaptive and less functional ways (Rohrmann, Bechtoldt, Hopp, Hodapp & Zapf, 2010).
Trait anxiety:	Refers to individual differences in anxiety proneness which are relatively stable and more genetically based (Engel-Yeger & Dunn, 2011b) and occurs regularly (Vuust et al., 2010).
Trigeminal sensitivity:	Receptors of the trigeminal chemosensory channel lie within the nasal cavity. Stimulation of this system in a healthy person leads to perception of a burning/stinging sensation. This typically occurs while eating spicy foods, but also during the detection of potential dangers, such as fires (Croy et al., 2011).

Abbreviations

AASP	Adult/Adolescent Sensory Profile
ACD	Automatic Caller Distribution
AES	Aesthetic Sensitivity: HSPS subscale, related to aesthetic awareness
ASD	Autism Spectrum Disorder
ASI®	Ayres sensory integration
AVG	Average
BIS/BAS Scale	Behavioural inhibition system and Behavioural activation system
EEG	Electroencephalography
EOE	Ease of Excitation: HSPS subscale, external demand related
ERPs	Event-related potentials
FFI	Five Factor Inventory
FFM	Five Factor Model
HIV	Human Immunodeficiency Virus
HPCSA	Health Professions Council of South Africa
HR	Human resource practices
HRQOL	Health related quality of life
HSPS	Highly sensitive person scale
KPI	Key Performance Indicator
LR	Low Registration
LST	Low Sensory Threshold: HSPS subscale, internal demand related
MSI	Multisensory integration
NEO	Neuroticism, Extraversion and Openness
NEO-FFI	NEO Neuroticism, Extraversion, Openness Five Factor Inventory (also the Big Five)
NYSL	New York Longitudinal Scales Adult Temperament Questionnaire
OS	Occupational science
OT	Occupational therapy
p	Predictability value
Q1	Low registration quadrant of AASP
Q2	Sensation seeking quadrant of AASP
Q3	Sensory sensitivity quadrant of AASP
Q4	Sensation avoiding quadrant of AASP
r	Correlation value

SA	Sensation Avoiding
SMD	Sensory modulation disorder
SOR	Sensory over-responsivity (Occupational therapy literature)
SP	Sensory processing
SPS	Sensory processing sensitivity (Temperament literature)
SS	Sensation Seeking
Ssens	Sensory Sensitivity
SUR	Sensory under-responsivity (Occupational therapy literature)
UK	United Kingdom
USA	United States of America
WFOT	World Federation of Occupational therapy
WHO	World Health Organisation
α	Cronbach's alpha score
β	Beta standardised regression coefficient

Chapter 1 Introduction

1.1 Overview

This quantitative correlation study describes the sensory processing of healthy adults in four different call centres in South Africa. Call centres is an industry characterised by high worker stress levels associated with a large open-plan office set-up, continuous telephone operations, constant worker monitoring and surveillance, and high production targets (Russell, 2008). Concerned with health promotion in the workplace and grounded in sensory processing theory, the study contributes to a growing body of professional literature in an under-researched and role emerging domain of occupational therapy in business orientated industries (Hocking & Clair, 2011; Pierce, Atler, Baltisberger, Fehringer, Hunter, Malkawi, & Parr, 2010). Sensory processing is defined as the ability of the nervous system to manage incoming sensory information for daily use, including the modulation, integration and organisation of sensory stimuli (Dunn, 1997; Engel Yeger, 2011). The primary thesis of this dissertation is that the theory of sensory processing has the potential to assist recruitment, retention and staff wellness practises in the call centre industry. Combining workplace analysis with the fundamental focus of occupational therapy on work as a human occupation, the study provides evidence for the use of sensory profiling in advancing worker performance and wellness. It also provides further cost saving benefits for commercial call centre enterprises.

The state of world health (Hanlon, Carlisle, Hannah, Lyon, & Reilly, 2011) and economies (North, 1990) are changing rapidly, and stress is increasingly evident in the workplace (Kirsten, 2010), in social communities and in the environment (Costello et al., 2009). Technological advances, global competition, downsizing and outsourcing are significant trends in the modern workplace with businesses seeking to remain economically sustainable. A redefinition of the role of workers in organisations has become the focus of commercial enterprises with the intention of optimising human resources for profit and growth (North, 1990). As the productivity related pressure on the workforce has escalated, so has a global recognition of the cost of absenteeism, illness and poor performance attributed to compounding stress increased (Riedel, 2009). Commercial industries are starting to recognise the value of occupational health and related health management programmes, not only for their economic benefit but also to improve the quality of life of workers (Kirsten, 2010). Healthcare, social and psychological sciences have adopted a health and wellness focus and consider the impact of work stress on the social and psychological wellbeing of workers. Considering global change and its health related implications, a health promotion and wellness approach is not only emphasised by the

World Health Organisation[3], but also aligned with the current South African health service strategies[4] and supported by commercial enterprises (Kirsten, 2010). In response to global change (Hinojosa, 2007), and the need for current occupational health programmes to be more holistic and integrated (Kirsten, 2010), occupational therapists can contribute unique evidence and knowledge to improve the occupational performance and quality of life of workers (Hinojosa, 2007).

1.2 Sensory Processing[5]

Predominantly used in paediatrics to treat children with developmental and learning difficulties, sensory processing has a long-standing history in occupational therapy (Arbesman & Lieberman, 2010; Bendixen & Kreider, 2011; Koenig & Rudney, 2010; Polatajko & Cantin, 2010). As the theory of sensory processing evolved, it expanded to adult populations supported by the different behaviours that individuals apply in response to the vast quantity of sensory messages received by the brain on a daily basis (Aron & Aron, 1997; Brown et al., 2001; Brown & Dunn, 2002; Zuckerman, 1994). Sensory profiling provides an assessment methodology to determine whether individuals over-respond to sensory stimuli, being sensitive on the one end of a continuum, or under-respond and seek sensory stimuli on the other end (Aron & Aron, 1997; Brown & Dunn, 2002; Zuckerman, 1994). Based on brain and behavioural sciences, a conceptual model of sensory processing was developed (Dunn, 1997) which received considerable attention in the field of occupational therapy and is widely applied within the sensory processing literature (Rieke & Anderson, 2009). This model, central to the current study, explains a physiological continuum of neurological thresholds that identifies how readily the nervous system detects sensory stimuli and the resultant behavioural response of an individual. The interplay between these two main constructs can be described and recorded in a four quadrant distribution of 1) Low Registration (LR), a high threshold and passive self-regulation response; 2) Sensation Seeking (SS), a high threshold and active self-regulation response; 3) Sensory Sensitivity (Ssens), a low threshold and passive self-

[3] World Health Organisation (1978). Primary Health Care. Report of the International conference on Primary Health Care. Alma Ata: Geneva. WHO.

[4] National Department of Health, South Africa (2010). Strategic Plan 2010/11-2012/13. Accessed http://www.doh.gov.za ,14 September, 2011.

[5] An updated taxonomy proposes 'sensory processing' as an encapsulating term to reflect a more global use in referring to sensory based processing challenges while 'integration' (the term introduced by Ayres), be used when referring to the theory and intervention developed by Ayres (1979) and framed as ASI® Ayres sensory integration (Miller, et al., 2007; Parham, et al., 2011). Aligned with global terminology as observed in other study fields, the term 'sensory processing' will mostly be used in this thesis.

regulation response, and 4) a Sensation Avoiding response (SA) which refers to a low threshold and active self-regulation response (Brown et al., 2001; Brown & Dunn, 2002; Brown & Dunn, 2002). Dunn's model formed the basis for the development and score criteria of the Adult/Adolescent Sensory Profile (AASP) (Brown et al., 2001), the measurement instrument that was used to determine call centre agent's sensory processing for this study. Based on the Adult/Adolescent Sensory Profile descriptions, it was hypothesised that individuals with low registration were likely to tolerate busy and lively work environments well, while the same work environments would prove distracting and overwhelming for individuals with sensation avoiding responses (Brown et al., 2001; Brown & Dunn, 2002).

1.3 Sensory Processing and Work Performance

As a result of the on-going development of the sensory processing theory and the explosion of knowledge which has occurred in the field (Schaaf & Davies, 2010), recent studies have started to observe sensory processing in healthy adult populations. These studies demonstrate how sensory processing can inform psychosocial wellbeing (Engel-Yeger & Dunn, 2011a; Engel-Yeger & Dunn, 2011b; Kinnealey, Koenig, & Smith, 2011), contribute to universal truths about human behaviour by describing how the senses inform day-to-day occupational performance (Brown et al., 2001; Brown, 2001; Dunn, 2001; Dunn, 2000), potentially support the manifestations of temperament and personality (Brown et al., 2001; Brown, 2001; Dunn, 2001; Dunn, 2000), and explain the impact of the environment on human occupation (Brown, 2001; Cohn & Lew, 2010; Dunn, Brown, & McGuigan, 1994). Despite the progress made in sensory processing theory there is limited evidence for understanding its relationship to worker behaviour. Although observed in one clinical group occupational therapy study (Bontempo, 2010), sensory processing has not been studied in healthy adults with regard to work performance, thus providing opportunity to expand the theory application.

The current study's unconventional sample (call centre agents without any known pathology), unusual place of practice (a commercial enterprise) and unfamiliar physical environment (a custom-designed work space) necessitated the search for evidence outside the field of occupational therapy and in interdisciplinary research. The multidisciplinary collaboration encouraged by occupational science provided a theoretical framework (Hocking & Clair, 2011; Pierce et al., 2010; Pollard, Sakellariou, & Lawson-Porter, 2010) from which to search for connections with existing evidence. The primary fields of inquiry were the sensory processing theory in occupational therapy and call centres as a business industry. The secondary fields of neuroscience, psychology and environment studies provided an opportunity to use alternative and unexpected evidence

to support sensory processing and work performance in the chosen research environment.

The study of sensory processing is rooted in the discipline of neuroscience which Ayres described at inception as a product of the nervous system in organising sensation for daily use (Ayres, 1979). Neuroscience principles are used to inform business practices, for example: in the field of sensory branding and consumer behaviour, for the development of products and brand promotion (Ariely & Berns, 2010); in the emerging field of neuroleadership, as a new approach to support management and organisational theory (Lafferty & Alford, 2010; Rock, 2010); in industrial psychology for managing people in the workplace (Rothbart, 2007); and in environmental psychology for designing conducive workplaces (Zeisel, 2006). Fundamental to these fields, as well as to sensory processing, is the understanding and use of brain function in support of worker behaviour and performance. Commonalities between the field of sensory processing and temperament have been identified (Dunn, 2001). As sensory processing is also studied as temperament traits (Aron & Aron, 1997; Zuckerman, 1994), the field of psychology provides rich opportunities for collaboration with occupational therapy. Exploring worker behaviour and recruitment in call centres from a sensory processing perspective is thus reasonable as temperament is commonly used in industrial settings to determine job performance and worker health (Anaby, Jarus, Backman, & Zumbo, 2010; Hutchinson, Stuart, & Pretorius, 2010; Roberts et al., 2011).

Environment studies have shown that high levels of distraction and noise, which are prevalent in open plan office environments, can potentially impact worker performance and satisfaction (Davis et al., 2011; De Croon, Sluiter, Kuijer, & Frings-Dresen, 2005; Veitch, Charles, Farley, & Newsham, 2007). This impact is possibly augmented in call centres as their large open plan designs, high density of workers and continuous telephone activity is likely to intensify noise and distractions (Barnes, 2007; Zapf et al., 2003). The broadening of environmental sciences' understanding and incorporation of work context into the study of human behaviour, and industrial psychology's application of temperament science to recruit and retain people for commercial industries (K. Ahmad, 2010), provide strong support to establish best-fit between individuals, their environments and their occupations. Occupational therapists use the same framework i.e. person-environment-occupation fit to support rehabilitation and to promote primary health and wellness (Dunn et al., 1994). Although studied and described differently, the multidisciplinary links between neuroscience, psychology, environment studies and occupational therapy provide essential support for the successful matching of individuals with work environments and job types for call centre work. It is at this juncture that the

role emergent contribution of occupational therapy in the workplace becomes evident through the findings of this study.

1.4 Sensory Processing and the Call Centre Industry

A call centre is a centralised business operation where staff are localised in one work area and perform telephone-related tasks for 75% of the day (or more) in customer service, sales and/or debt collection. The pace and volume of work are determined by information technology systems which automatically route calls to the agent's terminal to increase efficiency and allow for employee surveillance and performance monitoring (Russell, 2008). Apart from being excessively busy and stressful (Deery, Iverson, & Walsh, 2010), critical issues in the call centre industry are high attrition (voluntary turnover) and staff absenteeism, which cost the industry billions in lost revenue per year (Dimension Data, 2011). It is not unusual for companies to invest $5,000 to $7,000 [R40 000 – R56 000] on hiring and training each new recruit, while experiencing anywhere from 50% to 300% annual staff turnover (Lebreton et al., 2004). This translates into millions of dollars/rand lost annually, and emphasises the extraordinarily high economic value that the identification of applicants with high-turnover-risk would provide to the call centre industry. In addition, the identification of individuals suited to call centre work at the point of recruitment is likely to promote the health and wellness of the workforce in this particular industry. Call centre work is described as emotional labour and the negative impact of the associated stress and emotional exhaustion on the health and wellness of call centre agents is described in the literature (Deery et al., 2010; Holman, 2003; Kjellberg, Toomingas, Norman, Hagman, Herlin & Tornqvist, 2010). After analysing the characteristics of the call centre work environment (high density of workers, space allocation, seating, technology) from an occupational therapy and sensory processing perspective, the researcher naturally questioned its impact on occupational performance. To best demonstrate the natural emergence of this as a research question, call centre pictures are provided in Figure 1.1 to supply the reader with contextual insight.

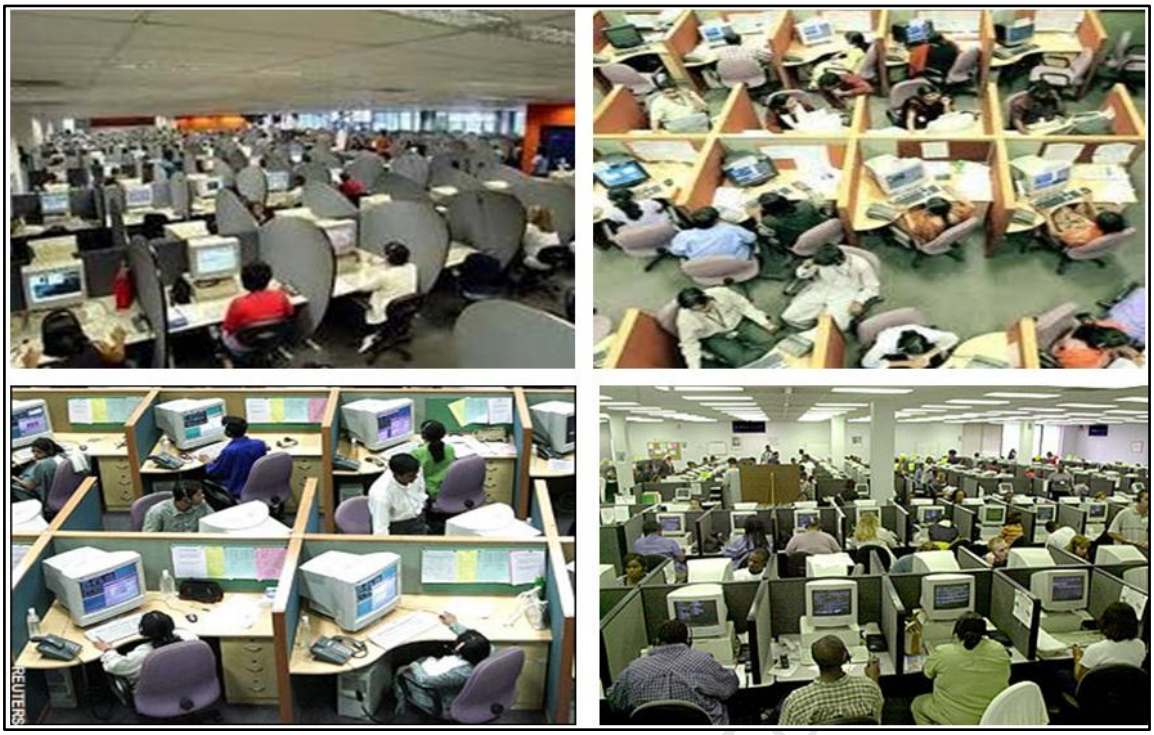

Figure 1.1: The Call Centre Environment[6]

While worker behaviour and performance in the call centre environment has received attention (Bain & Taylor, 2000; Holman, Batt & Holtgrewe, 2007; Russell, 2008), an extensive literature review revealed that, to my knowledge, no studies have been done to date on the impact of sensory processing on call centre agent performance. Optimising call centre agents' wellness and productivity has come under increasing scrutiny globally and solutions to the human resource aspect a focus, as the industry's staff costs are the largest financial overhead, accounting for 60% of the total cost (Dimension Data, 2011). The industry's human resource emphasis is on recruitment and selection of agents, skills training and the management of agent's performance (Callaghan & Thompson, 2002; Rohrmann et al., 2010; Sawyerr et al., 2009). Despite the human resource cost burden, the industry make high budget allowance for information technology systems (Russell, 2008) which merely becomes an enabler, but not a guarantee that the agents will successfully reach the clients they are serving or selling to. Performance quality, client satisfaction, sales and collection achievements, as the main outcome measurements for call centres, are more dependent on the fluctuating agent output than the stable information technology system. Another reality is the inflexibility of the industry with regards to operational set-up and job expectations, where the agents must fit the industry and not vice versa, thus excluding much agent accommodation (Russell, 2008). It would seem that in order to recruit, train and manage work performance successfully in the call

[6] Source of pictures: my.telegraph.co.uk; www.socialanxietysupport.com

centre industry, the core neuro-physiological composition of human behaviour and performance should be understood and considered. Human resource practitioners, industrial psychologists and call centre managers are usually responsible for the employment of sustainable call centre agents. Although sensory processing is not considered an aspect of selection and recruitment at present, the researcher posits that it has the potential to add unique value to both recruitment and performance practices. The understanding of human behaviour in the call centre environment calls for a multi-focal perspective, one that is not only biological, social, emotional and psychological, but also neurological due to the potential impact of the job demands of call centre work on the sensory processing of workers.

1.5 Background to the Study

The researcher is an occupational therapist with many years of experience in using sensory processing principles in the treatment of children with learning and developmental difficulties. Consideration for how sensory processing can affect the behaviour of adults became an interest as a result of using the Adolescent/Adult Sensory Profile (Brown et al., 2001; Brown & Dunn, 2002) with parents of the children seen in practice. The researcher advanced to applying sensory processing in adult training workshops and the acumen shared during these encounters was astonishing. These adults recognised the value of their sensory profile results in understanding, not only their children, but also their own lives, with regards to the impact of sensory processing on learning, work, behaviour and self-care tasks. It translated into a deeper and acceptable understanding of their daily behaviours, preferences, needs, habits and relationships. A further justification for the potential value of sensory based intervention for adults was the report of reduction in stress levels when implementing pragmatic sensory based strategies. Recognising the potential for expanding the application of sensory processing theory beyond paediatrics into role emerging practice contexts, the researcher set out to find a setting where sensory input would be in excess. The obvious and sensible result was exploring sensory processing in relation to worker behaviour in a busy, stressful workplace. The choice of the call centre industry was based on workplace observations by the researcher, commercial industry reviews that commented on the issues of attrition and absenteeism (Barnes, 2007; Russell, 2008; Zapf et al., 2003), the importance of the industry in South Africa for job creation (Benner, Lewis, & Omar, 2007; Dimension Data, 2011) and on the global emphasis of the optimal use of resources for business enterprises in either offshoring or outsourcing capacities (Russell, 2008; Thite, 2010; Thite & Russell, 2010). The uniformity of volume density, noise levels, lighting, space set-up and worker positions as definitive factors that facilitate productivity in the call centre industry (Barnes, 2007),

made this an ideal set-up and population for studying the impact of sensory processing on worker performance.

The researcher embarked on a Master's degree by dissertation in occupational therapy in 2005, with data collection commencing in 2006 in two call centres. During data analysis of the first study sample, the consulting statistician, Dr. Theunis JvW Kotze, and supervisor at the time, Ms Rina van der Walt, suggested an upgrade to a Doctorate level due to the volume and innovative nature of the data. This suggestion was reviewed by the University of Cape Town Health Science Faculty Research Committee and approved in January 2009. A doctorate study proposal followed and, after ethics approval (No. 289/2005), a second series of data collection were initiated at two further call centres, culminating in this thesis.

1.6 Assumptions

Some fundamental truths are applicable to this study and although not proven by evidence, seem reasonable to assume. Their relevance to the study is important as it contributed to the choice of study sample.

- Call centres are high sensory overloaded work environments when compared to other office type work.
- Call centre agents are healthy adults i.e. without any overt or chronic mental or physical illness.
- Worker health and wellness is a socioeconomic feature of commercial enterprises such as the call centre industry.

1.7 The Study Problem

Recruiting low-risk individuals to fulfil agent roles is a key strategic solution for the call centre industry for cost saving and occupational health benefits (Dimension Data, 2011). Surprisingly, negligible effort has been allocated to develop selection criteria to hire low-risk call centre agents (Sawyerr et al., 2009) and recruitment study evidence is scarce (Townsend, 2007). Sensory processing is not considered in the occupational therapy or call centre literature as a potential predictor for performance, absenteeism and/or attrition and is not included in recruitment practises. The industry recruit agents based on their technical, numeracy and language skills (Lebreton et al., 2004; Russell, 2008) and agents receive skills training and coaching to fulfil their roles (Lebreton et al., 2004; Russell, 2008). Temperament and personality indicators are included by some but this is not common recruitment practice (Dimension Data, 2011). When considering the environmental characteristics, related high levels of sensory stimuli and stress and

emotional exhaustion of call centres, it seems plausible to include sensory processing in recruitment strategies. The paucity of sensory processing as a performance predictor for the call centre environment is evident, while providing prospective solutions to manage human resource capacity.

1.8 Purpose of the Study

The purpose of this research is to provide the call centre industry with empirical evidence about the effects of sensory processing on the work performance, absenteeism and attrition of their agents. The potential benefits of recruiting best-fit agents are staff health and well-being, high performance and production targets and cost saving for the call centre industry. The high levels of sensory stimuli present in the work environment can be supportive for some workers, but have the potential to overload and distract others. By knowing more about sensory profiling, call centre managers would be better able to identify the agents best suited for this environment, which could lead to higher productivity and reduced absenteeism and attrition. Apart from establishing new and revolutionary human resource capacity for the call centre industry, research into sensory processing can be used as a possible predictor of worker performance across other industries and sectors at large. When consideration is given to the sensory profiles of workers in conjunction with the suitability of the work environment, this combined approach has the potential to enhance production rates and impact positively on the employee wellness within any industry. The study may also contribute to the existing knowledge base of sensory processing and expand the scope of occupational therapy practice. It has the potential to expand the application of the theory and intervention towards adults from a primary health care perspective, helping to prevent worker illness and attrition and increase their health and wellness.

1.9 Research Questions

- Can the sensory profiles of call centre workers be used to predict their levels of performance, absenteeism and attrition?
- If so, can the Adult/Adolescent Sensory Profile (AASP) add value to job-fit and related recruitment models for the call centre industry?

1.10 Aim of the Study

To determine the value of sensory profiling as an agent recruitment and selection tool for the call centre industry.

1.11 Study Hypotheses

- Hypothesis 1:
  Agents with low sensory thresholds, (in particular sensation avoiding profiles) do not perform as well as agents with high sensory thresholds, (in particular low registration sensory profiles) working in the same call centre environment.
- Hypothesis 2:
  Agents with low sensory thresholds, (in particular sensation avoiding profiles) are more often absent than agents with high sensory thresholds, (in particular low registration sensory profiles) working in the same call centre environment.
- Hypothesis 3:
  Agents with low sensory thresholds, (in particular sensation avoiding profiles) have higher attrition rates than agents with high sensory thresholds, (in particular low registration sensory profiles) working in the same call centre environment.

1.12 Study Objectives

1. To determine the relationship between sensory processing and work performance of call centre agents.

   a. To describe participant demographics and the properties of each study sample to determine similarities and differences between the four study samples.
   b. To determine the sensory profiles of the study sample agents.
   c. To determine the potential associations between the sensory profiles of call centre agents and their work performance, absenteeism rates and attrition levels.

2. To determine potential validity of the AASP as a recruitment tool for the call centre industry[7].

1.13 Outline of the Research Report

Chapter 1 provides an introduction and overview to the thesis, with study background, literature outline and study objectives.

Chapter 2 covers the literature analysis and evidence accrued in support for the study.

[7] In fulfilment of the study objectives an extension of the methodology emerged, which created a multi-layered approach not initially anticipated. This is fully described in Chapter 3 (pg 64) and the results in Chapter 4 (pg 123) discussed against this extended framework.

Chapter 3 provides the ethics and the methodology used to reach the study objectives, with regard to sampling and study instrumentation, outlined in four distinct analytic stages.

Chapter 4 is a comprehensive collation of the study results as obtained through statistical analysis and grouped according to the four methodological stages.

Chapter 5 covers the interpretation and discussion of results, provides the study recommendations and observes study strengths and limitations.

1.14 Conclusion

This chapter provided an overview of the study and a rationale for amalgamating the clinically orientated health science profession of occupational therapy, with the unconventional, fast growing and commercial industry of call centre business. It argued that observing sensory processing as a significant construct fundamental to human behaviour has the potential to add empirical evidence for understanding worker selection and performance. This information could have significant financial value for employers, as well as supporting the health of workers, including call centre staff.

Chapter 2 Literature Review

2.1 Introduction

The novelty of studying sensory processing in call centres meant two practice fields very distinct from one another had to be connected. This required the author to search through cross disciplinary research evidence and find interdisciplinary synergies, by using the vast web-based knowledge maze. In order to find global insights and representative research, the researcher aimed to include studies from various continents. Few South African studies were found in most of the fields that were explored. While fortuitous synergies were anticipated, based on the researcher's clinical reasoning[8], their origin and detail was unknown at the start of the literature review. Initial literature searches using the main study title keywords (sensory processing, call centres, work performance) did not yield any results. Each keyword was subsequently searched for individually, yielding articles from diverse disciplines including environmental sciences; business economics and management; environmental psychology and neuroscience. Anticipated study synergies (e.g. psychology and health and wellness) were also combined for searches. Unexpected synergies (e.g. temperament and chemosensory sensory thresholds) were identified by searching through current and new developments within the various study fields. The complexity of the literature review was compounded by having to analyse and contend with disparate terminology. The approach to the literature review was multimodal and while a critical approach was mostly applied, some descriptive and narrative methods were included. Due to the vast amount of available information, comprehensive reviews in all fields were insurmountable and some potential synergies may have been overlooked in both the reviewed and non-reviewed (e.g. workplace wellness) fields. There can be no claim that the analysis was exhaustive but a copious interdisciplinary focus provided empirical evidence for the current study.

[8] The use of the term clinical reasoning in this thesis refers to expert reasoning based on clinical experience, knowledge and acquired insights.

2.2 Framing the Literature Review

The literature review was organised into six main study fields as illustrated in Figure 2.1.

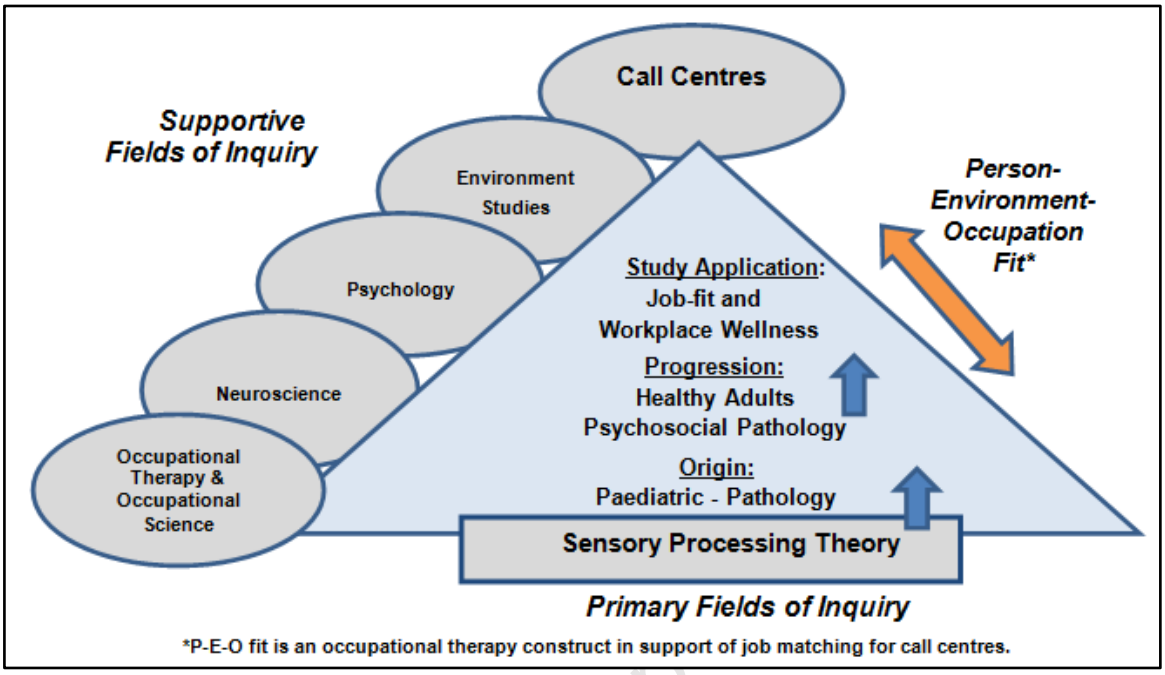

Figure 2.1: Literature Review Framework

The primary fields of inquiry were Sensory Processing (SP) in Occupational Therapy (OT) and call centres while the secondary fields were environment studies, psychology, neuroscience, occupational therapy and occupational science. The first section of the literature review deals with the call centre industry revealing its occupational realities and quandaries in support of the study problem. A review of environment studies follows to explain the impact of work environments on behaviour and performance. Since the field of psychology is closely associated with environment and temperament studies as well as worker behaviour (industrial psychology), the review then moves the evidence closer to a sensory processing (SP) perspective. The amalgamating function of neuroscience in SP and psychology is then considered, followed by a rationale for the use of the Person-Environment-Occupation (PEO) (Law, Cooper, Strong, Stewart, Rigby, & Letts, 1996; Strong, Rigby, Stewart, Law, Letts, & Cooper, 1999) model as an organising occupational therapy practice model for sensory processing intervention in call centres. The literature review concludes by supporting the study from an OT health promotion perspective and the strong interdisciplinary focus of OS. Neither the OT nor OS fields were extensively reviewed as particular study findings would not necessarily contribute to the current study.

2.3 Call Centres: Industry and Workplace

This section provides a descriptive overview of the call centre industry as a novel service platform in the field of occupational therapy. Global call centre human resource issues and sensory related job characteristics which influence worker performance are considered. Research evidence that addresses worker health and wellbeing, while contributing to operational efficiencies is presented. The final section reviews studies which used temperament traits as performance, absenteeism and attrition predictors. The relationship between sensory processing and temperament, reviewed in paragraph 2.3.3 (pg 20), provides the opportunity to explore performance, absenteeism and attrition from a sensory processing perspective.

2.3.1 Background of call centres

The emergence of call centres in the early 1990s coincided with accelerated advances in information communication technologies (ICTs), (Russell, 2008; Taylor & Bain, 2007). Call centres have become a preferred and fast growing source of customer contact in developed (Hannif, Burgess, & Connell, 2008; Russell, 2008), and emerging information economies (Benner et al., 2007; Dimension Data, 2011; Holman et al., 2007), and are huge employment generators (Batt, Holman, & Holtgrewe, 2009; Russell, 2008). The increasing deregulation of national economic orders and increasing global competition have led to the outsourcing and offshoring[9] of call centre services nationally and internationally, with accompanying escalated growth within this industry (Russell, 2008; Thite, 2010; Thite & Russell, 2010). The impact of call centres in the South African economy with regard to employment creation and economic growth has been acknowledged (Benner et al., 2007; Dimension Data, 2011) and supported by the Department of Trade and Industry (DTI).[10] In the South African call centre industry, Business Process Enabling South Africa (BPeSA)[11] was established as a governing body to expand the industry and position South Africa as an offshore destination for international enterprises (Benner et al., 2007).

[9] *Outsourcing*, referred to as Business Process Outsourcing (BPO), is used in the industry with regard to companies taking their call centre business to another service provider rather than doing it internally as a captive process. *Offshoring* refers to a company outsourcing their services to a call centre in a different country (Russell, 2008).

[10] http://www.contactindustryhub.co.za/newsletter_item.php?newsletter_id=59&newsletter_item_id=760

[11] http://www.bpesawesterncape.co.za/enterprise-development/

Call centres are either run as an in-house (also called captive) operation forming part of an internal company structure, or operate as an external and outsourced service provider. The way that call centres contact their customers differs: inbound call centres have a more passive role in that customers contact them by telephone with questions or complaints concerning a product and/or service. Outbound call centre staff call people, usually either in order to sell a product (telemarketing) or to collect bad debts. Some call centres combine both inbound and outbound activities, but one service usually dominates (Zapf et al., 2003). Although telephonic channels dominate, e-mail, and emerging social media and web-chats, are increasingly becoming supportive communication channels (Dimension Data, 2011). Accelerated growth has been observed in the collections industry and is reportedly associated with the economic climate and worldwide recession (Savona, Kirton, & Oldani, 2011).

A call centre agent[12] usually works in an open plan office environment (Barnes, 2007) at a cluster type desk, wearing a headset through which s/he communicates with the customer while inputting or retrieving data from a computer terminal (Zapf et al., 2003). Agents are the main interface between service providers and customers in many organisations (Ashill et al., 2009) and their influence on customer satisfaction is pivotal (Russell, 2008). Call centres are all about cost-efficiencies, and agents are required to handle as many calls as quickly as possible (Deery et al., 2010; Townsend, 2007). The pace and volume of work is determined by information technology systems which automatically route calls to the agent's terminal, also allowing for extensive performance monitoring and employee surveillance.

An agent's daily operations range between speaking to between 60 and 250 clients during an 8 hour shift (Zapf et al., 2003). Agents are considered to be "trapped at their desks" (Hannif et al., 2008, p.278), exposed to call queues (to maximise production rates) and are on the 'phones for 75% of the working day (and more) (Benner et al., 2007; Castanheira & Chambel, 2010; Castanheira & Chambel, 2010; Fleming & Sturdy, 2011; Holman et al., 2007; Sawyerr et al., 2009). Most call centres offer extended service or sales hours ranging between 12-24 hours per day, which results in flexi-time work shifts. Employers tend to regard staff as an expendable and largely unskilled workforce (Zapf et al., 2003), who are exposed to low wages, regular customer abuse and poor working conditions (Bain & Taylor, 2000; Hannif et al., 2008; Russell, 2008). The industry is

[12] Call centre agents are also called (CSR) customer service representatives (Zapf, 2003), or (FLE) front line employees (Ashill, 2009), depending on the country or management practice of origin.

viewed by some as an advanced form of Taylorism[13], marked by workloads that are demanding, repetitive, routine and highly scripted with low complexity. All this contributes to work pressure, stress and emotional exhaustion, and affects performance and absenteeism (Bain & Taylor, 2000; Bohle, Willaby, Quinlan, & McNamara, 2011; Castanheira & Chambel, 2010; Holman et al., 2007; Holman, 2002; Lin, Chen, & Lu, 2009; Russell, 2008; Zapf et al., 2003).

The structure of call centre operations is similar across nations, which suggests a convergence of standard management and employment practises (Batt et al., 2009; Benner et al., 2007; Dimension Data, 2011; Holman et al., 2007). Variations in the industry occur mostly around Human Resource (HR) functions and labour relations, as these are influenced by national laws and institutional norms (Batt et al., 2009; Holman et al., 2007). India is considered an outlier in the industry with regard to labour market conditions, as more than half of the call centre population is below 25 years old, university educated, and fluent in English, providing an ideal agent pool from which India has become the largest outsourced and offshore destination (Thite & Russell, 2010).

The high absenteeism and attrition levels in the industry are associated with automatic call routing, prescribed phone dialogues, excessive monitoring, limited autonomy and lack of career paths, resulting in stress, poor motivation and lack of commitment (Bain & Taylor, 2000; Hannif et al., 2008; Russell, 2008). Being absent from work is a coping mechanism used to establish mental health balance (Sawyerr et al., 2009; Schalk & Van Rijckevorsel, 2007; Townsend, 2007). Attrition in the industry is high, with about a third of agents staying for less than a year (Holman et al., 2007; Siong, Mellor, Moore, & Firth, 2006), and is strongly related to unsatisfactory working conditions.

2.3.2 The impact of call centre job characteristics on agents

When 26 job types were rated for levels of job stress, call centre work was rated amongst the top 6 (Johnson, Cooper, Cartwright, Donald, Taylor, & Millet, 2005). The following section provides empirical evidence to support the stressfulness of call centre work. It describes the sources of stress in the industry and the impact of these stressors on the physical and psychological well-being, job satisfaction and health of call centre agents (Holdsworth & Cartwright, 2003; Holman, 2002).

[13] Taylorist principles were introduced by Frederick Winslow Taylor (1856 – 1915) an American engineer who improved industrial efficiency and started production lines. http://en.wikipedia.org/wiki/Frederick_Winslow_Taylor

- Call centre work is often described as emotional labour[14] (Bain & Taylor, 2000; Castanheira & Chambel, 2010; Lebreton et al., 2004; Taylor & Bain, 2007; Townsend, 2007) and the occurrence of emotional dissonance[15] has been described in the literature as a contributing factor to underperformance (Hopp, Rohrmann, Zapf, & Hodapp, 2010). Evidence from three studies using the Frankfurt Emotion Work Scales (FEWS), ranging in sample sizes 375, 161 and 811, all found high levels of emotional dissonance, associated with high emotional exhaustion (Wegge et al., 2010; Zapf et al., 2003), burnout and lower autonomy (Castanheira & Chambel, 2010), and negative affectivity (Wegge et al., 2010).
- A French epidemiological cross-sectional study (n = 1987) found high job stress to be associated with a high proportion of working time (75% and more) spent handling calls (Odds Ratio: OR = 5.9); exposure to abuse either internally (OR= 3.1) or from customers (OR = 1.8); inadequate breaks (odds ratio, OR = 2.0), low perceived quality of work (OR = 2.4), and experiencing the workplace as unsatisfactory (OR = 2.0), (Chevalier, Dessery, Boursier, Grizon, Jayet, Reymond, . . . & Calvez, 2011).
- A cross sectional Swedish study used a questionnaire in 28 call centres to collect data from 1183 agents, and found that 61% reported high stress levels associated with time pressures, limited support and lack of autonomy; while 14% described themselves as 'worn-out'. The latter group also reported poorer health and took more sick leave (Kjellberg et al., 2010).
- High workload in a call centre sample of 480 was strongly associated with emotional exhaustion (r = 0.50) and contributed to a culture of absence (r = 0.18) (Deery et al., 2010).
- In a Taiwanese call centre (n = 1023), handling difficult customers was reported by 66.4% of men and 67.5% of women as the biggest contributor to work stress (Lin et al., 2009; Siong et al., 2006).
- In a study observing 823 agents across 36 call centres, dialogue scripting (β = 0.27) performance monitoring (β = 0.30) and workload (β = 0.27) contributed to job stress (Sprigg & Jackson, 2006).
- In a mixed method study of 113 agents, four distinct factors emerged from the analysis that contributed to the effectiveness of agents (measured through

[14] Hochschild coined the term ''emotional labour,'' defined as the psychological processes necessary for workers to align and manage their emotions by what their organisational structure and rules expect regardless of their internal feeling (Zapf et al., 2003). "Emotional labor is described as having to suppress true feelings and "serve with a smile" (Rohrmann, et al., 2010).

[15] "The discrepancy between expressed and felt emotions is called 'emotional dissonance' and prior studies show that it is an important phenomenon in service work as part of emotional labour, and linked to burnout (Wegge et al., 2010; Zapf et al., 2003).

supervisor ratings): customer stress (measuring various stress originators) (α = 0.85) and stress management (α = 0.74), intrinsic motivation (α = 0.91) and reward/recognition (α = 0.56). Agents who were intrinsically motivated were more effective, experienced less stress and managed their stress better (Mahesh & Kasturi, 2006).

- Worker wellbeing was studied in 557 call centre agents by measuring anxiety and depression ratings. Higher anxiety was associated with less job control (β = -0.11), reduced team leader support (β = -0.19) and monitoring levels (β = 0.14). Depression was related to reduced job control (β = -0.15), less team leader support (β = -0.21), performance appraisals (β = -0.14) and monitoring levels (β = -0.12). However, anxiety and depression levels were not significantly different when compared to clerical and manufacturing workers (Holdsworth & Cartwright, 2003; Holman, 2002).
- Studying the impact of emotional labour, two control-group studies found that cardiovascular activity increased when call centre agents had to suppress their true feelings (Rohrmann et al., 2010).
- Burnout was prevalent in a South African service agent sample (n = 146) and was also the highest indicator for intention to quit (r = 0.64). Lack of career opportunities (r = 0.66), performance monitoring (r = 0.32) and emotional labour (r = 0.31) further contributed to agents' lack of commitment and an intention to leave (Visser & Rothmann, 2008).
- Studying absenteeism and attrition in a small convenience sample of 89 inbound insurance call centre agents in the Netherlands found that agents who worked part-time (β = -0.29) were absent less often. A supposition was made that their probation periods prior to becoming permanent staff the motive. Agents with higher commitment (β = -18 and -0.22) and wellbeing (β = -0.27) had less intention to quit, explaining 47% of the variance in attrition (Schalk & Van Rijckevorsel, 2007).
- In two Australian cohorts (studying 126 call centre and an unspecified retail staff group), stress reactions (burnout, anxiety and somatic complaints) were more prevalent in call centre than retail staff (0.70 versus 0.23). Commitment (r = - 0.59), job satisfaction (r = -0.63), job stress (r = 0.40), supervisor support (r = -0.45) and combined stressors (work overload, work family conflict, role ambiguity, and role conflict) (r = -0.49) were associated with intention to quit for the call centre agents. Satisfaction, supervisory support and combined stressors on intention to quit were greater for call centre than retail workers (0.48 versus 0.16) (Siong et al., 2006).
- In a qualitative South African call centre study (n = 17), emotional suppression emerged as an important theme, and deviant behaviour at work and after work was recorded by the study participants (Dockrat, 2008).

- High levels of stress in call centre staff as opposed to other workers were refuted by some minority studies (Holman, 2002; Zapf et al., 2003). When compared to the newer and bigger sample studies (admittedly not using control groups) there is more evidence to support than refute the fact that call centre work is emotionally draining and stressful (Chevalier et al., 2011).
- Further to high stress levels were the documented health risks associated with call centre work. An Indian study with a random selection of 100 agents found anxiety in 55%, sleep disturbances in 29% and biological rhythm disturbance (alertness, mood, energy) in 21% (Bhuyar, Banerjee, Pandve, Padmnabhan, Patil, Duggirala, . . . Chaudhury, 2008). Agents with higher job stress had significantly more health complaints, including eye strain, tinnitus, hoarse or painful throat, chronic cough with phlegm, chest tightness, irritable stomach or peptic ulcers, frequent urination and musculoskeletal discomfort (odds ratio ranging 1.65 – 2.15) (Lin & Lu, 2009).

Differences in stress levels and/or job expectations between inbound/outbound and captive versus outbound call centres have been identified. As the current study included agents across all industries, such findings are important to consider.

- According to (Schalk & Van Rijckevorsel, 2007) in-house/captive call centres have better employment conditions than their counterparts in the outsourced industry. Higher stress levels ($p < 0.05$) and sick leave ($p < 0.029$) were observed in external (outsourced) call centres when compared to internal (captive) call centres (Kjellberg et al., 2010).
- Working conditions (considering layout and physical structure) was found to be more optimal in 6 internal/captive call centres when compared to 10 outsourced call centres in Sweden (Toomingas & Gavhed, 2008). In the same sample noise levels were lower in internal call centres when compared to outsourced ones ($p = 0.04$) (Gavhed, 2007). Increased external demands which limited HR practises was found to contribute to the pressured work environments experienced in outsourced call centres (Kinnie, Purcell, & Adams, 2008).
- An Indian study with a random selection of 100 agents showed a significant difference in the domestic versus international call centres. The study was however not specific enough to determine type of variation, apart from both coming from the outsourced industry (Bhuyar et al., 2008). Although job stressors were not found to differ between nine non-random selected call centres, only one of the nine was from the outbound industry, limiting the study results (Zapf et al., 2003). The evidence supports outbound call centres as being more demanding and stressful when compared to captive call centres.

2.3.3 Temperament and work performance, absenteeism and attrition

Studies which observed how specific temperament traits contributed to performance, absenteeism and attrition were critically reviewed. A review of these studies (half of them used the 'Big Five') are summarised in Table 2.1 below (please review the Glossary, pg xii for temperament terminology).

Where studies did not associate temperament with performance, absenteeism and attrition, these sections were marked as not applicable (N/A). For ease of interpretation and clarity, the correlation is documented by either a minus (-) or a plus (+).

Table 2.1: Evidence to Support the Relationship between Temperament Traits and Performance, Absenteeism and Attrition

Author and publication date	Sample	Methods and Relevant Instruments	Performance relationship	Absenteeism relationships	Attrition Relationships
(Ashill et al., 2009),	N = 170; Complete sampling; 1 call centre – retail bank; Inbound, service.	Structured questionnaires: Service recovery performance (adapted from Boshoff and Allen, 2000), α = 0.79; Job resourcefulness (adapted from Licata et al., 2003), α = 0.82.	Job resourcefulness **(+)**, (β = 0.31) Positive correlation	N/A	N/A
(Nicholls, Viviers, & Visser, 2009; Skyrme et al., 2005)	N = 150; Purposeful, non-random sample; 3 Communications call centres; Inbound, service.	Structured questionnaires: Customer Contact Styles Questionnaire Version 7.2, α = 0.74-0.90; Personnel Test Battery Basic Checking and Audio Checking, α = 0.93-0.94; Customer Contact Competency Inventory, α = 0.67-0.92; Average Call Handling Time and Call Quality.	*Conscientiousness* **(+)**, (r = 0.35) Most consistent predictor across all measurements and meta-analysis	N/A	N/A
(Sawyerr et al., 2009)	N = 194; Elective sampling, 8x call centres; Insurance and tele-communications industry; Inbound service.	Structured questionnaires: FFM (five factor model) α = 0.81-0.91; LOC (locus of control) α = 0.79-0.84; Supervisors rating on performance, absenteeism and intent to turnover.	*Openness to new situations/experiences* **(-)**, (p = 0.06) Negative correlation	*Conscientiousness* **(-)**, (β = **–** 0.30) *Internal LOC* **(-)**, (β = **–** 0.65) Unexpected were: *Agreeableness* **(+)**, (β = 0.284) *Emotional stability* **(+)**, (β = 0.75)	*Emotional stability* **(+)**, (p = 0.007) *Openness to experience* **(+)** ,(p = 0.024) Unexpected: *Locus of control (internal)* **(+)** ,(p = 0.017)

Author and publication date	Sample	Methods and Relevant Instruments	Performance relationship	Absenteeism relationships	Attrition Relationships
(Timmerman, 2006)	N = 203; Elective sampling, 1x call centre telecommunications industry; Inbound service.	Structured questionnaires: NEO PI-R True attrition (voluntary turnover) was measured through company records 8 months after questionnaire completion.	N/A	N/A	*Extraversion:* **(+)**, (r = 0.15) *Openness to experience* **(+)**, (r = 0.20) At the facet level: *Anxiety* **(-),** (r = –0.14) *Dutifulness* **(-)**, (r = –0.14) *Imagination* **(+)**, (r = 0.17) *Artistic interests* **(+)**, (r = 0.18)
(Siong et al., 2006)	N = 126; Recruited from 11 call centres (call centre types not supplied)	Structured questionnaires: Organisational stressors (adapted from Tate), α = 0.61-0.91; Job satisfaction, α = 0.83; Commitment, α = 0.80; Self-reported intention to quit, α = 0.82.	N/A	N/A	*Commitment* **(-)**, (β = -0.30) *Job satisfaction* **(-)**, (β = -0.40)
(Lebreton et al., 2004; Skyrme et al., 2005)	N = 359; 1 outbound call centre, research interviewers	PPI (Performance Perspective Inventory) including the FFM traits, α = 0.69-0.89; Objective performance data from company records.	*Emotional stability* **(+),** (r = 0.22, p =.01) *Conscientiousness* **(+)**, (r = 0.23, p =.01) *Agreeableness* **(+)**, (r = 0.15, p =.01)		

Author and publication date	Sample	Methods and Relevant Instruments	Performance relationship	Absenteeism relationships	Attrition Relationships
(Lebreton et al., 2004; Skyrme et al., 2005)	N = 150; 4 call centres; Inbound, service.	Included two newer statistical methods: dominance and epsilon (consistent results) together with traditional indices of importance (inconsistent results); Structured questionnaires: CSFI (Customer service fit index); including several of FFM traits, α = 0.72- 0.87; Absenteeism (self-reported).	Predicted variance in percentages: Emotional stability 55% of job satisfaction, 53% of negative job behaviours; Extraversion 21% of job dissatisfaction Conscientiousness 24% of negative job behaviours	Job-specific negative affect predicting 58% of variance Emotional stability predicted 26% of variance	N/A

The 'Big Five' results showed emotional stability (the opposite of neuroticism) and high conscientiousness to be the most consistent indicators for high performance. Agents with lower ratings of conscientiousness, less internal locus of control and negative affect were more often absent from work. However those with high emotional stability were more absent, which was interpreted as people who were stable, took control and days off to recover. Attrition was higher for agents who were more open to new experiences, extraverted, and had high emotional stability, a high locus of control and lower job satisfaction and commitment. The statistical method of structural equation modelling, based on factor analysis and principal component analysis, was frequently used in these studies. With these methods requiring extensive assumptions made on the collected information and the transformation of data, it had potential to confound results. Some self-reporting questionnaires were also used which might have influenced the results, especially when study participants recorded their own absenteeism and intention to quit. All studies, with the exception of Timmerman (2006) measured intention to quit and not true attrition, which casts doubt on whether they provide an accurate reflection of attrition. Sawyer's (2009) work was particularly useful as it closely resembled the current study in observing similar dependent variables of performance, absenteeism and attrition, but direct correlations were minimal. Although some of the sampling methods and demographics (Caucasian majority, 61-70%, mostly inbound call centres) could limit the study results, adequate support for studying temperament as a construct in the call centre industry was obtained.

2.3.4 Summary

- The pace of work in call centres is managed by information technology systems which route calls directly and consistently to agents, while also supplying a base for monitoring and surveillance thereby placing agents under constant pressure to perform.
- The industry is marked by demanding, repetitive, routine and highly scripted workloads with absenteeism and attrition global concerns in the industry.
- Call centre work is described as emotional labour with high stress levels, affecting performance, burnout, health and mental well-being.
- There is some evidence to substantiate the difference in results between inbound and outbound call centres and captive and outsourced centres. Captive and inbound centres seem to have more satisfactory work conditions.
- Temperament traits have been correlated with performance, absenteeism and attrition.

2.4 Environment Studies

The physical features of contemporary office design impact on worker performance and health, taking indoor variables (for example noise, lighting, ambient temperature, air quality) and interior design variables (for example space, furniture, fixtures, equipment, colour, artwork, natural views) into consideration (Rashid & Zimring, 2008). *The environment as a mediator between human behaviour and performance provides the framework for this section. It commences with an overview of the characteristics of open plan office spaces followed by evidence for the potential impact of open plan office work spaces on call centre agent behaviour, performance and health.*

2.4.1 Characteristics and impact of open plan office environments

Call centres are open plan office[16] environments (Barnes, 2007; Sözen, Akdağ, & İlgürel, 2009), the most popular office design used by commercial organisations (Davis et al., 2011). A field study of 779 open-plan office occupants in Canadian and US cities, the

[16] Open-plan offices tend to be large work spaces without interior walls that usually contain a big number of workers, each with individual workstation arrangements. This is common amongst most contemporary organizations and is viewed as a cost saving. There has been a 40% increase in the average UK office density since 1997 (from 16.6m² per person to 11.8m², British Council of Offices, 2009) (Davis et al., 2011). Open plan offices are intended to allow for flexible work flow and to promote team communication. Transitions and developments in workplace designs are enabling organizations to become more innovative where upgrading of open-plan offices supports more nomadic, group-based, flexible, and even remote working styles (Davis et al., 2011).

Cost-Effective Open-Plan Environments (COPE) project (Veitch et al., 2007) found a three factor structure of privacy/acoustics (r = 0.51 – 0.73), lighting (r = 0.27 – 0.88), and ventilation/temperature (r = 0.63 – 0.85) to be most conducive for job satisfaction. Where open plan office workers were satisfied with their physical environments, they were also more satisfied with their jobs, suggesting the role of the physical environment in organisational well-being and effectiveness (Veitch et al., 2007).

Three review studies of the open plan office environment literature[17] (De Croon et al., 2005; Rashid & Zimring, 2008; Szalma & Hancock, 2011) provided further evidence for the impact of such designs on worker health and performance:

- Major design risks such as a lack of acoustic and visual isolation creates over-stimulation of workers, causing distractions with cognitive overload. As a result workers find it difficult to concentrate, reacting negatively and becoming dissatisfied and unmotivated (Davis et al., 2011; De Croon et al., 2005; Veitch et al., 2007). The primary sources of office annoyance cited most frequently were people talking in the background and telephones ringing (Rashid & Zimring, 2008). Considering this in the context of call centres where agents talk on the phone for 75% of their working time and more; it could be expected to intensify the above mentioned risks and annoyances.
- Further evidence, (among them laboratory studies), noted that background noise minimises task performance, affecting task complexity and accuracy rather than speed (Davis et al., 2011; Jahncke, Hygge, Halin, Green, & Dimberg, 2011; Szalma & Hancock, 2011). Noise associated with unpredicted sounds like a telephone ringing, intelligible speech and intermittent peak noises that fluctuated above the average levels rather than being continuously noisy, all demanded more cognitive work, created increased physiological stress and exacerbated task performance (Rashid & Zimring, 2008; Szalma & Hancock, 2011).
- Open plan office designs reduced worker's privacy and job satisfaction, while lower density offices and the use of screens between workstations minimised the effect of excessive stimulation (Davis et al., 2011; De Croon et al., 2005). The negative effects of the open plan space were reduced where tasks had a lower complexity, and where lighting, ambient temperature and air conditions were more favourable (De Croon et al., 2005; Rashid & Zimring, 2008).

[17] De Croon, 2005, reviewed 49 studies, n = 16378 considering primarily the effect of office concepts on worker health and performance. Szalma, 2011, reviewed 242 studies, n = 13887 looking at the effect of noise on human performance. Rashid, 2008, proposed a stress framework, considering both office and health care environments; the total number of participants was not documented.

Considering the dense open plan office design which is typical of the call centre industry, it was surprising to find limited evidence with regards to its impact on worker performance and satisfaction. “The modern work physical environment is characterised by technology; computers and machines as well as general furniture and furnishings which through incessant interaction, bombard our brains with sensory information”, (McGuire & McLaren, 2009). The reviews that follow indicate the potential impact of the physical characteristics and augmented sensory stimuli that open plan offices and especially call centres may have on worker performance and satisfaction.

- In a Scottish call centre sample of 65 agents, McGuire found those agents who were satisfied with the design variables of their physical work stations (e.g. desk space, height, keyboard, and mouse) had higher committed ratings ($p < 0.001$) and higher scores on employee wellbeing ($p < 0.05$) (McGuire & McLaren, 2009).
- A qualitative case study of six Australian call centres confirmed them to be noisy and overloaded with a lack of visual control and poor levels of privacy (Barnes, 2007). Barnes further suggested that the physical set-up and management practises of call centres can influence worker resistance, and highlights the need to consider this as an important facilitator of performance.
- In the large French cross-sectional study (n = 1987) of Chevalier (Chevalier et al., 2011) 64.0% of agents rated ambient noise as their main complaint. About 94.0% blamed their colleagues’ conversations, 59.4% ringing phones, 36.2% computer/printer noises and 27.0% the noise of air-conditioning systems. Visual reflections were a concern for 56.0% and 36.0% said that the lighting was insufficient while 56.0% considered the heating to be unsatisfactory. Overall, 57.1% of employees who spent 75% and more of their time on the ‘phone, considered their workstations to be unsatisfactory.
- Measuring the noise levels in a 718 m² banking call centre in Turkey, the maximum acceptable background noise level of 68 decibels[18] was found to be exceeded by 18 decibels at all 12 different measuring points. By reducing the number of staff, reorganising the space, placing dividers between seats and covering the ceiling with sound absorbing materials the sound levels were reduced to acceptable levels (Sözen et al., 2009)

[18] Assessment and Management of the Environmental Noise Regulation of Turkey, The Official Gazette, Number: 26809, Turkey, 2008 in (Sözen, Akdağ, & İlgürel, 2009).

2.4.2 Differences in individual responses to the environment

Workers cannot be assumed to react uniformly to open plan office designs. The evidence that individuals differ in their perception and responses to the environments has been studied using various theoretical approaches, including cognitive, social, development and stress theories. There is however limited study evidence on individual differences of call centre staff. Being such a fast growing and prominent business industry paired with new design developments of hot-desking and home working, further study of this environment is needed (Davis et al., 2011).

The next section reviews the evidence for differences in individual responses to stressful work environments. It commences with a brief description of two human development theories that describe why people respond differently to environmental stimuli and proceeds with a review of recent studies. Two evolutionary-inspired theoretical arguments of the differential-susceptibility hypothesis (nature) and biological-sensitivity-to-context hypothesis (nurture) support the nature-versus-nurture phenomena (Belsky & Pluess, 2009). Central to both is the notion that some individuals are disproportionately likely to be adversely affected by environmental stressors because of a vulnerability in temperament which is physiological in nature (e.g., high stress reactive temperament), or genetic neurobiology in origin (e.g., serotonergic and dopaminergic systems)[19] (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van Ijzendoorn, 2011).

1. Individuals have varied susceptibility and reactions to environmental influences (Belsky & Pluess, 2009). A review of the evidence (Belsky & Pluess, 2009) found that people with negative emotionality (called difficult temperament in this field), were most susceptible to environmental influences. Negative emotionality reflects a highly sensitive nervous system which will respond faster and more intensely to environmental stimuli (Belsky & Pluess, 2009).
2. Biological sensitivity to context is described as a neuroendocrine predisposition toward exaggerated responsiveness to environmental stressors, creating a heightened stress response and impacting on people's health of (Boyce & Ellis, 2005; Ellis, Essex, & Boyce, 2005).

- An Australian open plan office study included 109 participants. The Stimulus Screening Scale (Mehrabian, 1977) was used to measure the degree to which

[19] Belsky, 2009 draws parallels between his review and the biological marker work done in sensation seeking, reward sensitivity and BAS/BIS systems.

participants experienced stress due to environmental stimuli, together with measurements for privacy, inhibitory ability (Stroop Test, 1935), task complexity, performance and job satisfaction. Stimulus screening (a high score indicated higher stress experiences) correlated negatively with task performance ($r = 0.56$, $p \leq 0.05$)) and job satisfaction ($r = -0.23$, $p \leq 0.05$). Poor inhibitory skills also resulted in less job satisfaction (Maher & von Hippel, 2005). The authors concluded that some individuals appear to cope better with the excessive stimulation inherent to the open-plan office environment, due to differences in their stimulus screening ability. These subjects were less affected by crowding and were able to reduce the stress of numerous stimuli, while non-screeners become over aroused by the same stimuli and reacted more negatively towards their environment (Davis et al., 2011; De Croon et al., 2005; Maher & von Hippel, 2005).

- Noise can be detrimental to performance for some people, but beneficial for others. Individuals who were identified as 'rigid' (and also had higher anxiety and arousal levels) performed best in normal and quiet environments, where flexible individuals actually performed better in noisy environments (Brand, Schneider, & Arntz, 1995). With the effect of noise regarded as over-arousal and more demand on attentional filtering (Szalma, 2011), evidence to support individual differences in responses to noise was sought.
- A laboratory study[20] showed that individuals (n = 58) scoring high on defensiveness and anxiety had the highest startle responses (p values <0 .002, 0.05 and 0.02) when presented with sudden noise (Temple & Cook, 2007). When considering the studies of Maher 2005, Brand 1995 and Temple 2007, individuals with more anxiety who find it difficult to filter excessive stimuli might find their performance hindered by open plan office environment such as call centres. The associations between sensory processing, anxiety and temperament are discussed in paragraph 2.5.2 (pg 31) and Table 2.4 (pg 50).
- Another study considered how and why corporate office staff positioned their desktop computers (facing inward to the cubicle, or outwards). Participants whose computers faced out of their cubicle (n = 22) did so with the intention of enhancing communication, protecting confidentiality of material and avoiding being startled. Workers who faced their computers inwards (n = 46) intended to reduce

[20] The State-Trait Anxiety Inventory (STAI-T) and Marlow-Crowne Social Desirability Scale (MCSDS) were used to measure anxiety and defensiveness. Startle responses were measured through noise probes 60 ms, 240 ms and 2,000 ms after 58 study participants were given pictures to view. Startle responses are rapid, reflexive actions and relatively independent of conscious control, or voluntary manipulation, and used to study emotion and attention processes (Temple & Cook, 2007).

distractions. No relationship to personality factors was found. However only extraversion, locus of control and self-monitoring capacity were assessed; and the small sample might have influenced results (Sommer & Augustin, 2007). Sommer's study highlighted the opportunities that minor adaptations to open plan office environments may have on individual's performance but also that it would be most successful when considering the needs and difference in responses of individuals.

A further and important extension of the literature is what Ellis, et al. 2011, called "for better or for worse" to show not only the detrimental but also the supportive influence of environments on individuals. That is, where the same environment is detrimental for some, it can be supportive for others, based on their biological make up and susceptibility. The nervous system and rearing of individuals should thus not only be understood as an indication of vulnerability (and avoid risk environments) but also of plasticity (incorporate conducive environments). With the emphasis on careful consideration of environments and their potential influences on individuals (Ellis et al., 2011), the study hypothesis that call centre will be enabling performance for some while hindering is supported.

2.4.3 Summary

- Open plan offices contribute to distractions and cognitive overload, affecting performance and worker health.
- Background talking and telephones ringing were cited most frequently as the primary sources of office annoyance. Since call centre agents' work requires that they spend 75% of their working time talking on the 'phone, such irritations was expected to intensify workers performance risks and annoyances.
- Background noise reduces task performance, affecting task complexity and accuracy rather than speed.
- Worker privacy and job satisfaction were identified as risk factors in open plan designs, while lower density offices and the use of screens between workstations minimised the effects of excessive stimulation.
- Individuals with anxiety, negative emotionality, low inhibitory processes and stimulus screening, and higher than average needs for privacy, were most susceptible to environmental influences because of their highly sensitive nervous systems, which responded faster and more intensely to environmental stimuli.
- Individual susceptibility and biological sensitivity to environments means that a workspace, while being detrimental for some, can be supportive for others.

2.5 Psychology

Industrial psychologists use temperament as a performance and recruitment tool in work settings. Potential territories for deeper understanding of worker performance exist by exploring synergies between temperament studies and an OT perspective of sensory processing and job success in call centres. The shared synergies between sensory processing studied as temperament in psychology and as a clinical intervention application in OT will be explored in this section. The concluded applications from an OT perspective are a focus point for discussion in Chapter 5 (pg 145). Extrapolating the evidence most relevant to the current study, it commences with an overview of potential synergies between personality, temperament and sensory processing before reviewing instrumentation, sensory sensitivity and sensation seeking. Evidence on sensory thresholds, and studies sharing adult instrumentation between OT and psychology follows.

2.5.1 Personality, temperament and sensory processing

The genetic predisposition of personality is shaped from a young age by continuous interaction with the environment (Croy et al., 2011) and consists of stable temperament[21] traits (Aron et al., 2010; Roberts et al., 2011; Rothbart, 2007; Van Den Berg & Feij, 1993). In psychology sensory processing is studied in healthy populations as a temperament construct and may share the same underlying genetic origins as sensory processing (Ben-Sasson, Carter, & Briggs-Gowan, 2009; Croy et al., 2011; Jerome & Liss, 2005). Sensory stimuli are processed differently by individuals (Aron & Aron, 1997; Croy et al., 2011; Jerome & Liss, 2005) and described as person-specific, rather than being an objective sensory filter from which individuals perceive their worlds influencing their thoughts, behaviours and emotions (Croy et al., 2011).

In personality studies two main groups, who have studied sensory sensitivity (Aron et al., 2010; Aron, Aron, & Davies, 2005; Aron & Aron, 1997) and sensation seeking (Zuckerman, Buchsbaum, & Murphy, 1980; Zuckerman, 2008) are of interest to the current study. In the OT literature sensory processing considers behaviour and occupation from a clinical perspective and is understood to result from low neurological thresholds (sensory sensitivity, also referred to as hypersensitivity) and high neurological thresholds

[21] The term temperament rather than personality (see Glossary of Terms) is preferred for use in this thesis as it potentially are more closely related to sensory processing studied in OT rather than the more encapsulating term, personality.

(sensory seeking, also referred to as hyposensitivity). The concept or understanding of sensory processing in OT is based on various biological sensory systems (visual, auditory, touch, olfactory, gustatory, movement), but sensory sensitivity and sensation seeking are more often combined rather than separated for clinical applications (Brown et al., 2001; Brown & Dunn, 2002; Dunn, 1997; Miller et al., 2007). Although the assessment instruments and applications of sensory sensitivity and sensation seeking in the OT sensory processing literature are distinctly different to the temperament literature, the potential synergies between these constructs merits attention. The study fields of temperament in psychology and sensory processing in OT do share some commonalities in the primary use of behavioural self-report measures but simultaneously aim to grow and strengthen evidence by studying neurobiological markers in a laboratory settings and to inform the field of psychopathology (Miller, Nielsen, Schoen, & Brett-Green, 2009; Vaidyanathan, 2009).

Interdisciplinary collaboration between these two study fields remains limited, and to my knowledge; no studies exist which combined the Adolescent/Adult Sensory Profile (AASP), the Highly Sensitive Person Scale (HSPS), measuring sensory sensitivity, and/or the Sensation Seeking Scale (SSS), measuring sensation seeking. Although a few studies shared instrumentation for adult populations (Brown & Dunn, 2002; Jerome & Liss, 2005), infants (DeSantis, Harkins, Tronick, Kaplan, & Beeghly, 2011), and children (Diamant, 2011), ample opportunities for wide-ranging collaboration between psychology and OT exist.

2.5.2 Sensory sensitivity as a temperament construct

In both the temperament and OT literature, the construct of sensory sensitivity fundamentally refers to behaviours that occur as a result of underlying neuro-physiological processes, facilitated by interaction with the environment, and resulting in hyper-responsivity to daily sensory input (Aron et al., 2010; Aron et al., 2005; Aron & Aron, 1997; Ayres, 1979).

The Highly Sensitive Person Scale (HSPS) is a reliable and valid 27-item instrument developed through a series of seven studies using varied samples and methodologies to measure the core variable of Sensory Processing Sensitivity (SPS) (Aron & Aron, 1997). Sensory sensitivity was described as a one-dimensional temperament construct at inception, associated with high arousability, and characterised by consistently inter-correlated sensitivity to the processing of external (e.g., light, noise) and internal (e.g., pain, hunger) sensory information (Aron & Aron, 1997; Smolewska et al., 2006). While Sensory Processing Sensitivity (SPS) is related to social introversion and emotionality, they are not the same and are also not the result of a combination of the two (Aron &

Aron, 1997). The one-dimensionality of the HSPS has been questioned by various authors (Evans & Rothbart, 2008; Evers, Rasche, & Schabracq, 2008). As a result a multidimensional construct inherent to the HSPS was explored and supported in a sample of 851 students, consisting of Ease of Excitation (EOE -external demand related); Aesthetic Sensitivity (AES - related to aesthetic awareness) and Low Sensory Threshold (LST -internal demand related), thus providing for a better understanding of research results and applications (Evans & Rothbart, 2008; Evers et al., 2008; Smolewska et al., 2006). More negative aspects appeared to be associated with EOE and LST while the AES factor appeared to be more related to a complex inner life, appreciation for the arts, music and a high level of conscientiousness (Liss, Mailloux, & Erchull, 2008). Most studies that used the HSPS after 2006 included the three factor model, but to ease reporting, the total SPS scores have mostly been used when providing evidence[22].

Sensory processing sensitivity (SPS) was found to have positive correlations with various 'negative' temperament traits and social-emotional correlates of: neuroticism (Ahadi & Basharpoor, 2010; Aron et al., 2010; Aron & Aron, 1997; Smolewska et al., 2006; Smolewska et al., 2006); shyness (Aron et al., 2005) and negative affectivity (Evers et al., 2008; Smolewska et al., 2006).

Further empirical evidence showed that high SPS scores were related to higher perceived stress and ill-health (Ahadi & Basharpoor, 2010; Benham, 2006; Evers et al., 2008); depression and anxiety (Liss, Timmel, Baxley, & Killingsworth, 2005; Liss et al., 2008; Neal, Edelmann, & Glachan, 2002). In a work related study high SPS scores correlated with work stress, especially in the second stage of stress (the more burnout indicative stage), ($r = 0.42$, $p \leq 0.001$), work displeasure ($r = -0.48$, $p \leq 0.001$) and needing time to recover from stress ($r = -0.48$, $p \leq 0.001$). The study findings were used to express the need for a particular approach in training and coaching of individuals with SPS in explaining the normalcy of their responses and guiding them towards better interaction with their environments, as well as making time for quiet and relaxed activities. The value for the use of SPS in selection of less stressful jobs was expressed by the author (Evers et al., 2008).

SPS also correlated with 'positive' temperament traits of openness to new experiences (Ahadi & Basharpoor, 2010; Smolewska et al., 2006) and conscientiousness (Ahadi & Basharpoor, 2010). High SPS was also found to be related to attention to detail (Liss et al., 2008), confirmed in a laboratory setting, using functional neuroimaging, which showed

[22] This detail did not add to the supportive evidence for the current study.

this group to have more activation in the visual attentional cortical areas when required to find minor changes in visual scenes, compared to low SPS (Jagiellowicz, Xu, Aron, Aron, Cao, Feng, & Weng, 2011).

2.5.3 Sensation seeking as a temperament construct

Sensation seeking has been studied as a behavioural trait since 1964,[23] producing a vast amount of literature across various study fields. Review for the current study of the period 1994 to 2011 produced 518 citations in Web of Science, 1065 citations in Ebscohost and 1070 citations in Google Scholar, all of which had sensation seeking in the title. Only the evidence central to the current study was reviewed. Regrettably, amongst this vast volume of data there were no studies found (to the researcher's knowledge) comparing constructs of sensation seeking in the adult temperament and sensory processing in OT fields.

Sensation seeking is essentially a normal trait construct, described as the seeking or need for "varied, novel, complex, and intense sensations and experiences, corresponding with the willingness to take physical, social, legal, and financial risks for the sake of such experience", p.26, (Zuckerman, 1994). Sensation seeking in OT literature is similarly linked to responses of enjoyment, creativity and the pursuit of sensory stimulation (Brown & Dunn, 2002) but is different in excluding negative behaviours such as impulsivity and risk taking as observed in Zuckerman's sensation seeking (Brown, et al, 2001).

Sensation seeking is conceptualised as a multidimensional personality construct, measured by a 40-item self-report questionnaire, the Sensation Seeking Scale, version 5 (SSS-V) and comprises four main subscales: Thrill and Adventure Seeking (TAS), Experience seeking (ES), Disinhibition (Dis) and Boredom susceptibility (BS), refer to the Glossary of Terms (pg xii) for further descriptions (Hittner & Swickert, 2006; Roberti, 2004; Zuckerman, 1994).

The temperament evidence that follows aims to show where sensation seekers might not be suitable versus support for being a suitable group to work in the call centre environment, as an important focus of this study.

- Sensation seeking is not intrinsically psychopathological or antisocial but can manifest as either adaptive (engagement in sports, music, vocation, art, media, fantasy and humour) or maladaptive (smoking, alcohol and drug abuse, reckless

[23] Development of a sensation-seeking scale. Zuckerman, Marvin; Kolin, Elizabeth A.; Price, Leah; Zoob, Ina. Journal of Consulting Psychology, Vol 28(6), Dec 1964, 477-482. doi:10.1037/h0040995

driving, promiscuous sex and risk taking behaviour) traits. The latter, is more prevalent in males, younger ages and Caucasians, has a strong neurobiological basis (Hittner & Swickert, 2006; Lynne-Landsman, Graber, Nichols, & Botvin, 2011; Roberti, 2004; Vuust et al., 2010; Zuckerman, 1994) and is associated with alcohol, smoking and drug abuse (Hittner & Swickert, 2006; Lynne-Landsman et al., 2011; Roberti, 2004; Vuust et al., 2010).

- A high prevalence of alcohol and drug abuse among call centre agents have been reported by various managers.[24] Although almost exhausting data platforms, no substance abuse evidence specifically pertaining to the call centre industry could be found.
- In a South African sample chosen for their sensation seeking behaviour, explicit sexual behaviour co-occurred with alcohol abuse and resulted in increased HIV risk behaviours (Kalichman, 2008; Kalichman, Simbayi, Jooste, Cain, & Cherry, 2006).
- High sensation seeking, compared to low sensation seeking behaviour has also been found to be associated with aggressive behaviours (Lynne-Landsman et al., 2011; Wilson & Scarpa, 2011)[25]. Sensation seekers behaviour has been shown to be activated by high arousal stimuli (Joseph, Liu, Jiang, Lynam, & Kelly, 2009) and to demonstrate a higher susceptibility for boredom (the latter was established through neurobiological research) (Jiang, 2009).
- In a study comparing high versus low sensation seekers in military soldiers, high sensation seekers found chaotic and unpredictable situations more manageable but did not cope well when confronted with boredom and monotony (Parmak, 2011). A thematic review by (Loukidou, 2009) provides insight into the impact of boredom on worker job satisfaction and health and its challenge to organisations, which potentially could be amplified in sensation seekers. High sensation seekers were more prone to change jobs (Van Vianen et al., 2003), especially where jobs were highly structured with low levels of autonomy (Van Den Berg & Feij, 1993). This study may contribute evidence for higher levels of agent attrition, particularly as the call centre industry is marked with low autonomy. The monotony, repetitiveness and lack of autonomy however may pose a potential mismatch. The low complexity of call centre tasks and monotony and repetitive nature of the work should be considered against this boredom factor. The high arousability associated with the

[24] This is based on personal communication with the management of all the call centres in the study population and various leaders in the field.

[25] The review study by Wilson, a meta-analysis of 43 samples and 32,217 study participants, showed a small but significant correlation between aggression and sensation seeking.

call centre industry may potentially be better suited to sensation seekers but the associated high risk for substance abuse of such people refutes their suitability.

Sensation seeking had negative correlations with the positive temperament traits of agreeableness (r = -0.31) and conscientiousness (r = -0.21) (Zuckerman, 1994) indicating this group to be less agreeable and conscientious. The less agreeableness might prove useful when having to sell or collect debt over the phone as insistent behaviour is needed for such tasks.

- In a South African study of 620 adults (17 to 30 years of age) the influence of temperament on character strengths and resilience was observed. Neuroticism-anxiety (r = -0.11 to -0.45) and aggression-hostility (r = -0.11 to -0.34) had the greatest negative influence on character and resilience, much less than sensation seeking, the values for which were insignificant. However, where high levels of activity (r = 0.12) and sociability (r = 0.40) were observed, sensation seekers scored higher for all virtues of character strength and resilience (Hutchinson et al., 2010)[26].
- In two work related studies both the functional/adaptive contributions (learning, leadership style and work performance), and the dysfunctional/maladaptive contributions (workplace deviance, delinquency and psychopathology) of sensation seeking were studied. The functional components of sensation seeking were mediated through goal orientated achiever[27] learning (Jackson, Hobman, Jimmieson, & Martin, 2009; Jackson, 2011)[28]. It has rarely been proposed that sensation seeking can be assisting towards achieving high work performance. Instead the literature seems to emphasise the maladaptive side of sensation seeking, (drugs, aggression, alcohol, sexual behaviours) (Jackson, 2011). From Hutchinson, 2010 and Jackson 2009, 2011 it can be anticipated that the high activity levels and sociability of working in dense call centres might be conducive for sensation seekers, as a potentially more resilient group. Jackson 2009, 2011, further contributed significantly towards eliciting the functional contributions of

[26] All p-values quoted were ≤ 0.01.

[27] High mastery goal achiever learning is an adaptive learning style with a focus on success and the development of new skills. Mastery goals are associated with classroom, sporting, training and employment success.

[28] Another measurement, the Jackson's Sensation Seeking Scale (J-SSS; Jackson, 2005) exists with strong correlation with both the total score and subscales of the SSS-V of Zuckerman, $p < 0.001$, with the more "functional" subscales of TAS and ES higher r-values than the "dysfunctional" subscales of Dis and BS (Jackson, 2011). The SSS-V of Zuckerman is more known, familiar and seems to be the measurement of choice for Sensation seeking. For this reason the more recent J-SSS was not investigated in detail.

sensation seeking through mediated learning which could translate into specific training programmes for individuals in the call centre industry.

- Sensation seeking was found to correlate with the 'positive' personality traits of openness to experience (r = 0.45) (Roberti, 2004; Zuckerman, 1994) and extraversion (r = 0.49; r = 0.22) (Jackson, 2011; Zuckerman, 1994). The evidence further showed a clear pattern in career choices of sensation seekers: Sensation seekers tend to make career choices where new, novel, and stimulating environments are an inherent part of the occupational demands (Roberti, 2004; Zuckerman, 1994). High sensation seekers prefer to study rhythmic rather than classical music[29] ($p \leq 0.001$) and were found to practise more in orchestral than solo settings ($p \leq 0.001$), preferring 'lively' group to 'quiet' individual settings (Vuust et al., 2010). They traded more frequently as investors (Grinblatt, 2009)[30]; engaged in entrepreneurship (Jackson, 2011; Nicolaou, Shane, Cherkas, & Spector, 2008) and were attracted to activist organisations and leadership roles (Wymer et al., 2008).
- High sensation seekers experienced less occupational stress and better psychological well-being than low sensation seekers in the police force (Chauhan & Desai, 2010), they have a reduced cortisol response to stressors (Roberti, 2004), while low sensation seekers had a higher rating for state anxiety (Vuust et al., 2010). Using standardised eye-blink electromyography and skin conductance responses (n = 34), low sensation seekers showed higher startle fear responses and more anxiety than the high sensation seekers when given a series of unpleasant and sudden auditory white noise stimuli through headphones. The authors suggested a blunted fear response to aversive stimuli in high sensation seekers, whereas environments with intense and aversive stimuli were thought to be a deterrent for participation in low sensation seekers (Lissek, 2005). The evidence showing call centres to be stressful and sensation seekers to be less inclined to suffer from stress provides support for this group being or becoming suitable agents.

2.5.4 Chemosensory thresholds and temperament

Chemosensory perception and the chemical senses of smell and taste have been studied widely in human and animal behaviour, food science and nutrition. Since sensory thresholds are considered as key elements of sensory processing in OT a few studies are

[29] Rhythm music is more improvisational and less repetitive, as opposed to classical music which needs more repetition of instrumental exercises and exact lines of music, and requires lots of solo practise (Vuust et al., 2010).

[30] The methodology and ethics in this study were questionable. Sensation seeking was measured through the evidence of speeding tickets in Finland and not the SSS, and the study ethics were not documented.

of particular interest as they measure sensory thresholds in relation to temperament and pain.

- Smell sensitivity measured through the Chemical Sensitivity Scale (CSS; Nordin, 2003, a self-rated questionnaire) was found to be strongly related to neuroticism (r = 0.366), in 101 young, healthy adults (mean = 27.01, SD ±8.12). The same study also tested noise sensitivity using the Noise Sensitivity Scale (NSS; Weinstein, 1978), which correlated highly with olfactory sensitivity (r = 0.76) and with neuroticism (r = 0.49) in a random subsample of 40 adults (Kärnekull et al., 2011).
- Two other studies observed laboratory tested chemosensory thresholds in relationship to temperament traits, observed by the Neuroticism, Extraversion, Openness – Five Factor Index (NEO-FFI): In a healthy adult sample of 124, olfactory sensitivity had significant correlations with agreeableness (r = 0.45 and r = 0.47 in linear multiple regression analysis), and trigeminal sensitivity (related to detecting danger) correlated with high scores of neuroticism (p = 0.005) (Croy et al., 2011). Sensory sensitivities (referring to olfactory, trigeminal and noise responses) were thus highly prevalent in people with high neuroticism scores. In 36 healthy men and 78 women (ages 18 to 52 years), pain thresholds measured through cutaneous electrical and intranasal CO^2 stimuli were significantly related ($p \leq 0.001$) but independent from non-painful stimuli of smell and taste. Two clusters also clearly separated persons with either high or low pain sensitivity, with women being more sensitive to pain than men (Hummel, Springborn, Croy, Kaiser, & Lotsch, 2011). This study data showed pain as a distinct sensory perception varying from other senses of taste and smell, meaning that participants did not present with general sensitivity across all sensory systems but rather displayed a varied threshold pattern. Although pain can potentially be seen as a separate system, Croy's study also found threshold variations. These results (Croy et al., 2011; Hummel et al., 2011) are of particular interest to the OT field and offer support for individuals being sensitive to one sense but not necessarily for another (Brown & Dunn, 2002). The focus on the chemical senses does limit transferability of results as the visual, vestibular, proprioception and non-pain touch systems are large focus areas in OT and were not included in the last 3 mentioned studies.

2.5.5 AASP and temperament studies

Two studies considered the AASP, temperament and attachment styles described in Table 2.2 (pg 38). The New York Longitudinal Scales (NYSL) Adult Temperament Questionnaire was completed by 207 adults in order to provide convergent and discriminant evidence in the standardisation study of the AASP (Brown & Dunn, 2002). In

the second study, 113 adults completed the AASP with attachment and coping styles instruments (Jerome & Liss, 2005). The combined results, using correlation values, are set out below in Table 2.2 according to the four quadrant sensory processing model of Dunn (Dunn, 1997).

Table 2.2: Relationships between Sensory Processing, Temperament, Attachment and Coping Styles

Low Registration (LR)		**Sensation seeking (SS)**	
No correlations with temperament		**Temperament correlations:**	
		Approach/withdrawal	r = - 0.41
		Negative mood	r = - 0.30
Attachment style correlations:		**No correlations with attachment styles**	
Relationship anxiety	r = 0.24		
Relationship avoidance	r = 0.22		
Coping styles correlations:		**Coping styles correlations:**	
Behavioural disengagement	r = 0.19	Mental disengagement	r = 0.21
Mental disengagement	r = 0.30	Denial	r = 0.18
Denial	r = 0.29	Focus on and venting emotions	r = 0.21
		Seeking emotional support	r = 0.22
		Positive reinterpretation and growth	r = 0.22
Sensory Sensitivity (Ssens)		**Sensation avoiding (SA)**	
Temperament correlations:		**Temperament correlations:**	
Negative mood	r = 0.32	Adaptability (change aversive)	r = 0.35
Sensory threshold	r = 0.45	Approach/withdrawal	r = 0.31
(a high score means more sensitivity)		Negative mood	r = 0.37
Attachment style correlations:		**Attachment style correlations:**	
Relationship anxiety	r = 0.21	Relationship avoidance	r = 0.27
Coping styles correlations:		**No correlations with coping styles**	
Focus on and venting of emotions	r = 0.29		

People with LR use coping styles that probably allow them to disengage from stressors, resulting in negative attachment behaviours, but these results did not correlate with temperament. The low threshold group (sensitivity and avoiding) correlated with more negative temperament traits and showed negative attachments behaviours. Sensation seeking individuals showed the opposite temperament correlations to the low threshold group, and a range of coping behaviours, which on careful inspection might be related to a need for more sensory stimuli and arousal opportunities. These two studies bring temperament and attachment closer to sensory processing. They add further insight to the study but do not translate directly into other evidence reviewed thus far as the Big Five were mostly used in the reviewed studies.

2.5.6 Culture bias

An important consideration in the use of psychometric tools is their relevance in different ethnographic contexts, for which the literature provides inconsistent evidence. Although the original SSS has been translated into more than 15 languages (Zuckerman, 1994) group comparisons were not evident. Some findings suggest attentional cortical control networks[31] are similar for all people, however (Aron et al., 2010) found the conditions that initiate and facilitate these networks to be moderated by cultural context. No difference between cultures was found in personality or the number of high-SPS persons, but strong cultural differences were detected in the presence of low-SPS (Aron et al., 2010).

In a South African study (n = 620), four psychometric tools were used and described as culturally fair, but no direct evidence were provided (Hutchinson et al., 2010). A large meta-analysis of 110 independent global samples (n = 30854), 46 outside of the USA (South Africa included), considered the impact of culture on the job satisfaction–job performance relationship, and found that it did not strengthen the relationship, but showed variability among cultures (Ng, Sorensen, & Yim, 2009). While Ng's work yielded culturally related differences in job satisfaction it did not add insights for the use of the psychometric tools. Evidence with regard to ethnographic variations in peoples' perception and interaction with environments, based on inherent traits, is an important consideration, yet inconclusive. Western based temperament traits and personality tools, although not ideal, have been widely used in a South African context thus supporting the current study using a USA standardised instrument.

2.5.7 Summary

- Temperament is a stable trait, shares the same underlying genetic origins as sensory processing and has been correlated with the AASP.
- Sensory sensitivity (Aron, 1997) and sensation seeking (Zuckerman, 1994) are not the same as studied in OT, but the similarities enabled an analysis between all the evidence. Sensory Sensitivity and Sensation Seeking are considered multi-dimensional constructs.
- Sensory Processing Sensitivity (SPS) has been associated with a sensitive nervous system and over responding to environmental stimuli, and is studied as a temperament trait.

[31] Referring to a laboratory study of a small sample (10 European-Americans and 10 East Asians), using functional magnetic resonance imaging of cortical responses to judgement of visuo-spatial tasks.

- Evidence shows that SPS is associated with other temperament scales of neuroticism, openness, conscientiousness and shyness. SPS is also associated with negative effect, higher stress and ill-health, anxiety and depression.
- SPS correlated with work stress (particularly burnout), work displeasure and the need for recovery from stress.
- Sensation seeking (SS) is a temperament trait associated with high arousability and a need for novel, varied and intense sensations and experiences. It is more prevalent in younger men and showed strong biological bases through various laboratory tests.
- SS is associated with other temperament traits of openness to experience, agreeableness and extraversion.
- SS is more prevalent amongst people who abuse alcohol and drugs, smoke and engage in explicit sexual practises. This and a higher HIV risk were confirmed in a South African study. SS is also associated with aggression.
- People who exhibit SS characteristics choose jobs and activities which are stimulating, (rhythm music careers, military, stock trading, and entrepreneurship) but they are also more prone to change jobs, especially when characterised by monotony and poor autonomy. Sensation seeking individuals are more susceptible to boredom.
- SS individuals performed better when engaged in goal orientated achiever learning. They also demonstrate less job stress and better psychological well-being when compared with low SSs who also had higher anxiety and greater startle responses.
- Smell and noise sensitivity (observed in low thresholds) have been associated with neuroticism.
- Individuals don't have the same threshold patterns across different senses but vary, with some showing lower and others higher values.
- AASP correlations with temperament showed the Sensory Sensitive and Sensation Avoiding group (low thresholds) to correlate positively with low sensory thresholds, negative mood, aversion to change, approach withdrawal and relationship avoidance and anxiety. Sensation seekers had less negative mood and approach withdrawal and more stable attachment styles.
- Findings related to differences in temperament and work experiences between ethnographic groups are inconclusive.

2.6 Neuroscience

Neuroscience is the scientific study of the central and peripheral nervous system in order to understand how brain functions inform for example behaviour, emotion, cognition and attention. A large interdisciplinary focus and various branches of neuroscience exist (e.g. affective, behavioural, cellular, clinical, cognitive, developmental, systems, social) creating a vast amount of evidence. This section only focuses on two areas pertinent to the current study. Firstly a brief overview on the emerging fields of neuroeconomics, neuroleadership, neuromarketing and related sensory branding is provided. The latter fields have focused on neuroscience to inform decision makers in commercial enterprises (Vromen, 2010)*. Neuroscience can provide the necessary framework needed to educate industry decision makers in the call centre industry about the commercial benefit of a productive and healthy workforce. Secondly, laboratory study findings of sensory processing in OT are reviewed as these significantly strengthen evidence for the field.*

2.6.1 Applied neuroscience for commercial industries

Neuroscience inspired many studies and led to the emerging fields of neuroeconomics, consumer neuroscience and neuroleadership (Reimann & Bechara, 2010). Consumer behaviour and neuromarketing have received considerable attention in both the scientific community and the media, especially in the food industry (Ariely & Berns, 2010). For instance, laboratory data obtained through functional MRI studies showed that activation of the nucleus accumbens, the brain's reward system, provides a potential indicator for consumer behaviour (Ariely & Berns, 2010). Although the evidence is still limited, neuroimaging can provide more accurate and hidden information about consumer products. This approach does raise some ethical issues with regard to product manufacturers using neural information to coerce the public into product choices that they neither need nor want (Ariely & Berns, 2010; Murphy, Illes, & Reiner, 2008). The branding and marketing industry utilise the sensory properties of products to appeal to consumers for example, label style and brand evaluation were the strongest drivers in purchase decisions for 521 German wine consumers (Mueller & Szolnoki, 2010). The quantitative and qualitative brand sense study by Millward Brown, a global market research agency, was conducted in 13 countries over an 18-month period by a team of 60 researchers. Results showed that 99% of all brand communication focuses on only 2 of the senses – sight and sound, while 75% of emotions are generated by smell. This study provided insight into the importance of multi-sensory branding and the potential for a higher success rate by forming emotional connections between consumers and products when the 5 sense synergy (smell, visual, auditory, gustatory, touch) is used (Lindstrom, 2005). With sensory neuroscience informing marketing and branding decisions, the value of

applying neuroscience to understand human behaviour in commercial contexts is reinforced (see Ployhart, 2011).

The emerging field of neuroleadership[32] combines neuroscience-based organisation and behavioural science into four core applications of the ability to 1) solve problems and make decisions; 2) regulate emotions; 3) collaborate with others; and 4) facilitate change. It aims to provide the necessary brain research to fill the gap between leadership behaviour and leadership development; and in so doing to support management and organisational theory, offering a new avenue and approach for overall learning, growth and change (Lafferty & Alford, 2010; Rock, 2010, Z.Ahmad, 2010). However, opinions are that it has yet to make the leap from art to science, and is criticised for rehashing old knowledge in a new format, but failing to provide a useful framework for understanding the new world of work (Hogan, 2010). Neuroscience research must yet conform to standardisation to enable comparison, replication, and only validation and real future data will provide evidence as to whether neuroleadership really can be engineered to work in a cost-effective manner (Lafferty & Alford, 2010). It is suggested that economists should use neuroscience to inform their fundamental quest for profit gaining practises in understanding of human capital, as individuals differ in their skills, knowledge, abilities and characteristics, and provide their best performance in supportive contexts (Ployhart, 2011). The interaction between human behaviour and context is an important construct for economists to consider when informing decision makers and advising on economic viability. These fields were not extensively reviewed but provide preliminary insights into the use of sensory processing as a normal, daily occurrence. Where neuroscience (also sensory related) and biological markers can inform consumer behaviour, marketing strategies, and neuroleadership, they also support investigating sensory based behaviours in workplaces.

2.6.2 Sensory processing[33] and neuroscience

Sensory integration, as established by Ayres, is a product of the nervous system (Ayres, 1979) and was developed into a clinical disorder classification and treatment of the neurological functions of registration, discrimination and modulation of sensory information (Miller et al., 2009). A call for translational research and multidisciplinary collaboration between clinical science (sensory processing) and basic science (neuroscience) was

[32] Neuroleadership has been coined by David Rock (2006), as a management theory with deep roots in psychology, behaviourism, social psychology and cognitive psychology (Lafferty & Alford, 2010).

[33] Refer to the full review on the sensory processing literature in paragraph 2.7 (pg 45).

made in order to increase empirical evidence and knowledge in the SPD field (Miller et al., 2009). As laboratory-based studies increased, the underlying neurological mechanisms which explained behavioural symptoms became an important research focus (Davies et al., 2010; Davies & Gavin, 2007). The detail of these studies is not necessarily relevant or important to the current study, apart from showing laboratory support for the field of sensory processing in OT.

- The first laboratory study of 19 children with Sensory Modulation Disorder (SMD), revealed differences in electrodermal responses to sensation when compared with a non-SMD group (McIntosh, Miller, Shyu, & Hagerman, 1999). Further studies of brain structure and function through electroencephalography (EEG) and event-related potentials (ERPs), found sensory gating (Davies et al., 2009; Davies et al., 2010; Davies & Tucker, 2010; Davies & Gavin, 2007; Gavin, Dotseth, Roush, Smith, Spain, & Davies, 2011) and the MSI (multisensory integration) of auditory–somatosensory integration (Brett-Green, Miller, Gavin, & Davies, 2008) to be significantly different in Sensory Processing Disorder (SPD) populations.
- Baseline vagal tone as a parasympathetic nervous system biomarker provided evidence for determining sensory processing in children (Schaaf, et al., 2010). Variations in sensory processing, measuring electrodermal activity was found in five cohorts of children (typical developing, Fragile X syndrome- FXS, Autistic, ADHD and SMD) (Miller et al., 2001). ADHD children with or without SOR showed different patterns of salivary cortisol and electrodermal responsivity to sensation (Lane, Reynolds, & Thacker, 2010), and a review of studies using a variety of neuroimaging techniques for sensory processing identified them as valuable biomarkers for autism (Marco, Hinkley, Hill, & Nagarajan, 2011). Various other authors supplied reviews on the laboratory based study findings which support neuroplasticity and the mediating effect of sensory input (Lane & Schaaf, 2010) and the diagnostic validity for Sensory Over-responsivity (SOR) (Reynolds & Lane, 2008).
- While laboratory evidence to support sensory processing in the clinical paediatric field is growing, it remains scarce in studies of healthy adults. A small sample of 20 students who completed the AASP and skin conductance testing showed a significant difference ($p = 0.001$) in responsivity between the four quadrant groups; with Low Registration (LR) and Sensation Seeking (SS) presenting with low responsivity, and Sensory Sensitivity (Ssens) and Sensation Avoiding (SA) presenting with high responsivity. Habituation to the stimuli occurred faster for LR and SA (Brown et al., 2001; Brown & Dunn, 2002). These results are an important initiation in laboratory markers but preliminary as an item revision of the AASP

occurred after the skin conductance study. Neuroscience marker studies using the AASP are identified as a gap in current scientific knowledge.

- There is however a wealth of basic neuroscience studies outside of the OT field describing single sensory domains (visual, auditory, tactile, gustatory, olfactory, chemosensory, vestibular, proprioception); MSI (multisensory integration); sensory gating; mismatch negativity and various structures and functions of the nervous system, which informs human behaviour in both clinical and healthy populations (Arbesman & Lieberman, 2010; Brett-Green et al., 2008). These were not reviewed as they fall outside the scope of the current study, but are acknowledged as having the potential to indirectly support it.

2.6.3 Summary

- Neuroscience is a supportive discipline for neuroeconomics, sensory branding, neuromarketing and neuroleadership. Insights and evidence from neuroscience could inform these emerging fields with a focus on behaviour and emotions in commercial industries.
- Consumers make buying decisions and maintain brand loyalty based on the sensory properties of products.
- Emerging laboratory studies provide evidence for laboratory markers of sensory processing, mostly in clinical paediatric populations.
- Laboratory studies investigating healthy adult sensory processing are scarce in the OT field, but there is potentially a wealth of information for studying healthy adult behaviour in the field of general neuroscience, which may inform the field of adult sensory processing.

2.7 Sensory Processing in Occupational Therapy

This section, the core field of the study, provides a review of sensory integration as established by Ayres, how the theory has progressed, and development in the terminology. Although some sections of this review are not directly related to the current study, it provides the history and background from which this study emerged. A large body of evidence in clinical paediatric populations dominates the field and is summarised only to demonstrate the theory structures. Thereafter progression into different study populations and ages are reported to exhibit the wider application of sensory processing, and finally adult literature and related instrumentation are documented, as they pertain to this study.

2.7.1 Sensory integration terminology overview

Ayres devoted her career (1954-1988) to the development of sensory integration (SI), designing more than 20 standardised tests and publishing more than 50 scholarly papers and books with an emphasis on children with learning difficulties (Peters, 2011). Ayres however viewed sensory integration as a daily neurological function applicable to all ages (Ayres, 1979). "*Jean Ayres' book on Sensory Integration is not about pathology. It's about human beings and how important sensory integration is to their developmental process*" (Peters, 2011, p.257-258). Worldwide, the generation of occupational therapists that followed Ayres' work started to elaborate on it. They tested, hypothesised and added to the body of scientific knowledge to validate sensory integration as a therapeutic methodology. In the USA, the biggest concentration of occupational therapists work in paediatrics, with SI ranking as one of the most used and researched practice areas (Schaaf & Davies, 2010). About 90% of OTs working in school based practice in the USA use SI principles (May-Benson & Koomar, 2010). This can explain the paediatric focus and evidence dominance in the SI field.

The sensory integration theory and application is complex, has grown extensively since its inception, and continues to evolve (Miller et al., 2007). An updated nosology was established through focus groups held by Miller and colleagues, based on the empirical evidence supplied by the initial factor analytic studies of Ayres in 1972 and 1989. Miller believed that the sensory integration theory had been through enough evolutionary changes to need a paradigm adjustment and a more global terminology application, and

the term "sensory processing" was proposed[34]. The diagnostic categories using *Sensory Processing Disorder (SPD)* [35] was accepted as the global umbrella term, with sensory modulation disorders, sensory discrimination disorders and sensory-based motor disorders as the 3 main subtypes. *Sensory Modulation (SM)* was divided into three subgroups: *Sensory Overresponsivity (SOR)*, *Sensory Underresponsivity (SUR)* and *Sensation Seeking (SS)* (Miller et al., 2007). Sensory integration is still regarded as "*one of the most developed and distinctive frames of reference to emanate from the profession of occupational therapy*", (Mailloux, et al., 2011, p.150) and referred to as *ASI® [Ayres sensory integration].* The nosology serves to guide practice and research, but remains preliminary and requires further empirical backing (Schaaf & Davies, 2010).

Sensory modulation[36] as the focus of the current study has been studied for over 40 years (Schoen, Miller, & Green, 2008). Ayres introduced the theory of sensory modulation with tactile defensiveness and gravitational insecurity as primal threat responses to daily touch and movement input (Ayres, 1979). The sensory modulation terminology, verification and classification became more sophisticated and have grown extensively over past decades with contributions made by various authors (Knickerbocker, 1980). The sensory processing model of Dunn, 1997 formed the basis for the development and score criteria of three standardised sensory processing instruments; the Sensory Profile, a caregiver's questionnaire for children (3-10 years), (Dunn & Brown, 1997); Infant Sensory profile (Dunn & Daniels, 2002) and the Adult/Adolescent Sensory Profile (AASP) (Brown et al., 2001). Dunn's sensory processing model adapted from the original model in 1997, as illustrated in (Brown et al., 2001), is displayed in Table 2.3 which shows the relationships between behavioural responses (or self-regulation) and neurological thresholds.

[34] The researcher found the term *sensory processing* provided more access to other study fields than *sensory integration* (the older, more familiar term) thus supporting the taxonomy development of Miller and colleagues.

[35] Sensory Processing Disorder (SPD) has been recognised and incorporated in 3 diagnostic classification references: the Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, Revised (known as the DC: 0–3R) (Zero to Three, 2005), the Diagnostic Manual for Infancy and Early Childhood of the Interdisciplinary Council on Developmental and Learning Disorders (ICDL, 2005), and the Psychodynamic Diagnostic Manual (PDM Task Force, 2006) (Miller et al., 2007).

[36] Sensory modulation is defined as: "both physiological reactions and behavioural responses. Behaviourally, the term refers to the ability of an individual to regulate and organise responses to sensations in a graded and adaptive manner, congruent with situational demands. Physiologically, the term refers to cellular mechanisms of habituations and sensitization that alter the structure and/or function of nerve cells, affecting synaptic transmission.", p. 57, (Miller et al., 2001).

Table 2.3: Behavioural Responses and Neurological Thresholds

Neurological threshold continuum	Behavioural response/Self-regulation continuum	
	PASSIVE	ACTIVE
HIGH (habituation)	Low Registration (LR)	Sensation Seeking (SS)
LOW (sensitisation)	Sensory Sensitivity (Ssens)	Sensation Avoiding (SA)

*From (Brown & Dunn, 2002)

For more detailed explanations and observable behaviours based on Dunn's model, please refer to Appendix G. Various bio-psychosocial factors such as genetics, experience, environment and context (Miller et al., 2001) establish and influence the threshold and behavioural response continuum (Rieke & Anderson, 2009). Dunn's model of sensory processing was not designed to identify pathology (Brown, 2001), but to observe its impact on functional performance and to guide intervention planning (Brown & Dunn, 2002). All individuals have patterns of sensory processing occurring on a continuum, but can also present with all four sensory processing behaviours and combinations are also possible, even those that seem contradictory (e.g. sensation seeking and sensation avoiding). This is because patterns include expressions from stimuli arising from multiple modalities (visual, auditory, tactile, olfactory, gustatory, vestibular, proprioception), (Brown et al., 2001; Brown & Dunn, 2002; Rieke & Anderson, 2009). Multiple quadrant results can thus exist for individuals, e.g. individuals can present with high scores for all 4 quadrants. Although Dunn's model is the central framework for the current study, there seems to be general consensus in the literature that sensory modulation, as a sub-type of sensory processing, is mainly expressed either by sensory hypersensitivity, as a result of a low neurological threshold to sensory stimuli (requiring very little stimulation for neural activation), or by sensory hyposensitivity, as a result of a high neurological threshold to sensory stimuli (requiring much stimulation for neural activation) (Engel-Yeger & Dunn, 2011a; Engel-Yeger & Dunn, 2011b).

2.7.2 Sensory processing foundation within paediatrics

The sensory processing literature encompasses a large body of scientific work, but the emphasis and application remains over-focused on the prevalence, assessment and treatment efficacies for the clinical paediatric population. A high prevalence of SPD exists within the clinical populations of autism spectrum disorders (ASD), (Ben-Sasson, Hen, Fluss, Cermak, Engel-Yeger & Gal, 2009; Brown & Dunn, 2010; Kern, Garver, Carmody, Andrews, Mehta, & Trivedi, 2008; Pfeiffer, Kinnealey, Reed, & Herzberg, 2005); Attention-Deficit and Hyperactivity Disorder (ADHD), (Ghanizadeh, 2011; James, Miller, Schaaf, Nielsen, & Schoen, 2011; Reynolds & Lane, 2009); Developmental Coordination Disorder

(DCD), Learning Disabilities (LD) and Fragile X Syndrome (FXS), (Bendixen & Kreider, 2011; Davies & Tucker, 2010; Mailloux et al., 2011; Reynolds & Lane, 2008) with accompanying difficulties in scholastic skills and socio-emotional development. Review articles of the paediatric literature revolve around diagnosis, subtypes of dysfunction, intervention, efficacy (May-Benson & Koomar, 2010) and neuroscience (Arbesman & Lieberman, 2010). Empirical evidence showed the association between sensory processing issues and diagnostic populations but did not link sensory processing with performance (Koenig & Rudney, 2010), and sampling appeared to be predominantly heterogeneous (Polatajko & Cantin, 2010). Gaps appeared to be in studies considering the core sensory processing aspects, such as; the detection of the sensory stimulus, how it as interpreted, the regulation thereof, how two or more modalities integrate, and the sensory-based behavioural response (Davies & Tucker, 2010).

Several studies were reviewed which diverted from the popular clinical populations to observe sensory processing in healthy children, atypical samples and other disciplines. The results are briefly summarised as it supports the novelty of studying atypical populations such as being done in the current study.

- Sensory processing disorder (SPD) was prevalent in children without a co-occurring diagnosis (Reynolds & Lane, 2008) in daily concentration and performance problems (Bar-Shalita, Vatine, & Parush, 2008) in contrast with their normal developing peers.
- Sensory over-responsitivity (SOR) was found to be present in 16.5% of 925 typical elementary school children, and corresponded with dysregulation and maladaptive social behaviours (Ben-Sasson et al., 2009a). SOR is described as a lifelong pattern causing individuals to withdraw or avoid negatively perceived sensations which can lead to anxiety and stress in anticipation of the stimuli. A range of social-emotional problems, such as aggression and resistance, emerge as a result, placing the child at risk for the development of psychopathology.
- Poor sensory regulation was found to either be a significant risk or to be concurrent with childhood psychopathology disorders of emotion and behaviour in a diverse and representative sample (n = 796) (Gouze, Hopkins, Lebailly, & Lavigne, 2009).
- A study of 1394 toddler twins showed familial aggregation of sensory defensiveness and tactile and auditory defensiveness to be associated with fearful temperament and anxiety (Goldsmith, Van Hulle, Arneson, Schreiber, & Gernsbacher, 2006). These studies show the coexistence of social, emotional and behavioural difficulties associated with SPD.
- Sensory modulation (SM) difficulties accounted for 42% of variance, ($p < .001$) of sleep problems (Shochat, Tzischinsky, & Engel-Yeger, 2009), and are more

prevalent in children with allergic rhinitis than a healthy control group (Engel-Yeger, Shani-Adir, Raiber, & Kessel, 2009). SM difficulties also affected participation in leisure activities ($p < 0.0001$) for children with atopic dermatitis (Engel-Yeger, Shani-Adir, & Kessel, 2011).

- Gifted children were found to be more sensory sensitive, with heightened emotional and behavioural responses (Gere, Capps, Mitchell, & Grubbs, 2009) compared to the normative sample of the Sensory Profile (Dunn & Brown, 1997).

2.7.3 Sensory processing theories – growth and scientific progress in adults

The sensory processing theories have been through paradigm shifts resulting in expansion of the theoretical constructs and application (Brown, 2001; Dunn, 1997; Dunn, 2001). About 15-20% of the population has more extreme responses to sensation and operates on the outermost margins of the sensory processing continuum, (Aron & Aron, 1997; Ben-Sasson et al., 2009a; Engel-Yeger & Dunn, 2011b).

The application of sensory processing as a theory and practice domain progressed into adult application through the field of mental health. Seminal work (not reviewed) could be traced back to 1974 (Jorstad, Wilbert, & Wirrer, 1977; Levine, O'Connor, & Stacey, 1977) when sensory integrative techniques were applied to adults with a history of schizophrenia. Of interest to the current study are a small number of studies observing the impact of sensory defensiveness on mental health, in the absence of pervasive pathology (Abernethy, 2010). A qualitative inquiry observed sensory defensiveness in five adults and their related unpleasant experiences of harmless sensory input, and how this interfered with their activities of daily living. The study participants used coping strategies of avoidance and counteraction (which particularly affected activity choices), predictability, mental preparation, self-talk and confrontation (Kinnealey, Oliver, & Wilbarger, 1995).

- Sensory defensive adults exhibited increased scores on anxiety ($p = 0.014$), depression ($p = 0.019$), and psychological adjustment ($p = 0.005$) when compared to a matched non-sensory defensive group. Subjects showed increased activity and attention in responding to sensation. Sympathetic nervous system responses to stimuli were also observed and subjects either controlled or avoided stimuli (Kinnealey & Fuiek, 1999).
- A quasi-experimental pilot study showed a significant correlation between anxiety and sensory defensiveness ($r = 0.62$, $p = 0.027$), and a subsequent sensory treatment protocol decreased anxiety as measured by the difference in pre-test and post-test mean scores on the Adult-SI (Sensory interview), ($p = 0.048$) and the BAI (Beck Anxiety inventory), ($p = 0.0453$) (Pfeiffer & Kinnealey, 2003).

- In another study, 3 sensory defensive adults received a 30 day sensory treatment protocol with a reduction in defensive behaviours respectively from 58% to 54%; 43% to 18%; and 72% to 36% when followed up 9 months afterwards (Moore & Henry, 2002).

These dated studies had small samples and methodological flaws in common, mostly around instrumentation, but provided a platform for further exploration of adult sensory processing. No occupational therapy studies were found that explored the sensory processing of healthy workers. This is surprising because the area of job analysis and work performance forms an integral part of the role of occupational therapy (Lysaght, 1997). The exception was a qualitative study that explored sensory processing in the workplace of high functioning autistic people (Bontempo, 2010). Some of the qualitative themes of this study were that sensory processing patterns can present both challenges and support for certain job expectations, may help to guide career choices, and therefore promote the optimal job-fit necessary for successful employment.

More recent studies observed sensory modulation in the absence of any overt pathology, supporting and expanding on Dunn's model (Rieke & Anderson, 2009). These studies are described in more detail in Table 2.4, due to their importance for the current study.

Table 2.4: Overview of Healthy Adult OT Sensory Processing Studies

Year/Author	Study title and objectives	Design and sample	Measurement Instrumentation	Result significance in support of this study	Study limitations
(Engel Yeger, 2011)	Exploring the relationship between affect and sensory processing patterns in adults.	Correlational, comparative study with convenience sample: N = 213 mean = 29.95±6.68	•AASP (Brown & Dunn, 2002); •PANAS (The Positive and Negative Affect Schedule; Watson et al 1988).	Negative affect were significantly related to Ssens, SA and LR (all p-values ≤0.0001) AASP quadrant scores, with negative item loading was strongest and more prevalent for Ssens and SA scores. SS correlated with positive affect p=0.042.	Hebrew translation of self-report AASP with potential interference with validity; convenience sample, parametric statistical tests were used even though instrument results were ordinal.
(Engel-Yeger & Dunn, 2011a)	Relationship between pain catastrophising level and sensory processing patterns in typical adults.	Correlational, comparative cross-sectional study with convenience sample: N = 290 mean = 30.2 ± 6.8	•AASP (Brown & Dunn, 2002); •PCS (Pain catastrophising scale, Sullivan, 1995).	All 3 PCS subtests and total score correlated significantly with Ssens, SA and LR AASP quadrant scores with most scores at p-value level of ≤0.001. The correlation values were smaller for low registration. These 3 quadrant results had higher perceptions of pain. No correlations were found with SS.	Narrow scope of demographics, Convenience sampling and instrumentation a self-questionnaire report.
(Engel-Yeger & Dunn, 2011b)	The relationship between sensory processing difficulties and anxiety level of healthy adults.	Correlational, non-experimental study with convenience sample: N = 135 mean = 27.63 ±5.84	•AASP (Brown & Dunn, 2002); •Demographic questionnaire; •State-Trait Anxiety Inventory (STAI) (Spielberger 1972).	Trait anxiety had high correlations with Ssens (r = 0.45), SA (r = 0.43) and LR (r = 0.31) with all p-values calculated at ≤0.001. State anxiety also correlated, but less strongly and only with the low threshold quadrants: Ssens (r = 0.26) and SA (r = 0.28) with all p-values calculated at ≤ 0.05.	Small sample

Year/Author	Study title and objectives	Design and sample	Measurement Instrumentation	Result significance in support of this study	Study limitations
(Kinnealey et al., 2011)	Relationship between sensory modulation and social supports and health-related quality of life.	Correlational, non-experimental study with control group N = 28 volunteers, 14 with SOR (sensory over responsive) and 14 NSOR (not sensory over-responsive).	•ASQ (Adult Sensory questionnaire, Kinnealy 1995) – screening tool; •ADULT-SI (Adult sensory interview, Kinnealy & Oliver, 2010) – screening tool; •AASP (Brown & Dunn, 2002); •MOS (Social support survey); •SF-36 (Short form health survey, version 2; Ware, Snow, Kosinski, & Gandek, 1993); •BAI (Beck Anxiety inventory; Beck & Steer, 1990); •BD-II (Beck depression inventory; Beck & Steer 1987); •HRQOL (Health related quality of life) was considered the final 4 instruments and compared to AASP (after screening through ASQ and ADULT-SI)	AASP quadrants (Ssens, SA and LR) showed significant, negative relationships with HRQOL of emotional and mental health. SA correlated with 6 of the 8 HRQOL indicators, LR correlated with 4 of the 8 and Ssens 2 of the 8. By contrast SS correlated positively with vitality. The SOR (combined result of Ssens and SA quadrants on AASP) group had higher anxiety, less social support, decreased vitality, poorer social functioning, decreased general health and increased bodily pain. A moderate, yet significant negative correlation was found between SOR and mental health. As SOR increases, mental health and social functioning decreased. Significant difference between groups (SOR and NSOR) in HRQOL (bodily pain, general health, vitality, social functioning) was found.	Small sample, single site and narrow demographics.

These studies applied sound methodologies and provide evidence that adults process sensory input differently. The low threshold quadrants (Ssens and SA), and the high threshold quadrant (LR) had strong associations with negative effect, heightened experiences of pain, anxiety and reduced health related quality of life. In contrast in most of the studies, sensation seeking had opposite correlations. When studying typical adults their sensory processing can thus potentially be determiners of how they experience everyday life and work.

2.7.4 Sensory processing: standardised assessments for adults

The Adult/Adolescent Sensory Profile (AASP) was the first standardised and validated measurement of sensory processing for adult application in both clinical and healthy populations (Brown et al., 2001; Brown & Dunn, 2002). Several intervention applications were identified (Brown et al., 2001; Brown & Dunn, 2002) for the use of the AASP. These were to: 1) achieve greater insight into personal behaviour and participant's responses to different types of environments; 2) understand conflict within relationships due to people's different responses, based on their processing of sensation; 3) design environmental adaptations to support performance; and 4) to make good decisions and choices with regard to job choices and environmental fit (Brown et al., 2001; Brown & Dunn, 2002). "…*when a person is making decisions about a living situation or job choice, results from the Adult Sensory Profile may enhance the decision-making process. A workplace with quiet surroundings and clear expectations might suit a sensation avoider, whereas a sensation seeker might prefer lots of activity and variety*" (Brown et al., 2001, p.82).

The Sensory Over-Responsivity (SensOR) Scales (Schoen et al., 2008) expanded on assessment tools, consisting of an examiner-administered performance evaluation, and a caregiver self-rating scale for ages 3 to 55. The instrument was developed to ensure classification of only sensory over-responsivity subtypes across seven sensory domains of sensory modulation for ages 3 to 55. Results from the SensOR correlate highly with the AASP quadrant results of sensory sensitivity and sensation avoiding. The SensOR scales allow for examiner observation in combination of self-report scales, potentially contributing to more reliable and predictable results (Schoen et al., 2008). SOR results can however be more pronounced in some contexts than others, and based on the potential cumulative effect to stimuli building up towards an aversive response, could potentially be missed in real time assessments. Self-report questionnaires are also widely used and applied, contributing to large scale epidemiological studies aimed at estimating prevalence, (Ben-Sasson et al., 2009a).

The AASP was considered the most appropriate OT instrument for use in the current study. Table 2.5 provides a summary of other studies which used the AASP, reporting on quadrant results trends, age, and adapting score categories for interpretation purposes. The current study used a novel method to create subgroups within the AASP for which the methodology and results below provide support.

Table 2.5: Relevant Studies, Within and Outside of OT, Applying the AASP as Instrumentation, Results and Methodology

Citation	Publication	Study population	AASP Quadrant inter-correlations	Age correlations	Adapting methodology and score categories
(Engel Yeger, 2011)	Exploring the relationship between affect and sensory processing patterns in adults.	Adults (typical) n=213	Inter-correlations not documented but score correlations were similar for Ssens, SA and LR and the opposite for SS.	Not documented	Reduced 5 score ranges to 3 (combined much more and more scores; combined much less and less scores)
(Engel-Yeger & Dunn, 2011a)	Relationship between pain catastrophising level and sensory processing patterns in typical adults.	Adults (typical) n=290	Inter-correlations not documented but score correlations were similar for Ssens, SA and LR and the opposite for SS.	Age correlated negatively with SS	Reduced 5 score ranges to 3 (combined much more and more scores; combined much less and less scores)
(Engel-Yeger & Dunn, 2011b)	The relationship between sensory processing difficulties and anxiety level of healthy adults.	Adults (typical) n=135	Not documented	Not documented	Reduced 5 score ranges to 3 (combined much more and more scores; combined much less and less scores)
(Kinnealey et al., 2011)	Relationship between sensory modulation and social supports and health-related quality of life.	Adults (typical) n=28	Negative correlations with HRQOL and AASP were found for Ssens, SA and LR. SS had a positive correlation with 1 HRQOL score.	Not documented	Combined Sensory sensitivity and Sensation avoiding to form SOR group.
(Bontempo, 2010)	Sensory Processing Patterns in High-Ability Adults with Autism Spectrum Disorders in the Workplace.	Adults (typical) n=20, ASD, n=20	Higher scores in Ssens, SA and LR were observed in the ASD group.	Not documented	None
(Rieke & Anderson, 2009)	Adolescent/Adult Sensory Profile and obsessive–compulsive disorder.	Adults (OCD) n=51	Higher scores were found in Ssens, SA and LR and lower scores for SS.	Not documented	None
(Jerome & Liss, 2005)	Relationships between sensory processing style, adult attachment, and coping.	Adults (typical) n=133	Inter scale correlations between the 4 AASP quadrants showed positive relationships between Ssens, SA and LR and SS also correlated positively with LR.	Not documented	None
(Pohl, Dunn, & Brown, 2003)	The role of sensory processing in the everyday lives of older adults.	Adults (typical) n=404	Higher scores in LR and lower scores in SS were observed for older adults (65+), but not higher for Ssens and SA as expected.	Age correlated negatively with SS	None
(Brown et al., 2001)	The Adult Sensory Profile: Measuring Patterns of Sensory Processing. [Standardisation study]	Adults (typical) n=615	Ssens and SA subscales items loaded together and not found to be distinctive.	Not documented	N/A

The results in Table 2.5 indicate a strong inter correlation between three quadrants on the AASP: Sensory Sensitivity (Ssens), Sensation Avoiding (SA) and Low Registration (LR). Sensation Seeking (SS) is more distinct and varied in results, when compared with the other three quadrants. The exception is Pohl's study (2003), which included a much older sample. Potentially, this is contradictory as LR is a high threshold indicator whereas Ssens and SA are low threshold indicators. This "surprising" result was concluded to either indicate the AASP model flawed, or that individuals can vary between having low and high neurological thresholds (Jerome & Liss, 2005). Jerome questioned this, but potentially contributed important evidence that a particular coping style may be relevant for Low Registration (LR) and thus explain the variation. LR correlated significantly with four out of seven coping styles (Behavioural disengagement, $r = 0.197$, $p \leq 0.05$; Mental disengagement, $r = 0.305$, $p \leq 0.01$; Denial, $r = 0.296$, $p \leq 0.01$ and Composite denial and disengaging, $r = 0.370$, $p \leq 0.01$), where none of the coping styles correlated with the expected SA quadrant. There were also coping styles which correlated with SS, but on closer inspection, results could potentially be more descriptive of typical sensation seeking behaviours (e.g. Seeking emotional support, $r = 0.226$ and Positive reinterpretation and growth, $r = 0.224$). This provides evidence that LR, as a subscale of the AASP, can be associated with coping behaviours as a result of the nervous system being overloaded and sensitive (Refer to Table 2.2, pg 38).

Authors in OT literature have commented on the variations within the sensory processing constructs and questioned its multidimensionality (Schoen et al., 2008), while also speculating that the LR quadrant might be associated with coping styles (Engel-Yeger, 2011). When individuals are overwhelmed by stimuli and overly sensitive, they detach themselves, often going into a state of "alienation" in order to self-protect (Aron et al., 2005; Evers et al., 2008). In summary, Ssens and SA are both constructs of low thresholds and related to SOR, while SS is a separate high threshold construct. LR potentially has a three-fold application: a coping construct to coincide with Ssens and SA (more prevalent based on evidence); associated as a high threshold construct in combination with SS (less prevalent); or, be on its own. These results and interpretations will be used to advance the methodology and analysis of the current study in development of a subset structure to account for the multidimensionality of LR.

2.7.5 Sensory processing and individual differences

Sensation is a form of constant communication between individuals and the environment they inhabit, and the processing of sensory input can be described as one of the most basic psychological functions supporting this person-environment interaction (Jerome &

Liss, 2005). Individuals process sensory information differently, resulting in different human experiences and choices, depending on the brain's threshold for stimuli.

- There is enough evidence to support the claim that some people are more sensitive than others to the processing of visual, auditory, tactile, olfactory, gustatory, vestibular and proprioceptive information, (Aron & Aron, 1997; Brown et al., 2001; Jerome & Liss, 2005). Sensory processing preferences are described as stable traits, making the progression into adult profiling inherently reasonable (Brown et al., 2001; Brown & Dunn, 2002).
- Dunn suggested that the development of habits is associated with the neuroscience substrates and related sensory preferences of an individual (Dunn, 2000) and are socially constructed due to incessant interactions with the environment for harmonious benefit (Cutchin, Aldrich, Bailliard, & Coppola, 2008). In a sample of 126 college students the relationship between habit measures and sensory processing, using the AASP[37] were studied (Reich & Williams, 2003). The evidence showed all four cognitive habit subscales[38] to have strong negative correlations with sensation seeking (r values ranging -0.25 to -0.43); and, positive correlations with sensory sensitivity (r values ranging .031 to 0.440 and sensation avoiding (r values ranging 0.45 to 0.56). No correlations were found between low registration and habit subscales. The study provides evidence that sensory processing, people's awareness and responsivity to the environment, and habit constructs may be related.
- In a qualitative study, the free-time play preferences of adults were explored, and it was found that their sensory preferences and sensory needs contributed to the choices that they made. These activities became 'restorative niches' to remove sensory overload and create a sense of well-being (Blanche, 2001).

The literature provides adequate evidence for the use of sensory preferences in adapting or changing individual's contexts, including relevant work environments, for optimum person-environment fit in support of health and occupation (Brown et al., 2001; Brown & Dunn, 2002; Brown, 2001). The emphasis of sensory processing in paediatrics is

[37] The literature stated use of the earlier version of the AASP, although not clear, it is assumed that it was the pilot version of the AASP before item revision, thus impacting study validity. (Brown, et al., 2001). Therefore this study was not included for analysis in Table 2.2.

[38] Habits were measured in two domains: routinisation (regarded as a personality trait) and personal need for structure (regarded as a cognitive measure) with 4 subscales: having order and routine (9 items), dislike disruption (5 items), create structure (4 items) and respond to lack of structure (7 items), using a 5-point Likert scale.

regrettable because the field could potentially supply universal truths and insights into the functioning of a wide range of populations (Dunn, 2001) in various contexts.

2.7.6 Summary

- Sensory processing is one of the most applied theory and practise domains within the field of occupational therapy, providing a large base of scientific research, dominated by clinical paediatric populations.
- Sensory processing theory was originally applied in the area of mental health, but the principles slowly started being applied to healthy adults, mostly for the study of affect, pain, depression, anxiety and their related impact on health and wellbeing.
- The AASP (Brown, et.al, 2001) measuring adult sensory processing, displays four basic sensory domains or quadrants which seem to have a fairly constant inter-correlation pattern. This raises questions concerning the homogeneity of modulation and classification of subtypes.
- General consensus is that there are two main types of sensory processing – SOR (sensory over-responsivity) and SUR (sensory under-responsivity).
- Sensory preferences, as established through profiling, are potential determiners of habits, daily behaviours, occupational and activity choices, job-fit and a sense of well-being.
- Sensory processing produces stable traits and can supply universal truths and insights into human behaviour across all populations, regardless of age, gender and health status.

2.8 Person-Environment-Occupation (PEO)[39] fit

This section is the culmination of evidence to highlight the value of the person-environment-occupation fit for job success and satisfaction. It acknowledges the common practise to use temperament for job-matching but provide a diverse and holistic view to what other disciplines contribute. It particularly aims to strengthen the support for observing sensory processing (part of person construct) in call centres (environment) to determine the job-performance (part of occupation construct) of agents from an occupational therapy framework.

The concept of fit between people and their environments in a work context is multidimensional and has been studied extensively across various disciplines (K. Ahmad,

[39] The reader should note that it is the concept of the inter-relationship and characteristics between the P-E-O constructs and not the therapeutic interpretation which is being applied here.

2011; Edwards & Billsberry, 2010). Job satisfaction, work motivation and 20% of productivity are shaped by the physical work environment, suggesting that consideration for the environment-person interaction as a performance management tool is in the best interests of both the worker and the organisation (Davis et al., 2011). In vocational behaviour and career development the person-environment (P-E) fit represents the premise that attitudes, behaviour and other individual level outcomes result not from the person or the environment separately, but rather from the relationship between the two (K. Ahmad, 2010). Some of the dimensions described in the literature include internal (personality, values, attitudes, skills, emotions, and goals) and external factors (job requirements, expected behaviour, organisational culture, pay structures, and collegiality) (Edwards & Billsberry, 2010). A fit between the environmental demands and personal abilities is fundamental to most models of personnel selection, in which the generally accepted paradigm is to analyse job demands and define the abilities required to meet these demands, and then to hire individuals accordingly (K. Ahmad, 2010). It is widely accepted that person-environment fit models provide a conceptually and empirically sound method to facilitate career development, vocational choice, occupational success and job satisfaction (K. Ahmad, 2010; Haase, 2008; Tak, 2011).

2.8.1 Vocational behaviour and career development

Studies reviewed in vocational behaviour and career development show that jobs differ in stimulus demand and therefore optimum person-environment fit is encouraged as it contributes to job satisfaction, well-being and worker relationships, while lowering worker intention to quit:

- In a person-environment fit study, 77 university students (25 Portuguese and 52 American) were asked to apply ratings to 24 occupational names with regard to stimulus demands (information load, interpersonal load, change load, time structure, and activity structure). The study explored whether polychronicity[40] influenced participant's ratings on how demanding they perceived jobs to be. Cultural differences between mean ratings were not statistically different ($p = 0.847$), but the various occupational groups had significantly different ratings ($p < 0.001$) for stimulus demand (Haase, 2008).

[40] Polychronicity is the inherent difference across cultures in handling time and space and based on the seminal work of anthropologist E. T. Hall (1959, 1966). For example, social distance between people in South American and Mediterranean cultures is approximately 18 inches, and they have a more fluid and flexible approach to time (polychromic) whereas the typical North American or North European interaction distance is approximately 36 inches and they have a more stringent use of time (monochromic). (Haase, 2008)

- In a Korean study (n = 901) various person-environment fit models correlated with intent to quit; person-job (r = -0.44), person-organisation (r = -0.38) and person-supervisor (r = -0.21), with person-job fit emerging as the strongest predictor (Tak, 2011).
- A Chinese study (n = 288) found the degree of person-environment fit (measured through intention to quit) strongly related to job satisfaction (r = -0.58), mental well-being (r = -0.37), physical well-being (r = -0.27) and work relationships (r = -0.44) (Yang, Che, & Spector, 2008).
- In a cross sectional study workers had higher psychological wellbeing where the person-job fit and the person-organisation fit increased (Park, Monnot, Jacob, & Wagner, 2011).
- In another study of 257 shop-floor workers in a light manufacturing assembly plant in Wales, UK, people with temperament sensitivity (measured by the 16 PF personality questionnaire, Cattell et al., 1992) were more satisfied when working in smaller groups, and a management strategy of "change the person or change the environment", was proposed for optimum person-environment fit (K. Ahmad, 2011, p.725).

The psychology literature provides further evidence to support the use of personality tools in determining job performance and worker health (Anaby et al., 2010; Hutchinson et al., 2010; Roberts et al., 2011). The 'Big Five' (Refer to the Glossary, pg xii) is widely accepted, has a strong psychometric design and is used extensively in organisational and other applied research (Jackson, 2011). Neuroticism and extraversion (as measured by the Big Five) are described as the most fundamental traits (Anaby et al., 2010; Kärnekull et al., 2011; Matthews & Campbell, 2009); emotional stability has been the most consistent and strongest predictor of job success (Roberts et al., 2011); and neuroticism has been found to be the most robust predictor of work stress, absenteeism, poor morale and ill-health (Anaby et al., 2010; Matthews & Campbell, 2009).

Parallel to the temperament findings, other studies have shown that jobs that are stimulating, manageable with high autonomy (Matthews & Campbell, 2009; Van Den Berg & Feij, 1993) and meaningful, well-organised and supported (Anaby et al., 2010) allow for the prediction of higher levels of job performance and well-being than personality. 144 Students were exposed to a rapid information processing task, producing a demanding and stressful task environment to determine performance influences. It was found that task-environment engagement, (energy, motivation and concentration), ($p < 0.01$), was a more feasible predictor of work performance than temperament, for which the p values were not significant (Matthews & Campbell, 2009). A study interviewing 213 Dutch employees in 18 companies across 34 occupational fields by an employee selection

agency for job change, found demographic data (gender and education) to be the strongest predictors of attrition, second was sensation seeking as a temperament construct and third (much less indicative) were the FFM personality constructs (Van Vianen et al., 2003).

Due to individual differences in personality traits and responses to emotional labour and work stress, it seems reasonable to suggest that some people are more suited to call centre work than others (Rohrmann et al., 2010). The correct job-fit for call centre agents could apply a more person-centred approach rather than a skills approach (Townsend, 2007; Van den Broek, 2003) as an HR recruitment strategy, because this has the potential to contribute towards healthier and more profitable work environments (Sawyerr et al., 2009; Thite & Russell, 2010; Wegge et al., 2010). Given the managerial challenges with regards to HR (Mahesh & Kasturi, 2006; Russell, 2008) and their ability to minimise burnout (Castanheira & Chambel, 2010), HR practitioners, as the recruitment and staff management gatekeepers, might apply a two-fold approach; getting the right people in but also keeping the 'wrong' people out (Townsend, 2007). The 2011 Global Dimension data report rated more rigorous screening of candidates at the recruitment stage as the most important of eleven initiatives to optimise people working in the industry by 63% of respondents (Dimension Data, 2011).

2.8.2 Environment and occupational therapy practice models

Powell Lawton, the environmental gerontologist made a large contribution in the field of environmental psychology over four decades and also informed the development of occupation therapy practice models (Brown, 2001; Dunn et al., 1994; Law et al., 1996; Letts & Rigby, 2003; Moore, VanHaitsma, Curyto, & Saperstein, 2003; Strong et al., 1999). The dynamic and complex interaction between a person, their contextual environment and the impact this has on occupation, performance, health and well-being is described in the OT models of Ecology of Human Performance (Dunn et al., 1994), the Kawa model (Iwama, Thomson, & Macdonald, 2009), and the Person-Environment-Occupation model (PEO) (Law et al., 1996). These models support the foundations on which occupational therapy assessments and interventions are based and their emphasis on environment as a determinant of occupational performance is of relevance to the current study. Considering the physical and sensory properties of the open plan office design in call centres, paired with the job demands and characteristics, it provides a relevant context to position occupational therapy intervention.

While a range of potential models exist for framing the role emergent practice of occupational therapy in the call centre industry, the P-E-O model presents a useful example for the current study. Developed and described in the OT literature (Law et al.,

1996; Strong et al., 1999) it provides a framework for considering individuals with regard to their best fit with the job environment, potentially benefitting both performance and worker wellbeing. Matching individuals based on their sensory processing style (which like temperament is regarded as a stable trait) could be used as a primary approach, and has the potential to increase the person-occupation fit. Environments as opposed to people are more malleable and can be adapted, as a secondary approach, which would then provide opportunities to make environmental adaptations and/or suggestions, and to increase the person-environment fit.

Sensory stimulation and processing is a constant part of daily living, and places varying demands on individuals to interact, which they do either in an adaptive or maladaptive manner (Brown, 2001; Brown, 2001; Dunn, 2001; Dunn et al., 1994). With sensory stimuli in excess in the call centre environment, it holds potential to enable work performance for some while hindering it for others. When a client's particular environment poses too many health threats an occupational therapist would consider adapting it, thus increasing the client's occupational competence or 'matching' the individual's abilities with an environment most suited to the promotion of their health and wellbeing (Bontempo, 2010; C. Brown, 2001; Cohn & Lew, 2010). Using the AASP as an instrument to match individuals optimally for health and performance therefore seem reasonable[41].

[41] Consideration for the legislation governing selection of individuals for jobs as an organizational strategy is an important consideration in South Africa in accordance with the Labor Law Act. Psychological testing and similar assessments can only be used when the test is scientifically valid and reliable, can be applied fairly to all employees, and is not biased against any employee or group. Aligned with the Act's requirements, occupational therapists, whose registration with the Health Professions Council of South Africa (HPCSA) is compulsory, may use the AASP as it is a scientifically validated and reliable instrument and not discriminatory against any person or group (Brown, et al, 2001).

2.9 Occupational Therapy and Occupational Science

"Occupational Therapy is a client-centred health profession concerned with promoting health and well-being through occupation. The primary goal of OT is to enable people to participate successfully in the activities of everyday life. Occupational therapists achieve this outcome by considering both the person and their environment to support their occupational engagement" (WFOT, 2011)[42]*. Occupational therapists are skilled in analysing the daily contexts, occupational performance*[43] *and functional skills of individuals, which they apply to promote health, wellness and meaningful participation in occupations which are significant for their clients* (Brayman et al., 2010)*. Occupation is described as complex and dynamic, and both work and non-work activities are considered as constructs of occupation of which certain occupations, especially when considering paid work practises, are more conducive to health and wellness than others* (Matuska & Christiansen, 2008)*.*

The role and identify of the occupational therapy profession has been subject to the definition derived from the medical perspective, as the traditional area of health-related-practices. This resulted in a sense of patriarchal control and dominance, with occupational therapy being considered a supplementary, or allied, medical profession. This bureaucracy of power politics contributed to the identify crises often experienced within the profession (Clouston & Whitcombe, 2008; Pollard et al., 2010). Changes within the health care industry, alignment with global and economic market sources, paired with increasing societal and consumer pressures require occupational therapy to be more flexible and to adapt in order to survive the pressures of the 21st century. The changing milieu of the majority world provides opportunities for the profession to progress into a more unique, health promotion and identity driven service development phase (Pollard et al., 2010). The fundamental characteristic of occupational therapy, which matches people's abilities with environmental demands to maximise their potential provides many opportunities for entrepreneurship in occupational therapy (Anderson & Nelson, 2011). It can also be applied in commercial business to reposition and expand the value of the profession from a rehabilitative to an occupational enrichment and worker wellness focus, in line with the vision of the profession to become more broadly recognised.

[42] WFOT (World Federation of Occupational therapy): http://www.wfot.org/information.asp

[43] Occupational performance is enabled by sensory, perceptual, neuromusculoskeletal, cognitive, and psychosocial functions (Gutman, Mortera, Hinojosa, & Kramer, 2007).

Occupational science[44] was officially launched by the Department of Occupational Therapy of the University of Southern California in 1989 with a vision and purpose to inform and advance current practice through research, expand the traditional occupational therapy boundaries and bridge into health promotion (Hocking & Clair, 2011). The need to strengthen the profession's scientific position (Nashat, 2011) by promoting interdisciplinary investigation of occupation was recognised as was the advantage of utilising the diversity which related disciplines could offer in providing more in-depth, comprehensive and global viewpoints about occupation (Pollard et al., 2010). Occupational science is still an emerging discipline, with occupation often studied in innovative ways in non-traditional samples, suggesting new territories for research from an occupational rather than a medically-based perspective (Glover, 2009; Pierce et al., 2010).

The challenge for the OT profession is to accept and embrace appropriate changes, to be courageous and innovative, and to translate insights into practise, (Hinojosa, 2007; Thomas, 2009). Innovation is most likely to occur in the blurred boundaries between different disciplines (Rudman et al., 2008), for the purpose of expanding knowledge and practise. The field of OS provides the necessary support for researchers to acknowledge and use interdisciplinary study findings. The professional growth, identification and sustainability of occupational therapy will be ensured by marketing our unique contributions and becoming professional ambassadors (Morley & Rennison, 2011).

2.9.1 Summary

- Occupational therapy is a client-centred health profession concerned with promoting health and well-being through occupation.
- Occupational therapy can make a contribution to industry and business via a preventative healthcare approach.
- Entrepreneurs are wanted in occupational therapy who will drive innovation through person-environment-occupation practice orientation in industries characterised by high stress
- OS was established to inform and advance occupational therapy. It supports multidisciplinary collaboration, innovation and practise expansion for consideration of health and occupation in healthy work populations.

[44] Henderson, A (1996). The scope of occupational science. In Zemke4, R., & Clark, F. Occupational Science. The evolving discipline. Philadelphia: F.A. David Company.

Chapter 3 Design and Methodology

3.1 Introduction

The aim of this study was to determine the value of sensory profiling as an agent recruitment and selection tool for the call centre industry. As the study data were collected and analysed, the researcher identified challenges and opportunities in the management of the data not anticipated at inception. As a result the study evolved into four multi-layered stages, each building on the previous one in order to achieve the study objectives. The four stages are a reflection of the researcher's clinical reasoning in managing and extending the study data and these are summarised as the methodology framework in Table 3.1.

Stage 1 of the study is aligned with objective 1; to explore the associations between sensory profiles, performance, absenteeism and attrition of call centre agents in four fully operational call centres in South Africa. It included the demographics of the study sample; their sensory profiles obtained through the use of the standardised Adolescent/Adult Sensory Profile (AASP), and performance, absenteeism and attrition information extracted from advanced technology systems and company records. ***Stages 2 – 4*** evolved as a result of the data insights obtained in Stage 1 and aligned with objective 2 of the study; to determine potential validity of the AASP as a recruitment tool for the call centre industry. Stage 2 describes the development of a novel six subset structure to observe the AASP results alternatively. The AASP baseline data indicated strong inter-correlations between the four quadrant results and a multidimensional outcome which posed a challenge for the study hypothesis. The subset structure allowed for an extended method to observe the AASP results separately. Stage 3 applied the collected performance, absenteeism and attrition data obtained through the baseline stage to the six subset structure developed in Stage 2. The objective was to determine whether the subset structure held validation for performance prediction and could therefore be used in recruitment practises. Stage 4 included the observation of the sensory profiles of a small group of managers. As these managers were successful agents promoted into team leader positions, the objective was to determine whether a particular best-profile exists.

This chapter provides the details of the quantitative, non-experimental and correlational study design. The sampling methods in choosing call centres as the study sample (discussed as Sites 1, 2, 3 and 4) and their workers as the study participants is detailed as well as ethical procedures in obtaining informed consent. Thereafter, the instrumentation, methods, analysis and implementation for obtaining results are described according to the four study stages.

Table 3.1: Methodology Framework

Aim of the study: **To determine the value of sensory profiling as an agent recruitment and selection tool for the call centre industry.**			
Stages	**Instrumentation and Measurements**	**Analysis**	**Study Sites applied**
STAGE 1: Baseline data (Study objective 1: To determine the relationship between sensory processing and work performance of call centre agents).			
1. To describe the environmental and operational characteristics of each call centre to determine the similarities and differences between the study Sites.	Call centre Site checklist	Descriptive analysis of the environment, operations and human resources	Sites 1, 2, 3 and 4
2. To describe the demographics of the study participants with regard to age and gender in order to establish whether they represented the general call centre industry.	AASP age and gender data fields	Demographic distributions of age and gender	Sites 1, 2, 3 and 4
3. To describe the sensory profiles of all agents within the study sample to determine whether certain distinctive variations and trends occur across the samples.	AASP	Spearman Rank Correlation analysis between the 4 quadrants results	Sites 1, 2, 3 and 4
4. To determine if there is an association between the sensory profiles of call centre agents and their work performance.	AASP and Key performance indicators (KPIs)	Spearman Rank Correlation analysis between the AASP and KPIs	Sites 1, 2, 3 and 4
5. To determine if there is an association between the sensory profiles of call centre agents and their absenteeism rates.	AASP and absenteeism data	Spearman Rank Correlation analysis between the AASP and Absenteeism data	Sites 1, 2, 3 and 4
6. To determine if there is an association between the sensory profiles of call centre agents and attrition.	AASP and attrition data	ANOVA analysis between the AASP and Attrition groups	Sites 1, 2 and 4
STAGE 2: Development (Study Objective 2: To determine potential validity of the AASP as a recruitment tool for the call centre industry).			
7. A subset structure was developed in response to the multidimensionality of the agent's AASP results for application in the call centre industry.	AASP	Lexicographical ordering and category allocation, using 'nearest neighbour' and 'interval location' as statistical procedures	Not Site specific but based on the inherent testing instrument
STAGE 3: Application (Study Objective 2: To determine potential validity of the AASP as a recruitment tool for the call centre industry).			
8. The subset structure was re-applied to the agents same performance data to determine potential associations between the subset score configurations and performance measures, for potential validity in call centre recruitment.	AASP subsets and KPIs	ANOVA analysis between the AASP subsets and KPIs of agents	Sites 1 and 4
STAGE 4: Validation (Study Objective 2: To determine potential validity of the AASP as a recruitment tool for the call centre industry).			
9. The AASP and subset results of call centre managers were analysed to determine if they had a distinctive sensory profile different to those of the agents, for further validation of the recruitment potential of the instrument.	AASP and subsets of managers and agents	ANOVA analysis between the observed AASP results of managers and agents	Sites 1 and 4

3.2 Study Population

The study population was approximately 1836 call centre staff working in four different call centres across two geographical areas of South Africa. The latest global and South African call centre statistics[45] were used to compare the study population for being representative of the overall industry. Based on these reports the captive, financial industry has the largest representation (34.6%), and outsourcing the second largest (18.9%), with the ten remaining industries (i.e. Government and Education, Consumer goods and retail, Travel and Transportation) all representing less than 9% (Dimension Data, 2011). Johannesburg hosts 51% and Cape Town is second with 38% of call centres in South Africa (Benner et al., 2007). Global representation indicated that 66.8% of call centres employ agents of up to 1000 employees, while 16.9% of the industry has between 1000 and 5000 employees (Dimension Data 2011). A recent development is the 16.3% of call centres with more than 5000 employees (Dimension Data, 2011), which is uncommon in South Africa.

3.3 Sampling of the Study Sites (Call Centres)

The call centre industry is a target, performance and time driven workplace with workflow interruptions kept to a minimum. As a result call centre management are mostly disinclined to participate in research which complicates access for data collection. The researcher had to rely on personal networks and contacts to identify five potential study Sites. The Sites were chosen based on specified criteria of the industry, sector, type, location and size (Dimension Data, 2011) to ensure representation of the overall industry and alignment with the larger call centre environment. Three large well-known, service, inbound call centres in the financial industry were approached for inclusion; being the most representative (34.6%) of the total industry. The management of two call centres accepted but a third, in Cape Town, declined due to operational pressures. Two alternative call centres further agreed to participate in the study; they were outsourced call centres performing outbound calling for sales and debt collection purposes. The composite learning sample construction for the study consisted of 4 separate study sites:

[45]The latest Global Benchmarking Report of 2011, n = 545 (Dimension Data, 2011) provided the most updated information but was not necessarily specific to the South African context. Therefore the Global Call Centre Report of 2007, n = 2477 (Holman et al., 2007) which contained a separate South African version, n = 64 (Benner et al., 2007) was also used.

- Site 1 is a captive/in-house call centre handling mostly inbound service calls in the financial industry. It is one of various call centre divisions in Cape Town and employed permanent and temporary staff.
- Site 2 is a captive/in-house call centre handling mostly inbound service calls in the financial industry. It is one of three divisions for a financial services company in Johannesburg and only employs permanent staff.
- Site 3 is an outsourced call centre, handling outbound calls for sales purposes. Site 3 has 63 permanent project-based agents representing the sales outbound sector in a small outsourcing call centre in Cape Town.
- Site 4, located in Johannesburg, is an outsourced call centre, handling outbound calls for debt collection purposes. It has 500 seats, but employs 1122 agents on a permanent basis who share seats in two shifts.

Sites 1 and 2 are similar in industry, sector and type but in different regions. Being captive, Sites 1 and 2 respectively formed part of a larger company structure. Site 3 and 4 are similar in industry and type but differ for region and sector. Both are single, outsourced call centres and this is their sole business function.

Meetings were held at all Sites with the executive management at the start of the study to explain the study process, objectives and expectations. For each of the study Sites the researcher had a designated liaison person through whom contact was made, permission obtained and further discussions and feedback occurred. The liaison person(s) provided the researcher with on-site guidance, ensuring optimal entry into the organisation and access to information. The liaison person was familiarised with the study process and methodology, and assisted the researcher with obtaining informed consent from management and study participants; enabled authorised access to the business premises on selected days to collect data; and facilitated access to performance data from the Information Technology (IT) personnel.

3.4 Sampling of Study Participants (Agents and Managers)

Different sampling methodologies were applied based on the accessibility of each Site. In sampling the call centre agents, all staff at Sites 1, 2 and 3 were invited to participate, the process, ethics and requirements having been stipulated, resulting in a convenience sample. For Site 1 not all agents volunteered to take part, but for Site 2 and 3, most agents participated. For Site 4, random sequential sampling was used and every 5th person was chosen from the agent staff list.

Managers were not intended as a study group at the initiation of the study in Stage 1. However, 48 managers completed the AASP out of interest without prior knowledge of the

researcher and were included, forming part of the 226 study participants. Site 2 collection occurred soon after Site 1 and managers were thus not included. As the study evolved and through contact with the industry the value of studying a manager's sample was identified. Their inclusion as a sample extension was based on the industry norm to promote high performing agents into management positions (D'Cruz & Noronha, 2011; Gorjup, Valverde, & Ryan, 2008) as part of a career development path (Dimension Data, 2011). This was also confirmed by each liaison person for the Sites. Team leaders, working side by side with the agents, operating within the same open plan office environment, and exposed to similar sensory stimuli, were ideal study examples or participants. Aligned with the study progression, 57 managers formed part of a convenience sample process for Stage 4 analysis. For Site 1, the manager sample (n = 48) was extracted from the full sample (n = 226) and a further 3 managers from Site 3, and 7 managers from Site 4 were invited to participate. This post-hoc convenient sample was small (about 13% of the approximate total of managers) in order to limit intrusion into their daily call centre operations and to minimise the cumulative research costs for the researcher. The final sample size consisted of 402 agents and 57 managers (with respect to the four study Sites). Table 2.3 provides a summarised overview of the study Sites and sampling methodology:

Table 3.2: Summary of the Study Sites and Samples

Identifiers	Site 1	Site 2	Site 3	Site 4
Industry	Captive	Captive	Outsourced	Outsourced
Sector	Financial industry	Financial industry	Sales	Collections
Type	Service: inbound	Service: inbound	Sales: outbound	Collections: outbound and (some) inbound
Geographic Region	Cape Town, South Africa	Johannesburg, South Africa	Cape Town, South Africa	Johannesburg, South Africa
Size (based on agents)	485	53	63	1122
Sampling method	Convenience	Convenience	Convenience	Random sequential
Agent sample size	n = 178	n = 53	n = 63	n = 108
Manager sample size	n = 48	n = 0	n = 2	n = 7
Total sample per site	n = 226	n = 53	n = 65	n = 115
Total sample for study	459			

Identifiers	Site 1	Site 2	Site 3	Site 4
Liaison person	Human Resource (HR) manager	Training manager[46]	Operations manager	Operations director and HR manager

3.5 Research Ethics

Ethical approval (No. 289/2005) was obtained from the University of Cape Town Health Science Faculty Research Ethics Committee for the initial data collection (Sites 1 and 2) and the expanded data collection (Sites 3 and 4) of the study (Refer to Appendix A). Guidelines for acceptable ethical behaviour in the field were based on the three fundamental principles recommended by the Belmont Report (1979)[47]: respect for persons, beneficence and justice. Respect for persons was adhered to by infringing as little as possible on agent's work time and by ensuring that the research findings were treated as confidential and anonymous with respect to agent and company details. Neither the company nor the researcher received any remuneration or sponsorship for the study and no agent results were given to management.

Beneficence was assured by making the researcher's contact details available to all participants and by invited contact with the researcher if necessary. Participants' score results (in a short report format) were made available on agents' request via email. About 20% of agents made use of this opportunity. The deeper rationale for the study was to ensure justice for workers in matching work environments with inherent sensory processing to ensure the best fit and therefore their health. While not directly available to the sample, the anticipated study results will enable the researcher to recommend appropriate recruitment procedures, which could lead to greater fairness of appointments in the future. If the study objectives are achieved, the results have the potential to ensure employees the best chance of being effective workers.

The three ethical principles were applied during the process of obtaining participant's informed consent which was followed at each Site. Care was taken to ensure that adequate information was conveyed in a comprehensible form, so that participants could

[46] Site 2 was compiled in conjunction with Mr Juan Lewis, a training manager at Site 2. He replicated the study idea, methodology and analysis in 2006 towards a mini dissertation for his Master's in Business Administration, and completed in 2008. The study idea and concept was introduced to Mr Lewis during a presentation to MBA students with regard to the sensory roots of performance in the workplace in 2006. Informed consent was obtained from Mr Lewis and the call centre management to incorporate this data sample in the study.

[47] The National Commission for the Protection of Human Subjects of Biomedical and Behavioural research: *The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research.* DHEW Publication No (OS) 78-0012, Washington, 1978.

make voluntary decisions regarding their involvement. A separate informed consent process was followed with executive management and with agents. Management at all Sites was asked to sign consent forms and to agree not to use study participation or non-participation against agents in any form or way. Ethical and professional conduct by the researcher was further guaranteed in the informed consent document (Refer to Appendix B). Site 4 being in the collections industry and subject to many legal considerations within this business model, also asked the researcher to sign a document agreeing to an ethical and professional code of conduct and confidentiality. This was duly completed.

The informed consent process with agents and team leaders followed (Refer to Appendix C) and entailed clear communication of the following:

- The study process, objectives and expectations as well as the amount of time the agent would need for completion of the questionnaire.
- Assurance of voluntary participation.
- A guarantee of confidentiality of the results and an undertaking not to make results available to management or other third parties.
- Agreeing or refusing to participate would not affect their work and job security in any way.
- The researcher would have access to agents' (but not managers') performance data.
- Findings on either the questionnaire or performance would not affect their job security or remuneration in any way.
- Participation would not be remunerated.
- Agents' results could be requested from the researcher by personal email, which the agent could have access to after scoring and interpretation.

3.6 Study Instrumentation

This study comprised two primary and two supplementary data collection tools. The primary study instrument was the standardised Adolescent/Adult Sensory Profile (AASP, Brown & Dunn, 2002). The other measurement tool was Performance Data which included Key Performance Indicators (KPIs), absenteeism and attrition information generated by sophisticated computer recordings for all agents' at all four study Sites. The KPI, absenteeism and attrition data therefore were not a single, standardised and normative testing instrument but rather Site specific recordings that measured performance, specific to each call centre. This provided accurate, reliable and unbiased 'calling' detail of agents. The AASP and Performance data as primary tools were used throughout the four study Stages.

Two supplementary measurement tools, the Sensory Overload Risk Assessment Rating (SORAR) and Demographic and Personal Questionnaire, were used in Stage 1 for Site 1 only[48].

3.6.1 Instrument 1: Adolescent/Adult Sensory Profile (AASP)

The AASP (Brown et al., 2001) is a standardised self-evaluation questionnaire used to determine behavioural responses to daily sensory experiences (Refer to Appendix D). The AASP was published in 2002, after development through a series of studies in 2001 by Catana Brown, Nona Tollefson, Winnie Dunn, Rue Cromwell and Diane Filion from the Occupational Therapy Education and Psychology departments' of university institutions in Kansas City, USA. The AASP is designed as a trait measure of sensory processing and provides a standardised method to measure the effect of sensory processing on individuals' functional performance. The AASP comprises a 60-item self-report questionnaire for which individuals must answer questions about their sensory preferences in each sensory category (Taste/Smell, Movement, Visual, Touch, Activity level and Auditory) on a 5-point Likert scale:

- Almost never (about 5% or less of the time) 1 point
- Seldom (about 25% of time) 2 points
- Occasionally (about 50% of time) 3 points
- Frequently (about 75% of time) 4 points
- Almost always (about 95% or more of the time) 5 points

Questions relate to the responses of individuals to sensory information from their environment at any given time. The items focus on everyday life experiences and increase the relevance and clarity of the AASP for the individual. The self-reporting format of the AASP makes it practical and easy to use because it is non-intrusive, easy to administer and takes about 10-20 minutes to complete. The answer responses are grouped into four quadrants (Low Registration, Sensation Seeking, Sensory Sensitivity and Sensation Avoiding) which represent the patterns of sensory processing as described in Dunn's (1997) Model of Sensory Processing.

[48] The findings of these two supplementary non-standardised instruments deviated from the study objectives and were thus not explored further for the other Sites.

3.6.1.1 Scoring the AASP

Based on the constellation of all 60 items, an individual's total score, according to their age group, is derived for each of the four quadrants (Low Registration, Sensory Seeking, Sensory Sensitivity, and Sensation Avoiding). Scoring criteria exists for three separate age groups (adolescents 11 – 17.11 years; adults 18 – 64 years; and older adults 65+ years). The AASP is scored for each quadrant according to a classification system resulting from the frequency distribution of scores in the standardisation sample (individuals without disabilities n = 496) (Brown & Dunn, 2002). The summary score chart only shows ages 18-64 as these pertain to the study sample.

Table 3.3: Quadrant Summary Score chart of the AASP (Ages 18 – 64)

Quadrant	Quadrant Raw Score Total	Much less than most people	Less than most people	Similar to most people	More than most people	Much more than most people
		- -	-	=	+	++
1.Low Registration	/75	15-----18	19-----23	24-----35	36-----44	45-----75
2.Sensation Seeking	/75	15-----35	36-----42	43-----56	57-----62	63-----75
3.Sensory Sensitivity	/75	15-----18	19-----25	26-----41	42-----48	49-----75
4.Sensation Avoiding	/75	15-----19	20-----26	27-----41	42-----49	50-----75

The score categories and symbols applied (- - ; - ; = ; + ; ++) had the following meaning based on the standardisation sample:

- Much less than most people (**- -**), less than 2% of the population
- Less than most people (**-**), between 2% and below 16% of the study population
- Similar to most people (=), between 16% and 84% of the study population
- More than most people (+), between greater than 84% and 98% of the study population
- Much more than most people (++), greater than 98% of the study population

3.6.1.2 Reliability and validity of the AASP

As a reliable and valid instrument, supported by scientific research, the AASP is regarded as the preferred instrument in occupational therapy to measure sensory processing in adults with and without a prior diagnosis, for assessment and intervention purposes. Reliability was determined through a systematic, rigorous and credible methodology with good sample sizes for the pilot as well as standardisation studies (Brown et al., 2001; Brown & Dunn, 2002). The profile was developed for ages 11 to 65+ years, and is based on the Sensory Profile (Dunn, 1999), a measure developed for children 3-10 years of age.

Following a large sample pilot study (n = 615), the final standardisation sample of the AASP (n = 950) included adolescents and adults without disabilities. The sample consisted mostly of Caucasians (92%), predominantly from the mid-west region of the United States of America and was described in 3 age groups:

- Adolescent: 11.0-17.11 years n=193 49% male, 51% female
- Adult: 18.0-64.11 years n=496 49% male, 51% female
- Older adult: 65 years and older n=261 42% male, 58% female

Content validity was established during development of the AASP. A review process of the child Sensory Profile (Dunn, 1999) resulted in choosing and rewriting those items in a self-report format, and constructing new items considered by the authors to be applicable to adults. An expert panel of judges was put together for item review of the AASP. They comprised five occupational therapy and psychology faculty members of the University of Kansas and the University of Kansas medical centre, as well as three clinical psychology graduate students who were familiar with Dunn's model of sensory processing. They reviewed and sorted 60 cards with questions/items on them for placement in the four quadrants of sensory processing (Low Registration, Sensation Seeking, Sensory Sensitivity and Sensation Avoiding). The objectives were: 1) to ensure that the test sampled an appropriate range of sensory processing behaviours of adolescents and adults, (2) the items were correctly placed within the quadrants, and (3) they reflected Dunn's Model of Sensory Processing (Dunn, 1997), which forms the main scoring criteria. After only one item was revised all judges correctly and consistently sorted all items to fit into the four specified quadrants.

Internal consistency estimates how reliable the AASP is and whether test scores will be similar when repeated. The coefficient alpha was calculated for each quadrant across the three separate age groups. Coefficient alpha is an index of internal consistency ranging from 0 (no consistency) to 1 (perfect consistency). The values of alpha for the various age groups and quadrant scores ranged from 0.639 to 0.775 with values for the age group 18-64 (used for this study) as: Low Registration 0.692; Sensation Seeking 0.639; Sensory Sensitivity 0.657 and Sensation Avoiding 0.699 (Brown & Dunn, 2002). This confirmed the instrument to be reliable and likely to produce similar results when repeated and used as the reference for the current study.[49]

[49] Coefficient alpha results of the standardisation sample (Brown & Dunn, 2001) were not re-calculated for the current study.

The standard error of measurement indicates the variability of test scores with repetition. The AASP provides a standard error of measurement (SEM) value for each quadrant and cut-score group: SEM values for the quadrants in the 18-64 age range were: Quadrant 1: 3.58; Quadrant 2: 4.10; Quadrant 3: 4.47 and Quadrant 4: 4.03 (Brown & Dunn, 2002). This resembles the degree to which obtained scores can differ from true scores. Confidence interval calculations indicated the SEM as low and that test scores have little variability (Brown & Dunn, 2002).

Convergent and discriminant validity for the AASP were established through matching results with the New York Longitudinal Scales (NYSL) adult temperament questionnaire and the AASP (Refer to paragraph 2.5.5, pg 37) (Brown & Dunn, 2002). Skin conductance measures confirmed the physiological responses associated with sensory input as established through the AASP quadrant results (Refer to paragraph 2.6.2, pg 42) (Brown et al., 2001).

3.6.1.3 Content applicability

The fact that the AASP was developed in the United States of America may mean that it is not always applicable within the South African context. The words "candy" and "applesauce" in item (7): "I don't like strong tasting mints or *candies* (for example, hot/cinnamon or sour *candy*)" and item (34): "I don't like particular food textures (for example peaches with skin, *applesauce,* cottage cheese, chunky peanut butter)"are foreign to the South African population. They were replaced with familiar words to give greater clarity and understanding: "sweets" was added to "candy" and "maize porridge" (similar in texture), was added to "applesauce" on the test forms after written permission was obtained from the test owners (2 February 2006, Angela Kearns, Legal department, Harcourt[50]). For the paper-based versions, the study participants could see both words (candy and sweets, and applesauce and maize porridge). For the electronic completion of the test, participants only saw the updated version (sweets and maize porridge). A modification was also made to item 7 of the AASP in a Chinese study (Chung, 2006) as mint and cinnamon were seldom used in the Chinese culture and replaced with ginger or marinated plum.

[50] Electronic licensing permission was granted by Harcourt Assessment Inc., the original owners of the AASP, to the researcher in 2006. The AASP was converted into an electronic format following specifications by Harcourt. Pearson Inc. is the current legal owner of the AASP following a merger in 2008 with whom the researcher has a legal agreement for use. The electronic version of the AASP went through rigorous development and testing phases during 2008 to ensure a 100% replication in tests questions and scoring.

3.6.1.4 Summary

Considering the literature and standardisation process, the Adolescent/Adult Sensory Profile:

- Assesses significant information regarding an individual's sensory processing. It draws comparisons and links between sensory processing of everyday experiences and resultant day-to-day performance;
- Includes the individual as an active participant in his or her assessment and intervention process;
- Is standardised and validated;
- Is applicable to individuals with or without any illness and/or disability;
- Can be used for research or clinical purposes;
- Is easy and quick to administer, score and interpret and can be completed by the individuals themselves.

3.6.2 Measurement 2: Performance data

Performance data consisted of three sections namely Key Performance Indicators (KPIs), Absenteeism and Attrition.

A KPI is defined as a quantifiable measure that reflects the critical success factors of an agent for a defined project, department or company and is agreed on before the agent commences work (Dimension Data, 2011). Although each call centre used different KPIs to measure their agent's performance, all were expected to make or answer as many calls as fast and as effectively as possible. Agents also have to limit time spent on breaks, training and coaching, as this means they cannot serve, sell to or collect from a client on the phone. Every agent has a log-in code to enter sophisticated information technology systems at their computer terminals which track, record and calculate their attendance and call information daily. These systems also have a monitoring and surveillance function as call results are presented on large television screens in a central part of the call centre and at the team leaders' computer terminals. Team leaders use this constant, live data to track call centre activity and agents' performance. The raw call data are then combined and calculated in a particular combination to deliver a performance appraisal platform for the agents. This forms part of each agent's monitoring, coaching and performance management process, and guides remuneration, rewards and bonuses. A dedicated information technology team monitors the system and call data while a separate team listen to random selected calls for quality assurance purposes. Due to the rigorous and electronic nature of collecting KPI and attendance data, this source of data can be regarded as valid and reliable, with a small margin of error. Most KPI data are about

good/high performance (preferred to be high by management), but some indicate poor/low performance (i.e. time spent on calls). To make this distinction, poor KPIs (preferred to be low by management) were marked with a ▼ throughout the methods and analysis sections of the thesis. It is important to evaluate the influence of the correlation because a ▼ KPI will require a different interpretation compared to other KPIs.

Agents' attendance is also recorded daily by the IT system of each Site, observing absenteeism rates. Absenteeism is regarded as a negative contributor to staff productivity in the call centre industry and employers aim to keep it as low as possible due to its cost implications (Dimension Data, 2011). Most absenteeism data fields were negative indicators showing people being more absent and away from work and marked with a ▼ to align with the performance data.

Call centres keep staff records including agent attrition because this is an important and costly consideration. An optimum period of 33 months of employment is considered ideal and the most cost effective to the business (Dimension Data, 2011). These records formed part of the performance data for all the study Sites and were obtained some time after the initial performance and absenteeism data.

Table 3.4 to Table 3.7, provide the details of the KPI, absenteeism and attrition data collected for each Site. The abbreviations for KPI data are used in the left column to resemble the data exactly as presented in table format in the analysis section. Explanations of what the data meant are provided in the right-hand column. This section provides the detailed performance data framework referred to throughout the thesis. Additional information is provided for Sites 1 and 4 due to the volume and nature of recordings.

3.6.2.1 Site 1

Raw data of all calls (number of calls made, time spent on calls, time spent on after call work, hold time, etc.) were recorded daily in real time. The Automatic Caller Distribution (ACD) system allowed for all incoming calls to be diverted automatically to the appropriate division and to an available, idle agent. The raw data were then electronically processed by the Site's IT system using pre-set configurations to determine five more condensed KPI groups, labelled as processed data[51]. The processed data results were used by

[51] The researcher did not have insight into the exact method or values ascribed by the IT system for documenting and converting performance data.

management for the calculation of agents' incentives and bonuses, and for managing performance.

They were:

- Talk Time Usage – calculated by using talk time and subtracting aux times
- Time Management – a combination of time usage and indicators from the raw data
- Overall Production Rating – the combination of number of calls and time usage
- Overall QA (Quality assurance) rating – these scores were calculated by designated QA staff who listened to a random selection of calls, ensuring that each agent was included across a particular time period (not necessarily within the data collection period)
- Overall Efficiency - Production and QA ratings combined

Performance data over a 4 month period was analysed and is listed in Table 3.4.

Table 3.4: Site 1: KPIs, Absenteeism and Attrition Data

Raw KPI data collected January to April 2006 (4 months)	
ACD[52] Calls	Number of calls placed and handled through the ACD dialler by the agent
▼Avg ACD in Sec	Average talk time in seconds on ACD calls
▼Avg ACW in Sec	Average after-call work in seconds (admin follow up work after a call)
▼Avg Hold in Sec	Average hold time of calls in seconds
▼Ave Handle T in Hours	Average handle time on phone (ACD + ACW + Hold time)
Other T in Hours	Time spent to route a caller/client to another division when a call was incorrectly transferred via the ACD system. The idea is to give the caller over in a "hot" fashion – in other words, getting the right detail from the client and handing over to another division in a conference call fashion. "Cold transfers" means the agent just put the client through to another number without the proper hand-over and assistance.
▼AUX Time	Time spent on breaks, lunch, reviews, meetings, training, admin, voicemail and faxes
Forced Work time in Sec	Work time in seconds on calls – Aux times
Potential call taking capacity	Call taking capacity: ACD and averages times

[52] ACD: Automatic Call Distributor is part of the IT system which allocates calls automatically to an available agent based on readings that the system makes and typically used in most call centres.

Processed KPI data collected January to April 2006 (4 months)	
Talk Time Usage Rating	Use of talk time considering aux times
Time Management Rating	General time management
Overall Production Rating	Overall production rating – focused around number of calls and time usage as captured by the system
Overall QA Rating	Quality assurance rating – focused on quality of calls obtained through listening back to calls by external parties. This is a randomised process but every agent will have at least 4 calls per months listened to by a designated member of the QA team.
Overall Efficiency Rating	Overall efficiency considering both production and quality assurance ratings combined
Absenteeism data collected January to April 2006 (4 months)	
▼Sick Leave	Sick leave
▼Annual Leave	Annual leave
▼Count Annual	Count of annual leave: total days entries for annual leave
▼Count Limited Leave	Days for all other leave: Absent without leave, compassionate leave, family responsibility leave, marriage leave, maternity leave, study leave
▼Total Count Entries	Total count leave entries across all leave entries
Attrition data collected 6 months and 16 months after initial data	
Staff records pertaining start date, end date and reason for leaving.	

3.6.2.2 Site 2

Performance and absenteeism data for Site 2 were collected over a 6 month period.

Table 3.5: Site 2: KPIs, Absenteeism and Attrition Data

Raw KPI data collected September 2006 to February 2007 (6 months)	
▼Avail T Average	This is the time the agent is idle on the system and waiting for a new call to come in. They are therefore not engaged in calls for this recording but logged in.
▼Ave Aux Time	Average time spent not making calls (breaks, lunch, meetings, reviews, admin, etc.). A high score for average aux time means the agent spent more time away from the phone, reflecting poor performance.
Ave Log in Six Months	Average log-in time; reflects the amount of time the agent is logged on to the ACD system and available for calls.
QA Average	Quality assurance average: Assessors listen to calls agents made to clients and assess the quality of calls based on the call centre standards. Agents are randomly selected but ensured every agent's calls get included. The QA rating is thus a score not IT system generated, and have potential bias over a short period of time.
▼QA St Dev	Quality assurance Standard Deviation Due to the random selection of assessing agent calls, the SD score gives a more reflective measure of the agents QA. This score was calculated by the study statistician (Dr.T.Kotze, 2007).

Absenteeism data collected September 2006 to February 2007 (6 months)	
X Months No Abs	Number of months of no absenteeism
▼Absent Total	Total absent days
Length Serv	Length of service; longer service time is needed as it counteracts attrition
▼Ave Absent	Average absent
Attrition data collected 24 months after initial date	
Staff records pertaining start date, end date and reason for leaving.	

3.6.2.3 Site 3

Performance and absenteeism data for Site 3 were provided for a 5 month period.

Table 3.6: Site 3: KPIs, Absenteeism and Attrition Data

KPI data collected January to May 2009 (5 months)	
Sales	Total sales
Hours	Available hours to take calls
Individual Sales Avg Per hour[53]	Individual sales average per hour
Campaign Avg Per Hour	How many product sales average per team per hour for the specific campaign
Team average % Above or below avg	% of sales above or below average
Absenteeism data collected January to May 2009 (5 months)	
▼X days Absent	Number of days absent
Attrition data collected 2 months after initial date	
Staff records pertaining start date, end date and reason for leaving.	

3.6.2.4 Site 4

The KPI data consisted of three sections; *Activity* (call activity and time); *Results* (call outcomes and payments received); and *Bonus* (points received for bonus purposes). Performance data over a 7 month period were analysed. Most KPIs for Site 4 were high performance indicators, those reflecting poor performance were marked with a ▼. The performance data for Site 4 were often measured and recorded through the IT system in the following manner: the actual KPI, i.e. contacting the right party to collect from (RPC),

[53] Individual sales average per hour was rated as the most important data field with the highest relevance by the operations manager for Site 3.

thereafter the standard was measured against call centre expectations, then adjusted for leave to avoid agents being wrongly penalised, leading to a % calculation and then a point's calculation. Performance and absenteeism data were provided over a period of 7 months.

Table 3.7: Site 4: KPIs, Absenteeism and Attrition Data

ACTIVITY KPI data collected January to July 2009 (7 months)	
Matters Worked	Actual amount of collection cases worked
STD Matters Worked	Matters worked ratio against the standard required
ADJ Matters Worked	Matters worked adjusted for annual leave
RPC (Right Party Contact)	Contacting the right party to collect from (in the collections industry it is imperative for agents to speak to the person that can repay the debt) and not a third party.
RPC Perc	RPC % (What is the % of people the agent spoke to how was the main debtor and not a third party, measured against the matters worked)
PNTS RPC Perc	Points received for RPC Contact % over months
In Call Connected Talk	Incoming call connected time with client – actual talk time for incoming calls, higher talk time meant that agents took more calls overall
Out Call Connected Talk	Outgoing call connected time with client – actual talk time for outgoing calls, higher talk time meant that agents made more calls overall
Talk Perc	Talk time % (is a % of the total seconds spent on accounts worked divided by the total talk time of incoming calls + outgoing calls)
PNTS Talk Perc	Points allocated and ratio measured against the standard KPI for talk time
Points Scored	Total points scored for activity section
▼PTP (Promise to Pay) Failed	Clients who promised to pay that failed/defaulted
▼Cost On PTP Created And Failed	A penalty calculated against the number of failed PTPs to avoid inflating PTPs made by the agent
▼PTP Due	Debtors who promised to pay that is still due
Score For ACTIVITY	Total average score for the activity section
RESULTS KPI data collected January to July 2009 (7 months)	
No Of PTP Kept	Number of (PTP) promise to pay kept by clients
STD No Of PTP Kept	Number of PTPs kept measured against the standard KPI
ADJ No Of PTP Kept	Number of PTPs kept adjusted for annual leave days
PTS No Of PTP Kept	Percentage point for PTPs kept by clients
Conversion Rate	A calculation that takes kept PTPs over PTP due
STD Conversion Rate	Measured against the standard of the call centre
ADJ Conversion Rate	Adjusted for leave
Cur PTP Kept	Current promise to pay kept for the client the agent is working on for that particular month period. Sometimes agents are also allocated to work with other division's clients based on business needs and availability of agents.
Cur Avg PTP Payment	Current average PTP payment that were made and kept and the monetary value thereof ; a calculation that takes the total monetary

	value collected on the PTPs kept divided by the number of PTPs kept.
STD Avg PTP Payment	PTP payments measured against the standard KPIs
ADJ Avg PTP Payment	PTP payments adjusted for annual leave days
PTS Avg PTP Payment	Points achieved for average PTP payment
Cur Total Collections	Current total collections made
STD Total Collections	Total collections made measured against the standard KPI
ADJ Total Collections	Total collections made adjusted for annual leave
PTS Total Collections	Percentage points for total collections made
Score For RESULTS	Total average score for the results section
BONUS KPI data collected January to July 2009 (7 months)	
Final Score	Total score the collector has achieved based on the overall measurable for Activity and Results
Incentive	Based on the points that the collector scored he/she will qualify for an incentive amount
PTP Negotiated	Collectors got extra bonus points when they collected more than the standard KPI
STD Hours Worked	Collectors got extra bonus points when they worked for longer than the standard KPI
Absenteeism data collected January to July 2009 (7 months)	
Attendance	Attendance score
Total Working Days	Total working days
▼Leave Days	How many leave days
▼Leave A	Annual and study leave
▼Leave B	Sick, responsibility and other leave days
EXTRA PNTS with Attendance	Extra points for good attendance
Attrition data collected 9 months after initial date	
Staff records pertaining start date, end date and reason for leaving.	

3.6.3 Additional measurements

A study assumption was that call centres are sensory overloaded and it was therefore hypothesised that people will respond differently based on their sensory profiles. A non-standardised Sensory Overload Risk Assessment Rating (SORAR) questionnaire (Refer to Appendix E) was compiled by the researcher to establish whether individuals perceived the call centre environment as busy and overloaded or not. The rating consisted of 6 questions on the subjective experiences of sensory overload in auditory, visual, tactile, smell, movement and multisensory information, using a 5-point Likert scale. The scale was designed to record: the lower the score, the lower the experience of sensory overload for that system, versus: the higher the score, the higher the experience of sensory overload. A total score for the 6 systems was calculated out of a possible 30. After

developing the rating scale, it was given to 6 people (colleagues and friends) to complete, scored and interpreted. The researcher wanted to determine whether the questions were clear and understandable. The instrument was not piloted formally and scientifically; it is not a standardised testing instrument which would affect the rigour of results, and was considered as such.

A non-standardised Demographic and Personal Questionnaire was also compiled by the researcher to obtain personal information on respondents' daily habits, roles, and work methods, and to identify potential relationships with their AASP scores. It consisted of 23 questions relating to personal demographics, daily roles and behaviours, marriage, dependants, exercise, smoking, temperament, and organisational skills (Refer to Appendix F). This was not a standardised testing instrument which would influence the rigour of the data, and was considered as such. It was designed to explore possible associations between sensory processing and daily behaviours, and if found to be useful, could give rise to further research questions.

The additional measurement tools were only used at the beginning of the study with Site 1 participants. The results provided interesting yet supplementary insights on subjective experiences of agents, but were not directly linked to performance. As the supplementary instrument findings deviated from the main study objectives and were not regarded as pivotal to the study findings, it was not replicated in the other Sites or explored further. The SORAR results in particular were significant and will only be displayed in Appendix I, together with results on smoking and AASP as supplementary data. These additional instruments provided preliminary findings which can be explored further in other research.

3.7 Data Collection Procedures

3.7.1 Stage 1

For Site 1 all call centre staff members were invited to participate in the study via email correspondence sent by the liaison person, and the study objectives, process and paper-based copies of the AASP were handed to 466 staff members. They were expected to complete the AASP in their break time and a 57% return rate yielded 266 completed sensory profiles, deposited in a locked drop box managed by the researcher. After 2 weeks the second data collection stage (SORAR and Demographic and personal questionnaire) yielded 182 completed questionnaires (80.5% return rate). During one month of data collection the researcher liaised closely with the HR manager and return visits made it possible to collect missing fields from the relevant agents. For Site 2 all staff members completed a paper-based AASP in a boardroom with the liaison person, following informed consent in a single session. For Sites 3 and 4, each agent received a

unique log in password for electronic completion of the AASP, with the researcher present, after informed consent was obtained. Being the smallest call centre, Site 3 data collection were done over three short sessions on three separate days to reduce impact on agent time and account for absenteeism and shifts. Agents completed the AASP at their computer terminals within the call centre, after internet access was enabled for on-line assessment. For Site 4 a calculation was done in preparation for data collection to determine the relationship between time available for assessment, internet computer terminals and the number of agents to test, in order to maximise the 1-day allowed for data collection purposes. The one day collection minimised agent down-time and travelling for the researcher, and the number of agents at this call centre made it possible to withdraw agents from working seats in a constant fashion. Five internet terminals were made available in their training facility, and with the help of an assistant who was familiar with the agents, every 5th person on the staff list was chosen for participation. A total of 120 agents was randomly pre-selected in this manner and when absent, the next person on the list was chosen.

The KPI and absenteeism data for Sites 1-4 were collected daily through each call centre's respective IT systems and supplied to the researcher in electronic format after collection of the AASP data. Site 1 supplied all KPI data for all agents, but the remaining Sites only forwarded data for those agents who completed the AASP. The IT systems and methods used by each Site were different in type, nature, sophistication level and the performance data that were measured. Detailed discussions with the liaison person for each Site ensured that the researcher understood the data, its relevance and functions.

To measure attrition, the liaison person for each Site reviewed staff records manually and provided the details of agents who were part of the initial AASP data collection who subsequently left. The researcher aimed to collect attrition data using a similar time frame for each call centre, in other words keeping the time frames between first collection and attrition collection the same. However, due to time and production pressures on management this was not possible and resulted in varying time lapses for each call centre. For Site 1 attrition data were collected twice; at 6 months, and 16 months after the initial collection date. The first attrition list consisted of many data irregularities and requested a second time. When the second data set provided by the HR manager still contained data irregularities, it was disregarded from the study. The time lapse from initial data to attrition collection was 24 months for Site 2; 2 months for Site 3, and 9 months for Site 4.

3.7.2 Stage 2 and 3

No new data were collected for Stage 2 and 3. Instead the inherent qualities of the AASP as an instrument were used to statistically develop the subsets to be used as an extended scoring configuration. The AASP and KPI data of all four Sites were used to validate the subset structure development in Stage 3.

3.7.3 Stage 4

The AASP was used to collect sensory processing data from the managers following informed consent. No performance data were collected for this group as their relationship to the sensory profiles of agents rather than with their performance was of interest to the study. The Site 1 managers' data were already collected at Stage 1 (unbeknown to the researcher) and the small conveniently selected group of managers for Sites 3 and 4 were supplied with a password to complete the AASP electronically at their own convenience and time at work. The results were generated by the electronic testing platform used by the researcher and automatically emailed to her for data cleaning and analysis.

3.8 Data Capturing and Cleaning

Data from all those who provided their consent to participate were collected to create the learning data set and captured in Microsoft Excel® (various versions) with the assistance of an independent statistician.

3.8.1 Stage 1

Data ordering and ranking were done for all instruments to reduce the margin of errors. Staff identification, kept confidential, was used to match and merge different data sets from different instruments. The data were checked for logical inconsistencies and cleaned accordingly if possible. Multivariate outliers were identified bivariately, checked and sometimes removed where definitely relevant. AASP scores for Sites 1 and 2 were calculated manually using a detail-orientated research assistant following training on scoring and spot checked by the researcher. For Sites 3 and 4, the scoring was automatically performed as part of the electronic completion which underwent rigorous testing at inception.

With the varied KPI data from each Site it was necessary to capture, clean and analyse each one separately. Within the four Sites which supplied the performance data for the study, reasonable quality control existed. Site 4 produced the cleanest and most consistent KPI data set but required more meeting time with the liaison person for explanations due to its complexities and volume. AASP and performance data with

missing values (5 in total) were omitted from the sample as the nature of this call centre did not allow another opportunity for agents to revisit the electronic testing platform. Missing values of AASP data for Sites 1, 2 and 3 were easily completed by returning to the relevant agents. For Site 1 data matching to extract the part of the sample that completed the AASP was done by the researcher with assistance from a statistician. The other Sites only supplied the KPI data for those agents who completed the AASP. Where data fields were indicative of poor/low performance, these fields were marked with a ▼ for all Sites. Not all performance data could be obtained for all study participants and missing values in the performance data were widespread. The fluctuation of agent attendance, temporary staff and non-recorded performance for the management group in Site 1 were the main reasons.

Each KPI and absenteeism data field collected over the specified months were averaged for each agent to obtain single values for analysis purpose.

The collected attrition data based on staff records also had to be cleaned for analysis: Attrition data were disregarded for Site 1 due to irregularities and for Site 3 due to small sample size (n = 7). Attrition data from Site 2 were divided in groups; *Current* agents (n = 26), *Dismissed* (n = 1), *Promoted* (n = 3), *Resigned* (n = 11) and *Transferred* (n = 12). For data reduction purposes the one dismissal was collapsed with resignations and the 3 promoted agents collapsed with current staff. Another choice for the collapsing of groups could have been to delete the dismissals and promotions, but the choice made allowed for best utilisation of the available information. The three remaining groups used for analysis for Site 2 were: *Current* (n = 29); *Resigned* (n = 12) and *Transferred* (n = 12).

Attrition data for Site 4 were matched with the initial data set and 46 missing fields found. There were 47 agents still working at Site 4 and 14 terminations. An assumption was made that the group with no attrition data could still be employed, but they were not treated as such and compared as a different data set. The final three groups used for analysis were: *No attrition data*, (n = 46); *Current* (n = 47) and *Resigned* (n = 14). It is possible that data errors crept in for the classification of the *Resigned* and *Transferred*' groups due to the sensitive nature of such data. Also being manually supplied may cast doubt on the accuracy of the data, which was the case observed in Site 1 anyway.

3.8.2 Stage 2 and 3

No new data were collected for Stages 2 and 3. Stage 2 used the inherent instrument properties of the AASP. For Stage 3, the AASP data of each site were used to form smaller groups for the subset development. This formatting of smaller groups meant that the number of participants was significantly reduced. Sites 2 and 3 were excluded as their

groupings were too small to allow for analysis. In Site 1, missing performance values also meant that the 6 subset groupings were too small to make useful comparisons. Isolated and inconsistent extreme values (outliers) also occurred. For these reasons use of the subsets to compare to performance data were abandoned for Site 1. Site 4 was the only remaining sample applicable for use and the performance data (collected over 7 months) analysed with the subsets. Only performance and absenteeism data were used for analysis as attrition data results were insufficient.

3.8.3 Stage 4

The manager sample was studied in the final Stage 4 of the study. Site 1 had a larger but more heterogeneous group of managers (n = 48) compared to Sites 3 and 4. Site 1 consisted of team leaders, an IT team, and a group of executive managers who worked in separate closed office spaces. Data from Sites 3 and 4 were combined as they both represented the outbound and outsourced industry.

3.9 Data Analysis

To perform the statistical calculations, Microsoft Excel® as well as Number Cruncher Statistical System (NCSS[54], various versions) was used. The Microsoft Excel® calculations were straightforward and logical. While Excel® contains extensive mathematical and statistical functions it enabled the researcher to report seamlessly on the results. NCSS was used for specialised graphical and inferential reporting.

The following section provides an overview of the relevant data analysis methods used in all four Stages. Procedures used to analyse AASP, performance, absenteeism and attrition with respect to locality, dispersion and correlations within each of the call centres will be described. Possible cause and effect between all measurements (and/or locality), were always considered with caution. After data cleaning, data analysis was applied using One Way Analysis Of Variance (ANOVA) to obtain estimates of means, medians and dispersion (mostly non-parametric one-way ANOVA). The means and medians were both calculated and when similar, symmetry was implied. When the means was observed to be larger than the medians the distribution was skewed towards the larger values or vice versa. Spearman rank, Pearson product moment correlation and regression analysis were used to determine relationships and regression. The focus was on the calculation of pair wise Spearman rank correlations for each Site. Furthermore, multivariate structures

[54]Hintze, J.L (1995) NCSS 6.0 User's manual. Utah, USA. (early version)

were studied by means of Spearman (mostly) and Pearson correlations. Specific descriptions pertaining to each Stage is discussed in the following sections.

As a general rule of thumb, the outcomes of the statistical tests for this thesis were loosely separated into those with a significance level less than 10% (or $p \leq 0.10$) and those with an associated significance more than 10% (or $p \geq 0.10$). Therefore remaining statistical tests with p-values more than 10% were treated as cases where the Null-hypothesis (of e.g. equality of means) held significance. The general rule of thumb also expresses the opinion that those findings with a probability (significance level) more than 10% are not important. This is a misconception that the author tried to avoid in this thesis.

3.9.1 Stage1 (AASP and Performance relationships for agents)

3.9.1.1 Demographical analysis

Descriptive analysis of the four call centre Sites was done to determine variations and differences in the nature of the environment, operational processes and human resource functions. The formal quantitative data from all the Sites were analysed for mean, median, range and standard deviation according to age. The researcher aimed to show how each of the 4 study Sites was different to the others with respect to their empirical distributions.

3.9.1.2 AASP analysis

The distributions of the AASP quadrant scores were observed across the Sites in order to determine their similarities and differences. Locality and dispersion of the AASP data were described using tables and violin plots. The violin plot technique was used to comprehend the distributions for all Sites. Spearman Rank correlations followed to show how the four quadrant scores were related and observed through bivariate distributions. Associated scatter plots were used to compare the Sites, validate the correlation and to identify unusual values (bivariate outliers) with regards to the AASP results.

3.9.1.3 KPI, Absenteeism and attrition analysis

In all four performance data sets the means of KPI and absenteeism data were calculated for each individual to arrive at a single collective performance score over the particular data collection period. Furthermore, the influence of AASP scores and age on the work performance and absenteeism of call centre agents, were studied by means of Spearman rank correlations. Some of the results were summarised as a correlation coefficient instead of the valuable associated scatter plots to abbreviate the reporting.

One-way Analysis Of Variance (ANOVA) was used to observe the locality of Age and AASP results with regards to attrition data for Sites 2 and 4. The data are first displayed in box plots and then tables with shading of z- and p-values to highlight their significance. Only the two AASP quadrants (Q2 and Q3) that were significant are displayed; the rest were omitted from the reporting.

3.9.1.4 Analysis to summarise the baseline results

The reader is reminded that the Sites differed with respect to the measurements made and sample sizes. The aim of this section was to summarise all different performance indicators across the study Sites and align with the AASP results in a clear and congruent manner. All statistically significant association pairs were counted and grouped according to either HIGH KPIs or LOW KPIs and summarised in two separate tables. Each association was linked to the correlated AASP quadrant. A crude percentage calculation was then performed to determine how much statistical significance was allocated to each of the AASP quadrants. This method provided a logical overview on the frequency of associations which was observed in the AASP of all four Sites with regards to performance, absenteeism and attrition.

3.9.2 Stage 2 (Subset development)

A novel process of collapsing AASP scores into intervals was performed and multivariately recorded. Using a lexicographical ordering system, the 625 score possibilities of the AASP was grouped into 6 subsets following nearest neighbour and interval location principles. The statistical methods, analysis and results from this Stage were based on clinical reasoning and originality, working closely with the study statistician to ensure the use of robust statistical principles and methodology to arrive at the results. The full process with regards to methodology and analysis will be described in detail in Chapter 4, pg 123 to assist the reader in understanding the sequential process.

All the study subjects were classified into the 6 subsets based on their collected AASP results in order to determine their distribution. The smaller groupings which resulted due to this reduction indicated which Sites could be used for further analysis.

3.9.3 Stage 3 (Subset application to the performance data)

The subjects of Site 4 (being the largest sample after data cleaning) and their subset classification were used together with performance and absenteeism data. One-way Analysis of Variance (ANOVA, mostly non-parametric) was applied to determine variance, means and medians to investigate whether the performance of the agents, differed according to the developed 6 subsets. The accompanying side-by-side box plot

associated with the One-way ANOVA enabled the researcher to identify possible unusual observations (outliers), such as extremely less than the first quartile and extremely more than the third quartile. To facilitate pair wise comparisons the Kruskal-Wallis Pair wise Multiple-Comparison Z-Value Test was employed by the NCSS system.

3.9.4 Stage 4 (Manager Sample AASP)

Comparison of managers to agents with respect to age, AASP and subset results, were used to determine whether differences existed. Non-parametric ANOVA was again used to compare agents with managers and descriptive statistics (medians, means and p-values) provided in box plots and tables.

3.10 Conclusion

This chapter has substantiated the use of a quantitative, descriptive research design applied in four multi-layered Stages in order to determine the impact of sensory processing on agent performance and the recruitment potential of the AASP. The Stages emerged as a result of the statistical relevance and meaning observed in the baseline data of the AASP, performance, absenteeism, attrition and demographic findings across the four study Sites. Stages 2 to 4, which were not anticipated at the inception of this study, were critical in order to judge the potential value of the AASP and the suggested subset structure for call centre recruitment.

Chapter 4 Results

4.1 Introduction

This chapter first provides an in-depth report of the results obtained from the study for each of the four study Sites according to the four study Stages. The formats used to display the results are largely tables of descriptive statistics and correlation matrices; figures; bivariate (scatter) plots; violin and side-by-side box plots. The interpretation of the data following these formats is demarcated by bullets (•). Significant data fields in the tables were shaded in grey based on the general rule of a statistical significance level less than 10% (or $p \leq 0.10$) to provide emphasis. There were other values (i.e. other than p-values) that needed to be emphasised, and where this occurred they are explained.

The reader will observe traces of information in this chapter that traditionally would belong in Chapter 3 (Design and Methodology) and Chapter 5 (Discussion). The reasons for this are:

- The study expanded beyond the initial conceptualisation, evolving from the baseline data results. It was the learning and insights gained from these comprehensive data results which justified the successive multi-layered approach and a subset structure development.
- To enable the reader to appreciate why and how the subsequent development evolved from the baseline data.
- The performance data contained extensive detail which will be provided in this chapter and summarised after each section as well as in Chapter 5 .
- This structure is regarded as the closest reflection of the researcher's clinical reasoning for translating the results in a comprehensive, yet logical manner. Some repetitions of methods and descriptions occur to allow for ease of reading.

This chapter contains a large volume of data and extensive reporting, but the researcher judged that the novelty of applying the theoretical roots of sensory processing to the field of business necessitated comprehensive and extensive cover in order to support the study objectives.

4.1.1 Data analysis stages

Data analysis was performed in the four distinct and multi-layered Stages as described in Table 3.1 (pg 65). The analysis in Stage 1 was aligned with the study objective 1 to determine the associations between the sensory processing, performance, absenteeism

and attrition of call centre agents. The analysis in Stages 2 to 4 was in accordance with the study objective 2 and explored the validity for the AASP as a potential recruitment tool. Figure 4.1 provides an overview on the data analysis for each stage according to the study aim and objectives. Results will be presented in this order.

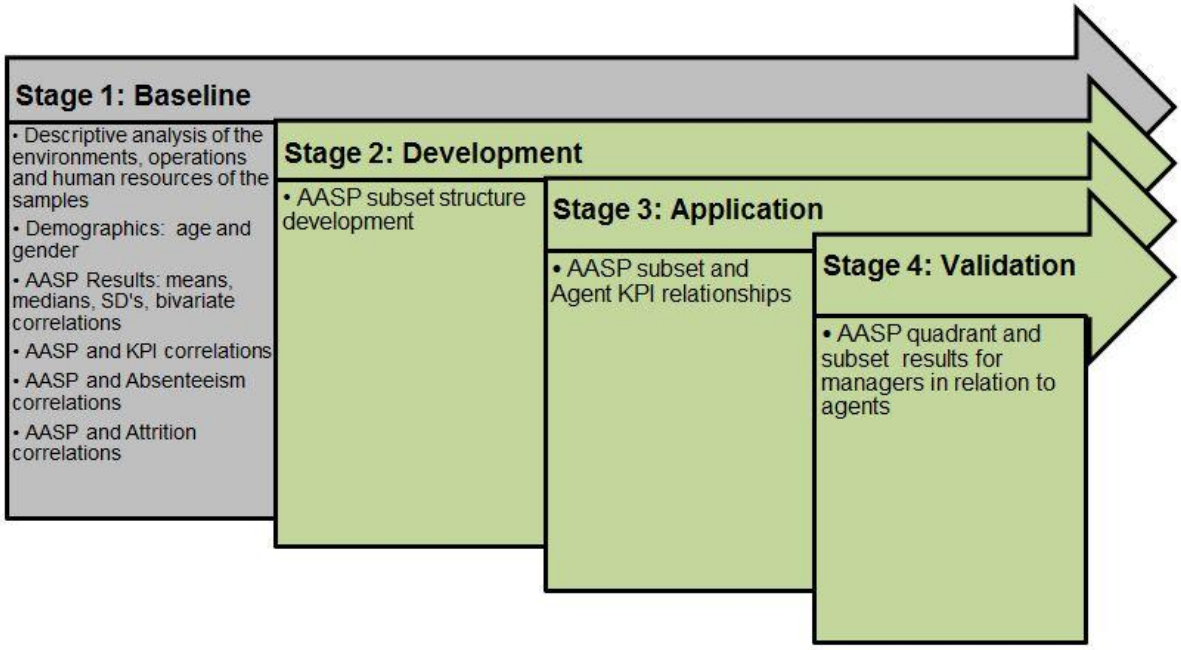

Figure 4.1: Overview of Data Analysis Stages

STAGE 1: Baseline Data

The **objective** for Stage 1 of the study was to determine the relationship between sensory processing and work performance of call centre agents, thereby:

- Describing the participant demographics and the properties of each study sample to determine similarities and differences between the 4 study samples.
- Determining the sensory profiles of the study sample agents.
- Determining the potential associations between the sensory profiles of call centre agents and their work performance, absenteeism rates and attrition levels.

4.2 Descriptive Analysis of the Call Centre Environments

Observations and analysis were done to record similarities and variations in the nature of the four call centre Sites with regards to the physical workspace, operational processes and human resource functions. Other variables such as; corporate culture, leadership styles, skills and competencies of agents, level of education, experience of agents, motivation and commitment are acknowledged as having potential to influence results, but were not collected.

4.2.1 Call centre environment

A descriptive overview of the 4 data collection Sites is displayed in Table 4.1.

Table 4.1: Call Centre Environment Overview Across all Sites

Identifiers	SITE 1	SITE 2	SITE 3	SITE 4
Open plan office space	Yes	Yes	Yes	Yes
Floor space	3224 m²	2500 m²	500 m²	3000 m²
Seat capacity	500	300	100	560
Agents employed	485	166	63	1122
Average cubicle space per person	2.3 m²	5.95 m²	2.5 m²	2.1 m²
Cubicle divider boards	Yes	Yes	No	Yes
Headsets (Bilateral: 2 ears, or unilateral: 1 ear)	Unilateral headsets	Unilateral headsets	Unilateral and bilateral headsets	Unilateral and bilateral headsets
Sound absorbing ceilings	Yes	Yes	No	Yes
Music in call centre	No	No	Yes	Yes
Chill rooms (rest areas)	Yes	No	No	Yes
Cafeteria on premises	Yes	Yes	No	Yes
Central air conditioning	Yes	Yes	Yes	Yes
Floor cover	Carpets	Carpets	Carpets	Carpets
Lighting	Fluorescents lights	Fluorescent lights	(Hi-bay) large bell shaped hanging lights	Fluorescent lights
Extras: Food and beverage availability	Microwaves, Fridges, Hot and cold water dispensers, Vending machines, Dishwashers, Cafeteria on site, Beverage trolleys in call centres	Microwaves, Fridges, Hot and cold water dispensers, Vending machines, Cafeteria on site, Coffee corner in call centre	Microwave, Fridge, Hot and cold water dispensers, Vending machines, No cafeteria on site Coffee corner in call centre	Microwaves, Fridges, Hot and cold water dispensers, Vending machines, Dishwashers, Cafeteria on site
Extras: Entertainment and "stress management" activities	Plasma TV Screens[55], Foosball machines, Pool tables, Table tennis, Dartboards, Punching bags	Plasma TV Screens	Foosball machines, Pool table, Table tennis, Dartboards, Punching bags	Plasma TV Screens, Foosball machines
Extras: Employee assistance structures	Medical clinic, ATM machine (banking facility), Internet kiosk	Medical clinic, ATM machine (banking facility)		Medical clinic, ATM machine (banking facility), Internet kiosk

[55] Plasma TV screens were used to display call activity for agent teams and sporadic entertainment.

- Site 4 employed the largest number of agents, and Site 1 occupied the biggest surface area. Sites 2 and 3 were noticeably different with respect to more cubicle space per person observed in Site 2. Site 3 was also the smallest call centre and had fewer 'extra' functions for agents. To compensate for the lack of sound absorbing ceilings, a net filled with colourful sponge blocks had been hung below the ceiling in an attempt to absorb high noise levels. Site 3 was also the only call centre without seat dividers[56]. Site 3 and 4 played loud music while agents were working and was experienced by the researcher as more lively and noisy with higher activity levels. Both unilateral and bilateral headsets were available to their agents.

4.2.2 Call centre process and operations

Table 4.2 provides a descriptive overview of the call centre processes and operations of the 4 data sites.

Table 4.2: Call Centre Process and Operations Overview Across all Sites

Identifiers	SITE 1	SITE 2	SITE 3	SITE 4
Call Centre Type	Captive	Captive	Outsourced	Outsourced
Call Centre Industry	Financial Services, In-bound	Financial Services, In-bound	Sales Outbound	Collections Outbound
Permanent versus temporary staff	Permanent 60% Temporary 40%	Permanent 100%	Permanent project based	Permanent 100%
Recruitment model	In-house and outsourced	In-house	In-house	In-house and outsourced
Training time	4 weeks	6 weeks	5 days	4 weeks
Training model	In-house	In-house	In-house	In-house
On-going coaching	Yes	Yes	Yes	Yes
Team leader agent ratio	1:12	1.15	1:10	1:15
Median salary	R9000.00	R10 500.00	R4500.00	R4500.00
Shifts	Rotational shift 7.00-15.00 15.00-19.00	None	Rotational shift 8.00-16.30 16.30-20.00	Rotational shift 7.30-15.00 15.00-20.30
Surveillance and monitoring of calls	Yes	Yes	Yes	Yes
Hot seating	50% hot seating	None	None	100% hot seating
ACD	Yes	Yes	Yes	Yes
Performance documentation: IT system/process	Raw data processed through an IT system and then converted into KPIs	Raw data processed through an IT system and then converted into KPIs	Raw data processed through an IT system and then converted into KPIs	Raw data processed through an IT system and then converted into KPIs

[56] During extensive observations of different types of call centres, the researcher noticed an absence of seat dividers in most areas where agents were doing outbound sales.

4.3 Demographic Distributions of Study Sites

Age and gender were the main demographics explored within the four data sites.

Table 4.3: Descriptive Statistics of Age According to Gender for all Sites

	Site 1			Site 2			Site 3*			Site 4		
	Female	Male	All	Female	Male	All	Female	Male	All	Female	Male	All
Count	147	79	226	26	27	53	23	27	50	73	36	109
Mean Age	32.5	31.9	32.3	28.5	26.3	27.4	24.9	26.2	25.6	27.1	27.6	27.3
SD**	7.53	5.84	6.98	8.69	4.91	7.04	4.20	4.64	4.45	5.85	4.26	5.36
Minimum	18	21	18	20	18	18	19	20	19	19	19	19
Maximum	60	44	60	52	39	52	36	39	39	46	38	46

*There were 13 missing fields for gender in Site 3. **SD resembled the standard deviation across all sites.

- Sites 1 and 4 included significantly more women than men, where fairly equal distribution for gender was observed in Sites 2 and 3. The average age ranged between 25.6 years (Site 3) and 27.4 years (Sites 2), and was highest for site 1 at 32.3 years. The minimum ages were similar across the sites but the maximum ages were higher for Sites 1 and 2. The violin plot in Figure 4.2 provides a visual representation of the full sample age demographics.

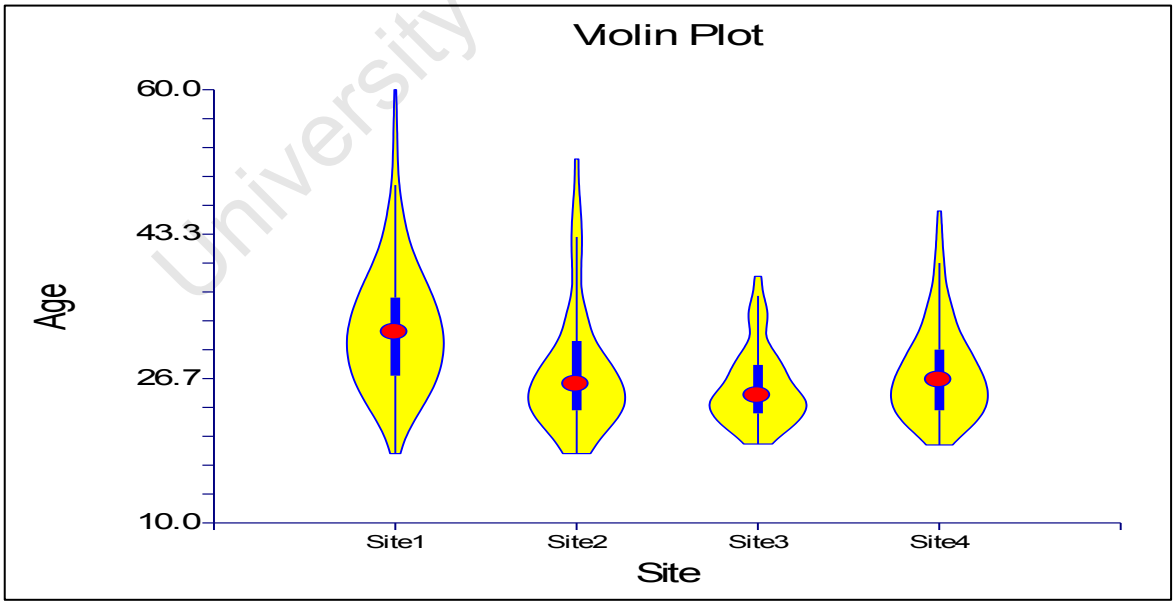

Figure 4.2: Age Distribution Across all 4 Sites

- All 4 sites had younger age concentrations. Site 1 had a wider age range and the highest median age. Sites 3 and 4 were similar with respect to distributional shape. There was a bigger concentration towards younger ages in Sites 2, 3 and 4. Site 3 had the least older people.

4.4 Adolescent/Adult Sensory Profile Measurement (AASP)

The locality, dispersion and associations of the AASP quadrant scores were described using tables and violin plots. This section, in particular the bivariate distributions, is important and received considerable emphasis for its contribution to the expanded data analysis. Abbreviations used throughout this chapter to disseminate AASP results are:

Quadrant 1 – Low Registration displayed as **Q1**
Quadrant 2 – Sensation Seeking displayed as **Q2**
Quadrant 3 – Sensory Sensitivity displayed as **Q3**
Quadrant 4 – Sensation Avoiding displayed as **Q4**

4.4.1 Locality and dispersion of AASP results for all sites

The mean, medians, SDs, and minimum and maximum scores for the AASP as observed across all 4 sites are displayed in Table 4.4.

Table 4.4: AASP Mean, Medians, SDs, Minimum and Maximum Results for all Sites

	Site 1				Site 2				Site 3				Site 4			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
N	226	226	226	226	53	53	53	53	63	63	63	63	108	108	108	108
Mean	31.0	50.6	35.8	35.7	29.7	49.6	35.5	35.1	31.5	50.0	36.3	38.6	28.8	50.7	37.2	38.0
Medians	31.0	50.0	35.0	35.0	29.0	50.0	35.0	34.0	30	50	36	38	28	50	36.5	37.5
SD	7.3	7.1	8.6	7.3	7.4	8.1	7.4	6.9	7.9	8.2	8.7	7.9	6.3	7.0	8.8	8.0
Min	17	27	15	19	18	33	21	22	18	34	20	20	16	31	18	21
Max	60	70	63	56	48	65	56	53	52	69	61	56	45	66	60	60

- The results of the AASP quadrants across all four study sites presented with significant similarities and some variations. Q2 had overall higher average, median, minimum and maximum scores in comparison to Quadrants 1, 3, and 4. Medians of the AASP quadrants across all 4 sites were fairly similar, but it is interesting to note that the Q4 medians for Sites 3 and 4 are higher than Sites 1 and 2. When considering both the mean and the median values, the distribution of the observed

quadrant scores were nearly symmetrical. The violin plots in Figure 4.3 provide a further visual representation demonstrating the results as interpreted in Table 4.4.

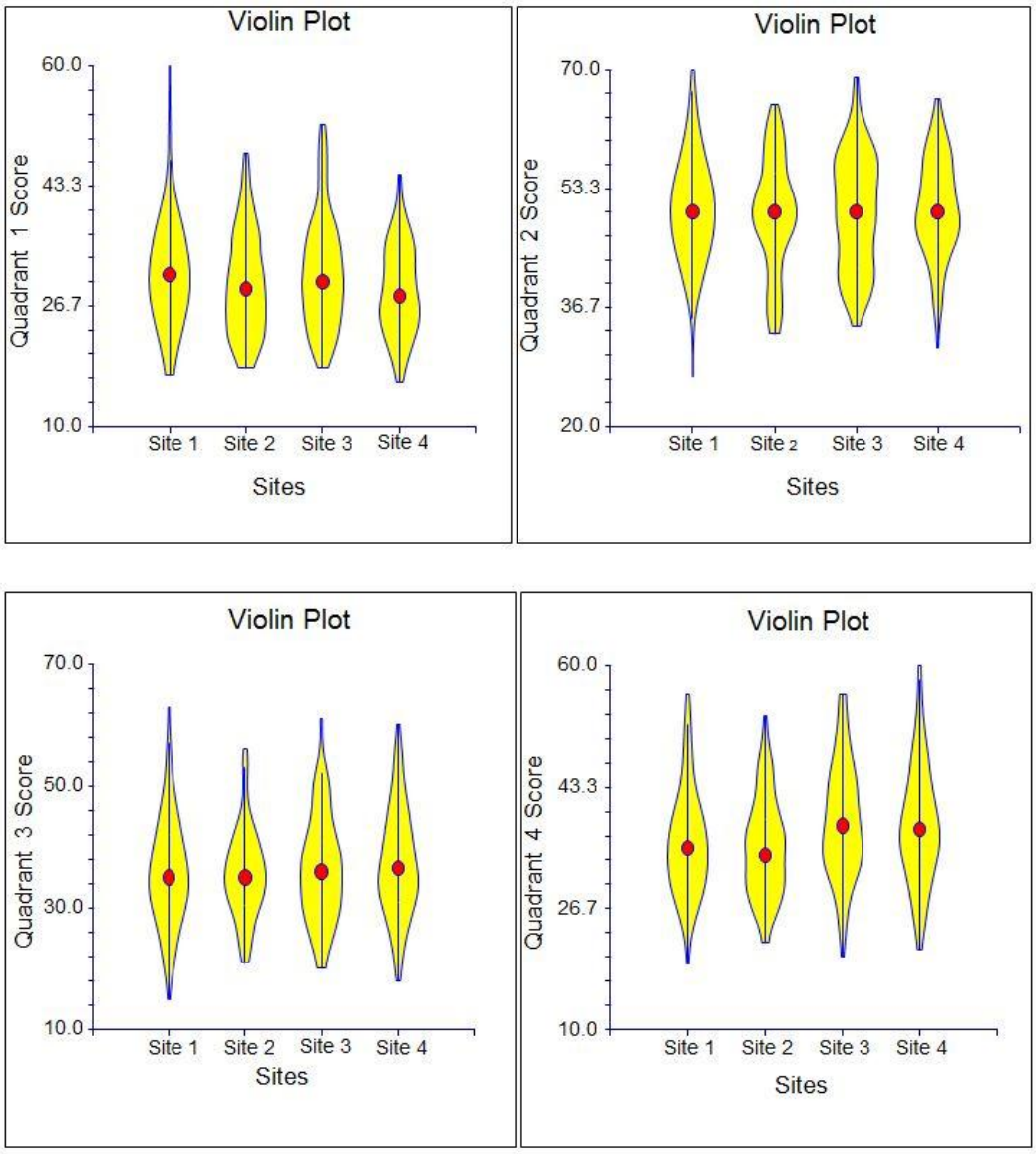

Figure 4.3: Violin Plot Distribution of AASP Quadrants Scores for All Sites

4.4.2 The AASP bivariate distributions

The four AASP quadrants were analysed to determine how they compared with each other. These bivariate inter-relationships between the four AASP quadrants are displayed in square array format and each individual block contains the correlation value at the top, the predictability (p) values which were shaded to highlight significance in the middle, and the sample size at the bottom. The study sites are displayed in pairs below; Site 1 and 2 in Table 4.5 (both representing inbound, service sites) and Sites 3 and 4 (both representing outbound, outsourced sites) in Table 4.6.

Table 4.5 and Table 4.6 show the Spearman Rank correlation coefficients between Age and AASP Quadrants for the study Sites.

Table 4.5: Spearman Rank Correlation Coefficients between Age and AASP Quadrants for Sites 1 and 2

	Site 1					Site 2				
	Age	**Q1 Score**	**Q2 Score**	**Q3 Score**	**Q4 Score**	**Age**	**Q1 Score**	**Q2 Score**	**Q3 Score**	**Q4 Score**
Age	1	0.06	0.016	0.187	0.053	1	0.002	-0.321	0.234	0.071
	0	0.36839	0.80869	0.00475	0.4279	0	0.98654	0.01923	0.09115	0.61161
	226	226	226	226	226	53	53	53	53	53
Q1 Score	0.06	1	0.039	0.516	0.469	0.002	1	0.081	0.313	0.354
	0.36839	0	0.56161	0.00000	0.00000	0.98654	0	0.56595	0.02262	0.00941
	226	226	226	226	226	53	53	53	53	53
Q2 Score	0.016	0.039	1	0.006	-0.042	-0.321	0.081	1	-0.147	-0.125
	0.80869	0.56161	0	0.92268	0.5298	0.01923	0.56595	0	0.29372	0.37193
	226	226	226	226	226	53	53	53	53	53
Q3 Score	0.187	0.516	0.006	1	0.713	0.234	0.313	-0.147	1	0.554
	0.00475	0	0.92268	0	0.00000	0.09115	0.02262	0.29372	0	0.00002
	226	226	226	226	226	53	53	53	53	53
Q4 Score	0.053	0.469	-0.042	0.713	1	0.071	0.354	-0.125	0.554	1
	0.4279	0	0.5298	0	0	0.61161	0.00941	0.37193	0.00002	0
	226	226	226	226	226	53	53	53	53	53

- Positive relationships were found between Age and Q3 in both sites and a negative correlation was found between Age and Q2 in Site 2 only. Strong positive relationships were found between Q1 and Q3; Q1 and Q4 and Q3 and Q4.

Table 4.6: Spearman Rank Correlation Coefficients between Age and AASP Quadrants for Sites 3 and 4

	Site 3					Site 4				
	Age	**Q1 Score**	**Q2 Score**	**Q3 Score**	**Q4 Score**	**Age**	**Q1 Score**	**Q2 Score**	**Q3 Score**	**Q4 Score**
Age	1	0.060	-0.134	0.306	0.284	1	-0.108	-0.049	-0.279	-0.148
	0	0.67976	0.35486	0.03061	0.04527	0	0.26595	0.61166	0.00349	0.12735
	50*	50	50	50	50	108	108	108	108	108
Q1 Score	0.060	1	0.203	0.615	0.555	-0.108	1	0.010	0.507	0.354
	0.67976	0	0.11146	0.00000	0.00000	0.26595	0	0.91617	0.00000	0.00017
	50	50	63	63	63	108	108	108	108	108
Q2 Score	-0.134	0.203	1	0.168	0.227	-0.049	0.010	1	-0.172	-0.200
	0.35486	0.11146	0	0.18683	0.07346	0.61166	0.91617	0	0.07589	0.03767
	50	63	50	63	63	108	108	108	108	108
Q3 Score	0.306	0.615	0.168	1	0.721	-0.279	0.507	-0.172	1	0.588
	0.03061	0.00000	0.18683	0	0.00000	0.00349	0.00000	0.07589	0	0.00000
	50	63	63	50	63	108	108	108	108	108
Q4 Score	0.284	0.555	0.227	0.721	1	-0.148	0.354	-0.200	0.588	1
	0.04527	0.00000	0.07346	0.00000	0	0.12735	0.00017	0.03767	0.00000	0
	50	63	63	63	50	108	108	108	108	108

* For the 63 individuals in Site 2 only 50 had documented ages resulting in13 missing fields.

- Positive correlations were also found between Age and Q3 and Q4 in Site 3. A negative correlation between age and Q3 was observed in Site 4. The same strong positive correlations were observed between the Quadrants as for Sites 1 and 2: Q1 and Q3; Q1 and 4, and Q3 and Q4. Further, correlations were observed with Q2 for these 2 sites that were not observed in Sites 1 and 2, but they were weaker: Q2 and Q4 had a positive correlation in Site 3 (unexpected), and Q2 and Q3 and Q2 and Q4 both had negative correlations in Site 4 (expected).

A summary of association pairs as observed in the correlation matrices is supplied below; combining what was learned from the study sites. The correlations consistently observed across all 4 sites are shaded for emphasis, and further displayed in scatter plots below.

Table 4.7 shows a summary of significant association pairs between Age and AASP quadrant scores across all sites.

Table 4.7: Summary of Significant AASP Association Pairs across all Sites

Association pairs	Correlation	Site 1	Site 2	Site 3	Site 4
Age and Q3	+	p = 0.004	p = 0.091	p = 0.030	Not significant
Age and Q4	+	Not significant	Not significant	p = 0.045	Not significant
Q1 and Q3	+	p = 0.000	p = 0.022	p = 0.000	p = 0.000
Q1 and Q4	+	p = 0.000	p = 0.009	p = 0.000	p = 0.000
Q2 and Q4	+	Not significant	Not significant	p = 0.073	Not significant
Q3 and Q4	+	p = 0.000	p = 0.000	p = 0.000	p = 0.000
Age and Q2	-	Not significant	p = 0.019	Not significant	Not significant
Age and Q3	-	Not significant	Not significant	Not significant	p = 0.003
Q2 and Q3	-	Not significant	Not significant	Not significant	p = 0.075
Q2 and Q4	-	Not significant	Not significant	Not significant	p = 0.037

The most consistent and strong correlations occurring across all four study sites were the positive correlations between Quadrants 1, 3 and 4. These correlations are emphasised both because they are important and because they provide the rationale behind the emergence of the subset structure development in stage 2 (see paragraph 4.8, pg 123). Figure 4.4 to Figure 4.6 provide scatter plots for visual highlighting on the quadrant bivariate correlations.

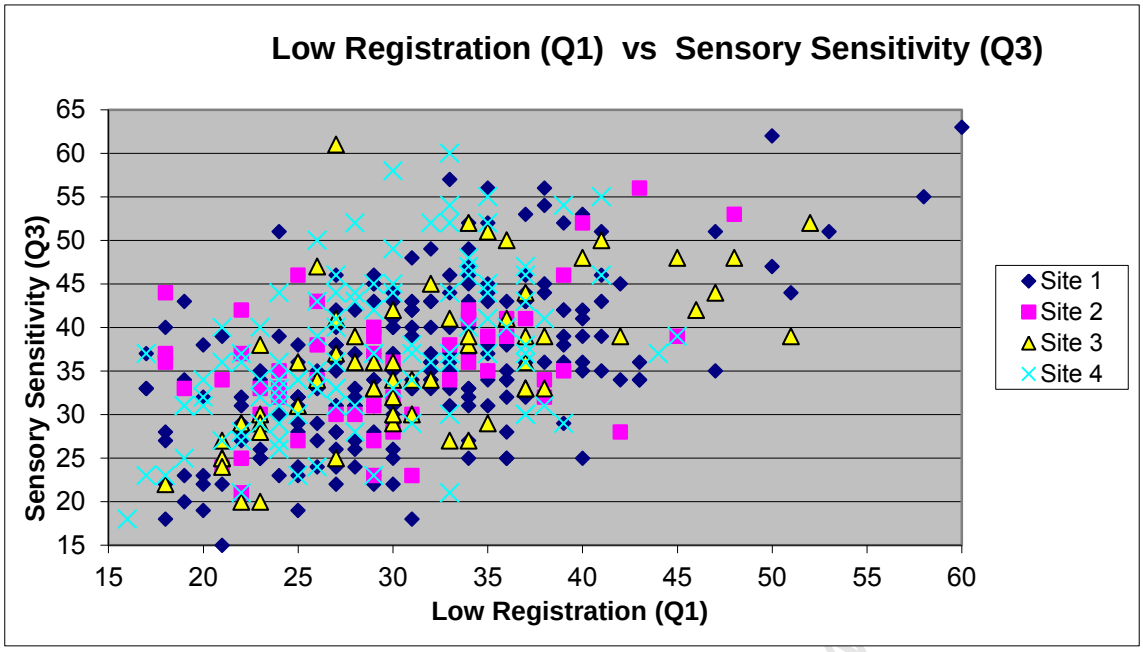

Figure 4.4: Scatter Plot of AASP Q3 and Q1 Across All Sites

- The strong positive correlation between Q1 and Q3 is visible in this graph. As Q1 increased, so did Q3. This was confirmed by the Spearman rank coefficients: Site 1: r = 0.516; Site 2: r = 0.313; Site 3: 0.615 and Site 4: r = 0.507. All p-values at ≤ 0.02 were significant.

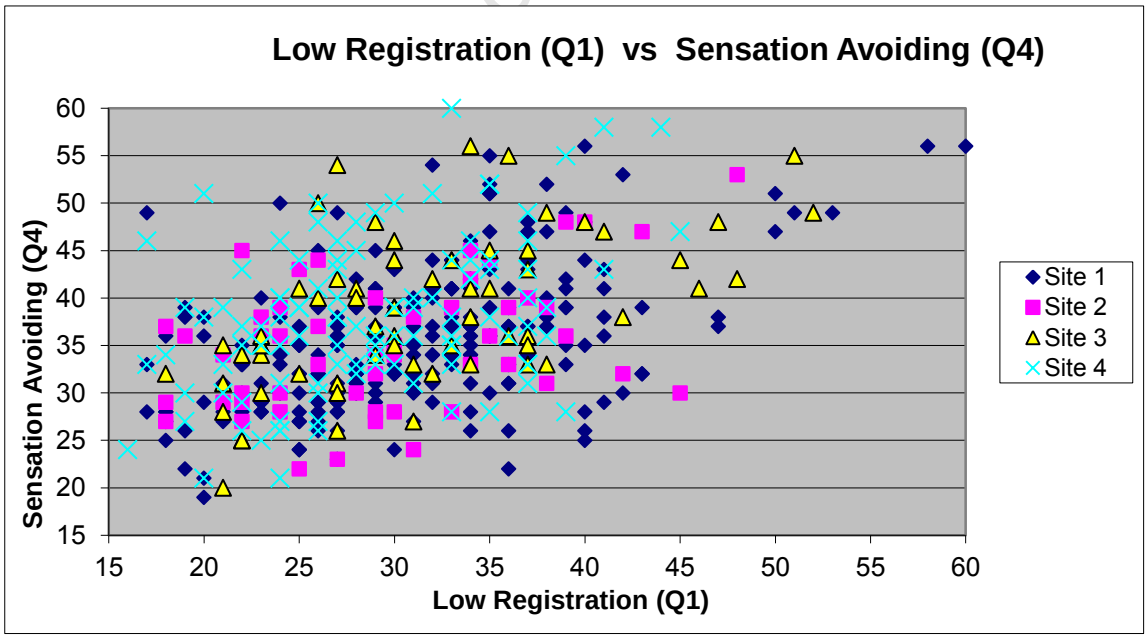

Figure 4.5: Scatter Plot of AASP Q4 and Q1 Across All Sites

- The strong positive correlation between Q1 and Q4 is visible and confirmed by the significant Spearman rank coefficients: Site 1: r = 0.469; Site 2: r = 0.354; Site 3: 0.555 and Site 4: r = 0.354. All p-values at ≤ 0.00 were significant.

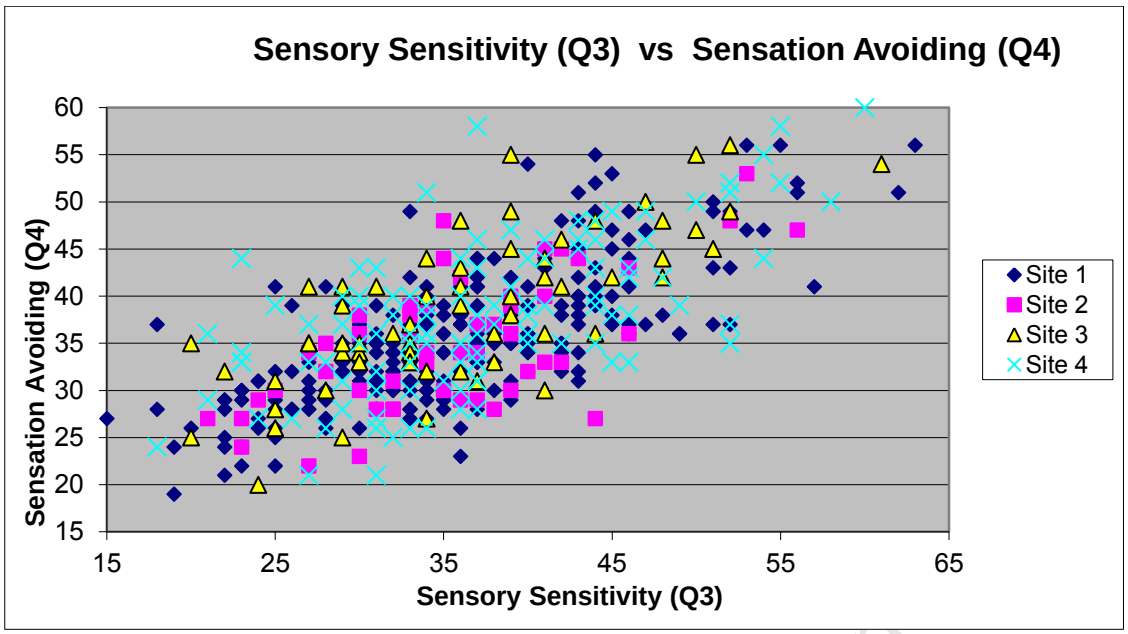

Figure 4.6: Scatter Plot of AASP Q4 and Q3 Across All Sites

- The graph displays the strong positive correlation between Q3 and Q4 as confirmed by the Spearman Rank coefficients: Site 1: r = 0.713; Site 2: r = 0.554; Site 3: 0.721 and Site 4: r = 0.588. All p-values at ≤ 0.00 were significant.

4.4.3 Summary of AASP results across all 4 sites

- The strong and consistent positive correlations observed between Q3 (Sensory sensitivity) and Q4 (Sensation avoiding) can be expected as they both resemble low thresholds. Low Registration as observed in Q1 has been designed as a high threshold indicator (Brown et al., 2001; Brown & Dunn, 2002; Dunn, 1997) but had consistent, positive correlations with both Q3 (Sensory Sensitivity) and Q4 (Sensation Avoiding), the low threshold indicators. This finding was considered in Stage 2 of the study in developing a different subset structure. Q2 (Sensation Seeking) was somewhat separate from the rest of the results and the negative correlations observed in Site 4 with Q3 and Q4 were expected. The positive correlation of Q2 with Q4 in Site 3 was unexpected, weak in comparison and occurred in isolation.

4.5 Performance Data

Spearman Rank correlation analyses were used to record relationships between the AASP and the KPIs for all Sites. In the correlation matrices which follow below, the correlation values are given at the top of the data sections, the p-value in the middle (shaded when significant) and the number of study participants at the bottom. Each call

centre used diverse IT systems and their KPI recordings differed, therefore each site's performance data were analysed separately.

Most KPIs were indicators of good/high performance (e.g. ACD referred to the amount of calls made) according to the standards set out by the management of each Site.

A simple scenario would be a positive correlation of a KPI with the AASP implying that the performance increases as the AASP quadrant score increases and vice versa. However, some KPIs were recorded on a reverse scale as indicators of poor/low performance (e.g. ACW referred to after call admin work and made calls longer) and according to the standards should be lower. Therefore KPI data indicative of poor/low performance were differentiated by the use of the symbol ▼. For those KPIs not marked by ▼ the simple scenario holds true. A positive correlation with the KPI and higher quadrant scores would mean good performance and a negative correlation vice versa. However, this is inversely interpreted with KPIs marked with a ▼.

This distinction is important as a positive correlation (between the ▼KPI and AASP quadrant) would imply poor performance. For example where 'After call work' (ACW) was observed to be higher for a particular quadrant it was taken to mean longer time on calls for agents with those profile results, which are non-preferred and indicates lower work speed. A negative correlation (between the ▼KPI and AASP quadrant) would however be an indication of good performance. KPI abbreviations were used throughout with explanations added in the left data lines next to the tables to ease interpretation. Refer to 3.6.2 (pg 75) for further explanations where necessary. Reference to the number of significant association fields will be made throughout the results section in order to prepare the reader for the concluding tables which summarise the performance data across the sites (see paragraph 4.5.5, pg 112). About 10% of collected and analysed data for Sites 1 and 4 were found to be insignificant and were omitted from the recording process to reduce the disseminated volume.

KPI results across all the study sites translated into large volumes of data and were considered as essential information, as they enabled the researcher to observe the significance and consistency of trends. The reader's attention is drawn to the frequency of the correlations observed throughout all the data displayed.

4.5.1 Performance data: Site 1

Receiving inbound service calls the agents at Site 1 were expected to take as many calls as possible, and assist the client successfully in the shortest possible time spent both on the phone and for the admin work after the call, so as to be ready for the next caller. Raw

and processed data of these processes was analysed and the results recorded over a period of 4 months.

4.5.1.1 Raw KPI data

The raw data recordings of all daily calls provided detailed performance data on how agents were managing their work. Table 4.8 shows the Spearman Rank correlation coefficients (with associated p-&N-values) between raw KPI data and the AASP Quadrant scores for Site 1.

Table 4.8: Spearman Rank Correlation Coefficients for Site 1

	Q1	Q2	Q3	Q4
ACD Calls (Number of calls handled)	0.096 0.31008 113	-0.004 0.96247 113	0.128 0.17589 113	0.063 0.50592 113
▼Avg ACD in Sec (Average talk time in seconds)	-0.068 0.47294 113	0.062 0.51103 113	0.079 0.40414 113	0.041 0.66939 113
▼Avg ACW in Sec (Average after call work in seconds)	0.079 0.40781 112	-0.063 0.50924 112	0.114 0.23025 112	0.252 0.00741 112
▼Avg Hold in Sec (Average hold time of calls in seconds)	0.036 0.70974 112	-0.140 0.14192 112	0.241 0.01063 112	0.196 0.03830 112
▼Avg Handle T in Hours (Average handle time on phone ACD + ACW + Hold time)	0.062 0.52093 110	-0.004 0.96437 110	0.220 0.02100 110	0.275 0.00369 110
Other T in Hours (Time spent on rerouting a client to another solution/agent/division for assistance)	0.082 0.39036 113	-0.008 0.93306 113	0.308 0.00092 113	0.122 0.19657 113
▼AUX Time (Time spent on breaks, lunch, reviews, meetings, training, admin, voicemail and faxes)	-0.016 0.86264 114	-0.003 0.97189 114	-0.160 0.08819 114	-0.031 0.74677 114
Forced Work Time in Sec (Work time in seconds on calls – Aux times)	0.041 0.66906 109	-0.054 0.58058 109	0.204 0.03363 109	0.104 0.27991 109
Potential Call Taking Capacity (Call taking capacity: ACD and average times)	0.125 0.18771 113	-0.031 0.74801 113	0.191 0.04297 113	0.103 0.27762 113

- No correlations were found in Q1 and Q2.
- Q3 had 2 association fields with poor KPIs and 4 association fields with good KPIs: The positive correlations observed between Q3 and *Average hold in seconds* (p = 0.01), meant that agents with high scores on sensory sensitivity kept clients on hold for longer periods of time and also had higher *Average handle time* (p = 0.02), indicating poor KPIs. However, at the same time agents with high Q3 results, had high *Other Time* (p = 0.000) which is the calculated time spent on rerouting a client

to another solution/agent/division for assistance. A negative correlation between Q3 and *Aux time* (r = -0.16; p = 0.08) was observed meaning these agents spent less time on breaks, lunch, reviews, meetings, training, admin, voicemail and faxes. The positive correlations of Q3 with *Forced Work time* (p = 0.03) and *Potential call talking capacity* (p = 0.04) meant these agents worked for longer and had a higher call taking capacity.

- Q4 had 3 association fields with poor KPIs: The strong positive correlation between Q4 and *Average ACW in seconds* indicated that agents with high sensation avoiding scores spent more time on wrap-up work after a call, decreasing their ability to be ready for the next caller. Agents with high Q4 scores took longer to handle calls as observed in the strong positive correlation between Q4 and *Average Handle* time. They also kept clients on hold for longer periods of time as observed in the positive correlations between Q4 and *Average Hold in Seconds*. These correlations are all congruent with poor KPIs.
- The raw data had numerous correlations with Q3 and Q4 scores mostly around the use of time, with Q4 appearing to have poorer use of time and Q3 better use of time. The longer hold and handle time of Q3 agents can potentially be attributed to these agents taking more time and effort to assist clients.

4.5.1.2 Processed KPI data

The above raw data were then electronically processed by the site's IT system using pre-set configurations to determine more condensed KPI groups. Due to the configuration of the data, it was expected that the raw data were more robust than the processed data. Processed data were documented for 4 months separately, and another correlation matrix created thereafter reflected the averaged score across the 4 months. Fluctuating sample sizes were due to missing data fields.

Table 4.9 shows the Spearman Rank correlation coefficients (with associated p- & N-values) between KPI data for January and February and the AASP Quadrant scores of for Site 1. Table 4.10 shows the Spearman Rank correlation coefficients (with associated p- & N-values) between KPI data for March and April and the AASP Quadrants scores for Site 1.

Table 4.9: Correlation Coefficients for Site 1 in January and February

	January				February			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Talk Time Usage	-0.366 0.0018 70	-0.045 0.71450 70	-0.079 0.51438 70	-0.307 0.00977 70	-0.304 0.00767 76	-0.030 0.79781 76	-0.146 0.20693 76	-0.302 0.00797 76
Time Manage-ment	-0.139 0.2389 74	0.070 0.55269 74	-0.007 0.95165 74	0.032 0.78515 74	-0.157 0.16613 79	0.141 0.21468 79	0.039 0.73028 79	-0.026 0.81874 79
Overall Production	-0.329 0.00544 70	0.052 0.66958 70	-0.031 0.80105 70	-0.178 0.14115 70	-0.306 0.00727 76	0.060 0.60441 76	-0.067 0.56411 76	-0.233 0.04248 76
Overall QA[57]	0.005 0.97280 46	0.036 0.81305 46	-0.164 0.27520 46	-0.157 0.29765 46	0.086 0.47788 70	0.004 0.97585 70	-0.124 0.30450 70	-0.080 0.50859 70
Overall efficiency	-0.357 0.00239 70	0.009 0.93785 70	-0.134 0.26869 70	-0.278 0.01998 70	-0.259 0.02377 76	0.043 0.71460 76	-0.093 0.42554 76	-0.211 0.06718 76

- Negative correlations were observed consistently between the KPI data and Q1 and Q4, in 11 association fields, suggesting that agents with high Q1 and Q4 results do not perform as well as O2 and Q3 agents.

Table 4.10: Correlation Coefficients for Site 1 in March and April

	March				April			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Talk Time Usage	-0.107 0.38698 68	-0.035 0.77871 68	0.120 0.32879 68	-0.013 0.91579 68	-0.061 0.71202 39	0.006 0.97112 39	0.123 0.45444 39	-0.065 0.69352 39
Time Manage-ment	-0.166 0.17261 69	0.134 0.27294 69	-0.073 0.54943 69	-0.139 0.25571 69	-0.223 0.17145 39	0.021 0.89714 39	-0.098 0.55177 39	-0.001 0.99633 39
Overall Production	-0.179 0.14314 68	0.031 0.80047 68	0.041 0.73733 68	-0.141 0.24985 68	-0.228 0.16330 39	0.046 0.78317 39	0.012 0.94357 39	-0.098 0.55317 39
Overall QA	-0.097 0.50062 50	-0.026 0.85542 50	-0.060 0.67871 50	0.128 0.37452 50	-0.062 0.74909 29	0.259 0.17443 29	-0.283 0.13703 29	-0.268 0.15986 29
Overall Efficiency	-0.202 0.09899 68	0.044 0.72281 68	0.045 0.71593 68	-0.096 0.43754 68	-0.286 0.07718 39	0.135 0.41329 39	-0.077 0.64344 39	-0.198 0.22782 39

[57]QA ratings will always be for a smaller sample as this is a random recording listened to by specific quality assurance staff. Only a certain number of calls can be monitored for quality on a monthly basis and not all of these calls are listened to.

- The negative correlations observed between KPI data and Q1 and Q4 continue but only 2 association fields were found.

The processed data from January to April as above were converted into one single data set and the means across all 4 months calculated and correlated with the AASP. Table 4.11 shows the Spearman Rank correlation coefficients (with associated p- & N-values) between AVERAGES of processed KPI data and the AASP Quadrant scores for Site 1.

Table 4.11: Correlation Coefficients for Site 1 (Averages)

	Q1	Q2	Q3	Q4
Talk Time Usage Rating	0.067 0.48644 111	0.006 0.95314 111	0.216 0.02296 111	0.067 0.48709 111
Time Management Rating	-0.052 0.58504 112	0.044 0.64631 112	-0.109 0.25476 112	-0.079 0.40724 112
Overall Production Rating	0.010 0.91906 111	0.032 0.73503 111	0.119 0.21286 111	0.014 0.88261 111
Overall QA Rating	-0.220 0.09466 59	0.208 0.11327 59	-0.362 0.00490 59	-0.298 0.02197 59
Overall EFFICIENCY RATING	-0.012 0.90383 111	0.043 0.65426 111	0.094 0.32519 111	-0.002 0.98645 111

- The QA ratings forQ1, Q3 and Q4 had negative correlations with high scores in these quadrants; meaning that the quality of the agent's calls was poorer than other agents. Although Q2 did not present with a significant correlation it was interesting to note the positive correlation in contrast to those observed in Q1, Q3 and Q4.
- While *Talk Time usage*, *Overall production rating* and *Overall efficiency* KPI data was significant for the 4 months separately, this was not found in the averaged result. Q3 had a positive correlation with *Talk Time Usage*, not previously found. The danger of averaging was that it could possibly confound the structures previously perceived in the separate monthly data sets. The QA rating had a smaller sample size as not all calls were listened to, and a random selection of agent's calls was done. It has to be considered that QA was the only KPI not generated by the IT system but collected manually, and may therefore have been open to subjectivity.

4.5.2 Performance data: Site 2

Receiving inbound, service calls, the agents at Site 2 were expected to take as many calls as possible, and assist the client successfully in the shortest period of time spent on the

phone and for administrative work afterwards to be ready for the next caller. Performance data over a 6 month period was analysed. Due to missing values only 48 of the 53 agent's work for Site 2 were analysed.

Table 4.12 shows the Spearman Rank correlation coefficients (with associated p-&N-values) between KPI data and the AASP Quadrant scores for Site 2.

Table 4.12: Correlation Coefficients for Site 2 (Averages)

	Q1	Q2	Q3	Q4
▼Avail T Average (Average available idle time, not engaged in calls)	0.064 0.66481 48	-0.423 0.00273 48	-0.017 0.90921 48	0.223 0.12693 48
▼Ave Aux Time Six Months (Average extra times spend on breaks, training, lunch, etc.)	0.109 0.46275 48	0.090 0.54295 48	0.176 0.23089 48	0.016 0.91590 48
Ave Login (Average log in time)	-0.041 0.78428 48	0.286 0.04838 48	-0.139 0.34767 48	-0.142 0.33575 48
QA Average[58] (Quality assurance average)	-0.085 0.56697 48	0.088 0.55179 48	-0.313 0.03029 48	-0.255 0.08029 48
▼QA St Dev (Quality assurance Standard deviation)	0.101 0.49558 48	-0.202 0.16920 48	0.268 0.06575 48	0.154921 0.293077 48

- No correlations were found with Q1.
- Q2 had 2 association fields with good KPI's: a significant negative correlation (p = 0.002) with *Available idle time*; suggesting Q2 agents spent more times actively on calls and were less idle. Corresponding with the latter, Q2 also had a positive correlation with *Ave log in time* (p = 0.04) meaning as Q2 increased so did log in time.
- Q3 had 2 association fields with poor KPIs: Q3 had a negative correlation with QA average (p=0.03) suggesting lower quality assurance ratings and a positive correlation with *QA Standard Deviation over 4 months*. For higher Q3 scores, *QA Standard Deviation over 4 months* were larger, indicating large variability and not ideal from a KPI perspective. The *QA Standard Deviation over 4 months* was a good summary of the agent's quality attained and consistent with the lower QA average.
- Q4 had a negative correlation with *QA average* (p = 0.08) suggesting lower quality ratings obtained for calls.

[58]Site 2 being a smaller call centre and data collected over 6 months (as opposed to 4 in Site 1) meant that all agents had calls randomly listened to.

4.5.3 Performance data: Site 3

As an outsourced sales call centre, the agents at Site 3 were expected to sell products as fast as possible to as many clients as possible. Performance data over a 5 month period were analysed. All KPIs for Site 3 were indicative of high performance measures.

Table 4.13 shows the Spearman Rank correlation coefficients (with associated p-&N-values) between KPI data and the AASP Quadrant scores for Site 3.

Table 4.13: Correlation Coefficients for Site 3

	Q1	Q2	Q3	Q4
Sales (Total sales)	0.065 0.62445 59	0.126 0.34289 59	-0.199 0.13091 59	-0.212 0.10755 59
Hours (Available hours)	0.111 0.40289 59	0.114 0.39118 59	-0.068 0.60701 59	0.062 0.63828 59
Individual Sales Avg Per hour (Individual sales average per hour)	-0.056 0.67485 59	-0.035 0.79399 59	-0.197 0.13566 59	-0.286 0.02819 59
Campaign Avg Per Hour **Team average** (Products sold by team average per hour)	-0.015 0.91115 59	-0.078 0.55658 59	-0.215 0.10136 59	-0.178 0.17831 59
% above or below avg (% of sales above or below average)	-0.040 0.76399 59	-0.019 0.88910 59	-0.065 0.62474 59	-0.138 0.29561 59

- No correlations were found with Q1, Q2 or Q3.
- Q4 had one negative correlation (p = 0.02) with *Individual sales average per hour*. As Q4 increased, the average of Sales per hour decreased. In other words; agents with higher Q4 scores (Sensation Avoiding) made fewer sales per hour. This KPI was noted as the most important indicator by the operations manager of Site 3.

4.5.4 Performance data: Site 4

As an outsourced collection call centre, the agents at Site 4 were expected to collect outstanding debt as fast as possible, using as little time and the fewest resources possible. Site 4 data were collected over a 7 month period.

4.5.4.1 KPI Activity Section

The activity section of Site's 4 performances gave an indication of the type of tasks the agents were busy with during that particular time frame. For example, how many calls, how many debtors promised to pay and the number of incoming and outgoing calls

handled. Table 4.14 shows the Spearman Rank correlation coefficients (with associated p- & N-values) between ACTIVITY KPI data and the AASP Quadrant scores for Site 4.

Table 4.14: Correlation Coefficients for Site 4 (Activity)

	Q1	Q2	Q3	Q4
Matters Worked (Actual number of collection cases worked)	-0.232 0.02515 93	-0.029 0.78270 93	-0.122 0.24570 93	-0.082 0.43261 93
STD Matters Worked (Matters worked ratio against the standard requiredKPI)	-0.028 0.79014 92	0.077 0.46748 92	0.083 0.43239 92	-0.114 0.28136 92
ADJ Matters Worked (Matters worked adjusted for annual leave)	-0.041 0.69696 92	0.083 0.43081 92	0.070 0.51014 92	-0.108 0.30705 92
RPC (Right Party Contact) (Contacting the right party to collect from)	-0.273 0.00819 93	0.204 0.04999 93	-0.100 0.34188 93	-0.289 0.00498 93
RPC Perc (% of main debtors the agent spoke to, measured against matters worked)	-0.208 0.04596 93	0.131 0.20961 93	-0.105 0.31822 93	-0.247 0.01684 93
PNTS RPC Perc (Points received for RPC Contact % over months)	-0.210 0.04348 93	0.140 0.18149 93	-0.104 0.31963 93	-0.232 0.02546 93
In Call Connected Talk (Actual talk time for incoming calls)	-0.068 0.51919 93	0.124 0.23495 93	-0.177 0.08998 93	-0.216 0.03785 93
Out Call Connected Talk (Overall outgoing call connected time)	-0.061 0.56168 93	0.180 0.08362 93	-0.002 0.98605 93	-0.068 0.52009 93
Talk Perc (% of seconds spent divided by the total talk time of incoming + outgoing calls)	-0.004 0.97018 93	0.142 0.17556 93	0.073 0.48974 93	-0.014 0.89663 93
PNTS Talk Perc (Points allocated and measured ratio against the standard KPI for talk time)	-0.173 0.09787 93	0.217 0.03677 93	-0.194 0.06281 93	-0.276 0.00743 93
Points Scored (Total points scored for activity section)	-0.206 0.04721 93	0.044 0.67468 93	-0.183 0.07982 93	-0.238 0.02170 93
▼PTP (Promise to Pay) Failed (Clients who promised to pay but failed/defaulted)	-0.274 0.00778 93	0.158 0.12956 93	-0.054 0.60599 93	-0.191 0.06668 93
▼Cost On PTP Created and Failed (A penalty calculated against the number of failed PTPs to avoid inflating PTPs made)	-0.209 0.04448 93	0.202 0.05178 93	0.031 0.76866 93	-0.135 0.19538 93
▼PTP Due (Debtors who promised to pay that is still due)	-0.273 0.00817 93	0.238 0.02167 93	-0.067 0.52409 93	-0.192 0.06508 93
Score For ACTIVITY (Total average score for the activity section)	-0.038 0.71617 93	0.046 0.66056 93	-0.022 0.83448 93	-0.013 0.90518 93

- Q1 had 5 association fields with poor Activity KPIs. Agents with high scores on Q1 had less RPC with clients, an important factor for high performance in the collections industry as it is imperative to speak to the person who is the debtor and not a third party. The continued negative correlations with *RPC %* and *Points received* were likely to be associated with the negative correlation in the first RPC results. Q1 negatively correlated with *Points talk percentage*, (p = 0.09) meaning these agents got less points for talk time on the phone; and *Total points scored* p = 0.04) meaning these agents had less productive activity around debt collecting. Q1 however had3 negative correlations with poor KPIs; *PTP failed*, *Cost on PTP failed*[59] and *PTP due*. This meant they had fewer debtors who failed to keep their promise to pay, less inflated PTPs and less PTP due. However, considering the strong negative correlation with RPC, it potentially meant that these agents got fewer debtors to commit to pay in the first place, thus less of them failed.
- Q2 had 3 positive correlations with good KPIs of *RPC* (p = 0.04), *Out call connected talk* (p = 0.08) and *Points Talk Percentage* (p = 0.03). Q2 agents spoke to the right debtor, spent more time on the phone and received more points. Q2 however presented with a positive correlation (p = 0.02) with *PTPs due*; and a positive correlation with *Cost on PTP created and due* (p = 0.05), which are poor KPIs. Q2 agents were spending more time on the phone, speaking to more clients but had a greater tendency to inflate their PTPs.
- Q3 had 3 association fields with poor KPIs: negative correlations were observed in *In Call connected talk* (p = 0.08); *Points talk percentage* (p = 0.06) and *Total points scored* for the activity section (p = 0.07). Q3 agents had less actual talk time on the phones which were observed in lower points for talk percentage and lower overall results in total points scored.
- Q4 had 6 association fields with poor KPIs: the negative correlations with *RPC***,** *RPC***%,** *Points RPC* meant they spoke to fewer debtors. Further negative correlations with *In Call connected talk* (p = 0.03); *Points talk percentage* (p = 0.00) and *Total points scored* (p = 0.02) meant these agents spent less time on the phone, received less points for time and for total points. The negative correlations with the remaining 2 poor KPIs meant agents with high Q4 results had less *PTP failed* and *PTP due*, likely for similar reasons as described for Q1.

[59] Agents may phone many clients and just get them to promise to pay their debts which will result in more PTPs due and thus an inflated score. The Cost on PTP failed is thus calculated to prevent agents from inflating the PTP due results and just trying to make as many calls as possible without getting the required result.

- In summary, for the activity section there seemed to be a concentration of poor KPI results associated with Q1, Q3 and Q4 and better KPIs observed for Q2.

4.5.4.2 KPI Results section

This section measured the conversion of debtors who promised to pay into actual payments as the final required result. It reflected whether the activity KPIs of the agent was forceful and successful enough to result in the debtor actually paying. Table shows the Spearman Rank correlation coefficients (with associated p- & N-values) between RESULTS KPI data and the AASP quadrant scores for Site 4.

Table 4.15: Correlation Coefficients for Site 4 (Results)

	Q1	Q2	Q3	Q4
No of PTP Kept (Average number of promise to pay kept by clients)	-0.181 0.08200 93	0.126 0.22864 93	-0.027 0.79380 93	-0.126 0.23049 93
STD No of PTP Kept (Number of PTPs kept measured against the standard KPI)	-0.137 0.19121 93	0.133 0.20485 93	-0.015 0.88424 93	-0.114 0.27845 93
ADJ No of PTP Kept (Number of PTPs kept adjusted for annual leave days)	-0.080 0.44480 93	0.214 0.03937 93	0.045 0.66822 93	-0.101 0.33380 93
PTS No of PTP Kept (Percentage point for PTPs kept by clients)	-0.121 0.24704 93	0.131 0.21100 93	-0.020 0.84682 93	-0.070 0.50475 93
Conversion Rate (A calculation that takes kept PTPs over PTP due)	-0.007 0.94622 93	0.014 0.89326 93	-0.036 0.73514 93	0.092 0.38219 93
STD Conversion Rate (Conversions measured against the standards)	-0.053 0.61689 93	0.242 0.01947 93	-0.068 0.51425 93	-0.102 0.32838 93
ADJ Conversion Rate (Adjusted for leave)	-0.077 0.46034 93	0.218 0.03612 93	-0.075 0.47217 93	-0.075 0.47606 93
Cur PTP Kept (Current promise to pay kept for the client you are working on for that particular month period)	-0.089 0.39793 93	0.232 0.02505 93	0.014 0.89456 93	-0.193 0.06428 93
Cur Avg PTP Payment (Current average PTP payment that were kept and the monetary value thereof)	0.026 0.80482 93	0.214 0.03921 93	-0.065 0.53805 93	-0.236 0.02279 93
STD Avg PTP Payment (PTP payments measured against the standard KPIs)	0.162 0.12145 93	0.232 0.02536 93	0.081 0.44288 93	-0.190 0.06829 93
ADJ Avg PTP Payment (PTP payments adjusted for annual leave days)	0.225 0.02997 93	0.184 0.07719 93	0.134 0.20003 93	-0.106 0.31202 93
PTS Avg PTP Payment (Points achieved for average PTP payment)	-0.148 0.15583 93	-0.022 0.83735 93	-0.204 0.04939 93	-0.187 0.07309 93
Cur Total Collections (Current total collections made)	-0.130 0.21449 93	0.219 0.03528 93	-0.078 0.45578 93	-0.234 0.02397 93

	Q1	Q2	Q3	Q4
STD Total Collections (Total collections made measured against the standard KPI)	-0.001 0.98924 93	0.277 0.00727 93	-0.034 0.74812 93	-0.250 0.01582 93
ADJ Total Collections (Total collections made adjusted for annual leave)	0.085 0.41621 93	0.197 0.05888 93	0.081 0.44184 93	-0.102 0.32843 93
PTS Total Collections (Points for total collections made)	-0.232 0.02539 93	0.168 0.10758 93	-0.117 0.26534 93	-0.133 0.20239 93
Score For RESULTS (Total average score for the results section)	-0.202 0.05267 93	0.066 0.52734 93	-0.108 0.30225 93	-0.133 0.20322 93

- Q1 had 3 association fields suggesting poor KPIs: The negative correlation with *Number of PTPs* kept (p = 0.08), meant these agents got fewer debtors who paid, and got less *Points for total collections* (p = 0.02) and their *Total score for Results* was lower (p = 0.05). A positive correlation was observed in the *Adjusted score for PTP payments* considering annual leave.
- Q2 had 10 association fields observed in positive correlations with good KPIs, suggesting high performance for agents with high Q2 scores: *Adjusted number of PTPs kept* (p = 0.03); *Standard and Adjusted conversion rates*, meant they converted more PTPs due into PTPs kept and their debtors paid when measured against the standard of the call centre and when adjusted for leave. The four significant results of *Current PTP Kept*, *Current Avg PTP Payment*, *STD Avg PTP Payment*, and *ADJ Avg PTP Payment* meant they had more debtors who paid. The important *Total collections* results for *Current* (p = 0.03), *Standard* (p = 0.00), and *Adjusted* (p = 0.05), also positively correlated with the Q2 score. They made more total collections, compared to the standard of the call centre and when adjusted for leave.
- Q3 had 1 negative correlation with *Points average PTP payment* (p = 0.04), meaning agents with high Q3 scores were allocated fewer points for average payments received from debtors.
- Q4 had 6 association fields, all negative correlations with the KPIs of *Current PTP Kept*, *Current Avg PTP Payment*, *STD Avg PTP Payment*, *Points Avg PTP* payment as well as the important Total collections results for current (p = 0.02) and standard (p = 0.01).
- In summary: The above results indicated that agents with high scores on Q2 made more successful collections, while agents with high scores on Q4 (especially) and Q1 were less successful at making collections.

4.5.4.3 KPI Bonus section

The calculation of bonuses for high performance agents was calculated by the call centre management based on an accrual of activity and results indicators. Table 4.16 shows the Spearman Rank correlation coefficients (with associated p- & N-values) between BONUS KPI data and the AASP Quadrants scores Site 4.

Table 4.16: Correlation Coefficients for Site 4 (Bonus)

	Q1	Q2	Q3	Q4
Final Score (Total score achieved on the overall measurable for Activity and Results)	-0.195 0.06150 93	0.082 0.43633 93	-0.118 0.26056 93	-0.151 0.14953 93
Incentive (Based on points scored the collector would qualify for an incentive amount)	-0.156 0.13681 92	-0.048 0.64748 92	-0.031 0.77151 92	-0.107 0.30866 92
PTP Negotiated (Bonus points apply when collected more than the standard KPI)	-0.159 0.12824 93	0.195 0.06153 93	0.082 0.43636 93	-0.096 0.36117 93
STD Hours Worked (Extra bonus points when they worked for longer than the standard KPI)	0.072 0.49331 92	0.048 0.64940 92	0.050 0.63450 92	0.058 0.58349 92

- Q1 had a negative correlation with *Final score* (total summary for activity and results), (p = 0.06) meaning agents with Q1 results had an overall poorer final result.
- Q2 had a positive correlation with *PTP negotiated* (p = 0.06) and received bonus points as they collected more than the standard KPI.
- It is noteworthy to draw attention to the overall trend in KPI results of positive correlations for Q2, and negative correlations for Q1, Q3 and Q4, as observed in all 3 sections of *Activity*, *Results* and *Bonus*. With most of these results indicating high performance, high Q2 agents can be regarded as better collectors when compared to Q1, Q3 and Q4 agents.

4.5.5 Consolidation of performance results across all 4 study sites

By means of summarising the KPI results from all four Sites, the number of significant associations was counted and grouped according to how they resembled high/good and low/poor KPIs. A crude percentage calculation was performed to determine how much statistical significance was allocated to each of the AASP quadrants. Each Site and the number of associations were entered in a table corresponding to the AASP quadrant, **bolded** for attention and displayed in Table 4.17 and Table 4.18. For example: there were 27 statistically significant association pairs indicative of high performance and 52 association pairs indicative of poor performance observed over the entire four site's performance data as displayed in Table 4.8 to Table 4.16. Of the 27 good KPI associations, 4 fields were observed for Q1, accounting for 15% of the total high KPI

associations, 16 fields observed for Q2, 59%, 5 fields observed for Q3, 19% and 2 fields for Q4, accounting for 7%.Of the 52 poor KPI associations, 18 fields were observed for Q1, accounting for 35% of the total high KPI associations, 2 fields observed for Q2, 4%, 9 fields observed for Q3, 17% and 23 fields for Q4, accounting for 44%.

Table 4.17 shows the AASP score results and HIGH KPIs as observed through the number of significant association fields and calculated % values in all Sites.

Table 4.17: AASP Score Results and High KPIs

AASP and HIGH performance KPI associations	Passive Responses	Active Responses
High Threshold	**Low Registration Q1** Site 1: 0 data fields Site 2: 0 data fields **15%** Site 3: 0 data fields **Site 4: 4 data fields**	**Sensation Seeking Q2** Site 1: 0 data fields **Site 2: 2 data fields** **59%** Site 3: 0 data fields **Site 4:14 data fields**
Low Threshold	**Sensory Sensitivity Q3** **Site 1: 5 data fields** Site 2: 0 data fields **19%** Site 3: 0 data fields Site 4: 0 data fields	**Sensation Avoiding Q4** Site 1: 0 data fields Site 2: 0 data fields **7%** Site 3: 0 data fields **Site 4: 2 data fields**

- This format supplied a clear overview and indication of the highest concentration of good performance as call centre agents observed in Q2/Sensation Seeking (59%) most prevalent for Site 4. Secondly, Q3/Sensory Sensitive had 19%assigned to good KPIs but only observed in the service, inbound industry. Q1/Low Registration had a further 15% allocation for Site 4. The least associations with good KPIs were observed for Q4 at 7%.

Table 4.18 shows the AASP score results and LOW KPIs as observed through the number of significant correlation fields and calculated % values in all Sites.

Table 4.18: AASP Score Results and Low KPIs

AASP and LOW performance KPI associations	Passive Responses		Active Responses	
High Threshold	**Low Registration Q1** **Site 1: 9 data fields** Site 2: 0 data fields Site 3: 0 data fields **Site 4: 9 data fields**	**35%**	**Sensation Seeking Q2** Site 1: 0 data fields Site 2: 0 data fields Site 3: 0 data fields **Site 4: 2 data fields**	**4%**
Low Threshold	**Sensory Sensitivity Q3** **Site 1: 3 data fields** **Site 2: 2 data fields** Site 3: 0 data fields **Site 4: 4 data fields**	**17%**	**Sensation Avoiding Q4** **Site 1: 9 data fields** **Site 2: 1 data field** **Site 3: 1 data field** **Site 4: 12 data fields**	**44%**

- This format supplied a clear overview and indication of a higher concentration of poor performance as call centre agents observed in Q4/Sensation Avoiding (44%), secondly Q1/Low Registration (35%), thirdly Q3/Sensory Sensitive (17%) and the least poor indicators were observed in Q2/Sensation Seeking (4%).

In consideration of both high and low KPIs observed in the tables above, the distribution of results are more concentrated and clearer for Q2 and Q4, both the active response profile quadrants. Q1 have variations and discrepancies and although more concentrated towards low KPIs was not easy to interpret. Q3 has a more equal distribution between high and low KPIs but the high KPI results were only observed for the service, inbound industry. The association fields for poor performance were higher (52) in comparison to good performance associations (27).

4.6 Absenteeism Data

Most absenteeism data fields were negative indicators showing people being more absent and away from work, and marked with a ▼ to align with the performance data. This is displayed in Table 4.19 to Table 4.22. These tables show the Spearman correlations coefficients (with associated p- & n-values) between absenteeism data and the AASP quadrant scores for each site.

Table 4.19: Correlation Coefficients for Absenteeism and ASP Scores: Site 1

	Q1	Q2	Q3	Q4
▼Sick Leave	0.124 0.18005 119	0.001 0.98734 119	0.114 0.21897 119	0.158 0.08622 119
▼Annual Leave	-0.127 0.13501 140	0.004 0.96091 140	-0.033 0.69662 140	-0.085 0.31584 140
▼Count Annual leave (Total days entries)	0.115 0.12160 182	0.094 0.20836 182	-0.126 0.09050 182	-0.036 0.62675 182
▼Count Limited Leave (Total days on limited/other leave)	0.074 0.32374 182	0.140 0.05991 182	0.056 0.45012 182	0.083 0.26380 182
▼Total Count Entries (Total days for all leave entries)	0.146 0.04956 182	0.104 0.16253 182	0.041 0.58423 182	0.056 0.45115 182

- Q1 had no association with absenteeism. Q2 had a positive correlation with *Count limited leave*, meaning these agents took more leave other than annual and sick leave. Q3 took less *Annual leave* as observed in the negative correlation (p = 0.09) and Q4 took more *Sick leave* (p = 0.08).

Table 4.20: Correlation Coefficients for Absenteeism and ASP Scores: Site 2

	Q1	Q2	Q3	Q4
X Months Not Absent (Number of months of no absenteeism)	0.133 0.36713 48	-0.249 0.08854 48	0.098 0.50603 48	0.156 0.28995 48
▼Absent Total (Total absent days)	-0.178 0.22682 48	0.307 0.03371 48	-0.325 0.02401 48	-0.140 0.34287 48
Length Service	-0.055 0.71015 48	-0.015 0.91987 48	0.106 0.47155 48	0.176 0.23016 48
▼Ave Absent (Average absent)	-0.060 0.68984 46	0.098 0.51766 46	-0.309 0.03682 46	-0.015 0.92149 46

- Q1 had no association with absenteeism. Q2 had a negative correlation with *Number of months with no absenteeism* and a positive correlation with *Total absent days*, meaning the higher Q2 the more absenteeism was observed. Q3 had less absenteeism as observed through the negative correlations with *Total absent days* and *Average absent* result. Q4 had no associations with absenteeism.

Table 4.21: Correlation Coefficients for Absenteeism and ASP Scores: Site 3

	Q1	Q2	Q3	Q4
▼X days Absent (number of days absent)	0.074 0.57581 59	0.063 0.63692 59	0.015 0.90791 59	-0.120 0.36693 59

- No correlations were found for absenteeism in Site 3.

Table 4.22: Correlation Coefficients for Absenteeism and ASP Scores: Site 4

	Q1	Q2	Q3	Q4
Attendance	0.018 0.86355 93	-0.073 0.48693 93	0.067 0.52368 93	-0.061 0.56042 93
Total Working Days	0.095 0.36448 93	-0.037 0.72165 93	0.203 0.05054 93	0.157 0.13402 93
▼Leave Days	0.128 0.22289 93	-0.043 0.68547 93	0.095 0.36599 93	0.178 0.08842 93
▼Leave A (Annual and study leave)	0.120 0.25194 93	-0.035 0.73890 93	0.088 0.40216 93	0.170 0.10381 93
▼Leave B (Sick and other leave)	-0.030 0.77437 92	0.010 0.92383 92	-0.083 0.42890 92	0.075 0.47981 92
AVG EXTRA PNTS with Attendance (Avg extra points for attendance)	-0.203 0.05143 93	-0.100 0.33931 93	-0.123 0.23895 93	-0.075 0.47416 93

- Q1 had a negative correlation with *Average extra points for attendance*, meaning that agents with Q1 results did not get extra points for attendance. Q2 had no associations with absenteeism. Q3 had a positive correlation with *Average total working days* meaning the higher Q3, the more working days were observed. Q4 had a positive correlation with *Average leave days* suggesting that agents with high Q4 scores take more leave.

4.6.1 Consolidated summary of all absenteeism results across all 4 sites

The data across all four sites were summarised using the same method as applied with the performance results. The bigger sample size for Site 1 should be noted. There were 4 significant association fields for higher absenteeism (▼) and 6 for lower absenteeism. The correlations as either positive or negative, with either a 'less' absenteeism indicator, versus a 'more' absenteeism indicator, were considered.

Table 4.23 shows the summary of associations between LESS/LOW ABSENTEEISM INDICATORS and AASP results as observed through the number of significant correlation fields and % values in all sites.

Table 4.23: Associations between Low Absenteeism and AASP Results

AASP and Absenteeism Associations	Passive Responses	Active Responses
High Threshold	**Low Registration Q1** Site 1: 0 data fields Site 2: 0 data fields **0%** Site 3: 0 data fields Site 4: 0 data fields	**Sensation Seeking Q2** Site 1: 0 data fields Site 2: 0 data fields **0%** Site 3: 0 data fields Site 4: 0 data fields
Low Threshold	**Sensory Sensitivity Q3** **Site 1: 1 data field** **Site 2: 2 data fields** **100%** Site 3: 0 data fields **Site 4: 1 data field**	**Sensation Avoiding Q4** Site 1: 0 data fields Site 2: 0 data fields **0%** Site 3: 0 data fields Site 4: 0 data fields

Table 4.24 shows a summary of associations between MORE/HIGH ABSENTEEISM INDICATORS and AASP results as observed through the number of significant correlation fields and % values in all sites.

Table 4.24: Associations between High Absenteeism and AASP Results

AASP and Absenteeism Associations	Passive Responses	Active Responses
High Threshold	**Low Registration Q1** Site 1: 0 data fields Site 2: 0 data fields **16.6%** Site 3: 0 data fields **Site 4: 1 data field**	**Sensation Seeking Q2** **Site 1: 1 data field** **Site 2: 2 data fields** **50%** Site 3: 0 data fields Site 4: 0 data fields
Low Threshold	**Sensory Sensitivity Q3** Site 1: 0 data field Site 2: 0 data field **0%** Site 3: 0 data field Site 4: 0 data field	**Sensation Avoiding Q4** **Site 1: 1 data field** Site 2: 0 data fields **33.4%** Site 3: 0 data fields **Site 4: 1 data field**

- Consideration for all results across the four study sites, clearly show agents with high Q3 results to be more at work and the least absent. Q2 had the most absent indicators (50%), but this was only observed in Sites 1 and 2, for service, inbound call centres. Further, Q4 had a 33.4% allocation of absenteeism indicators, and Q1 16.6%.

4.7 Attrition Data

True attrition and not intent to turnover was calculated by means of ANOVA calculations. The data of Site 2 and 4 are first displayed in box plots and then tables with shading of z- and p-values to highlight their significance. Only 2 AASP quadrants (Q2 and Q3) were significant and displayed.

4.7.1 Attrition data: Site 2

For Site 2, the attrition groups used for analysis were: *Current* (n = 29); *Resigned* (n = 12) and *Transferred* (n = 12). Age and thereafter the associations with Q2 are displayed.

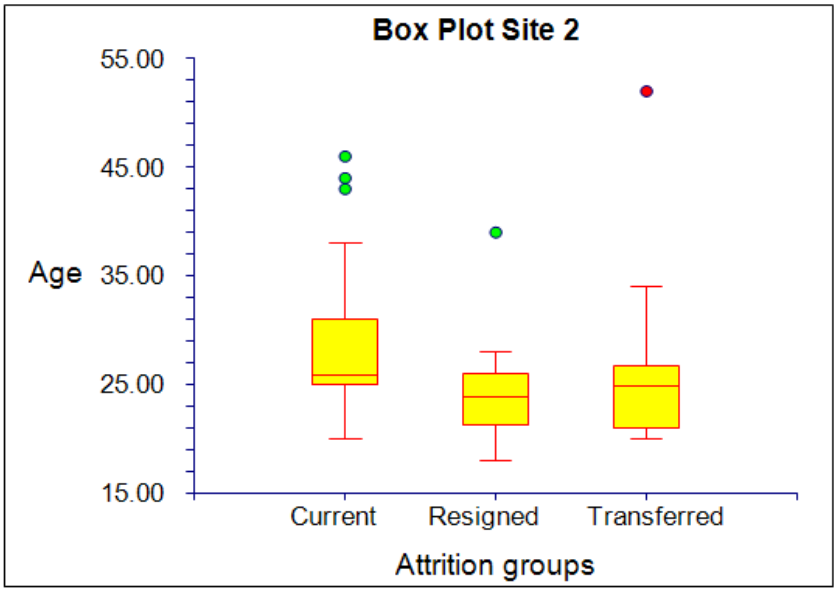

Figure 4.7: Side by Side Box Plots of Age and Attrition Groups for Site 2

- The *Resigned* group were younger and outliers towards the higher age values were noted for all 3 groups.

Table 4.25: Median and P-values between Age and Attrition Groups: Site 2

Attrition	Current n = 29	Resigned n = 12	Transferred n = 12	p-value (Kruskal-Wallis)
Median	26	24	25	0.056

- The paired comparisons resulted in a highly significant difference between *Resigned* (24 years) and *Current* (26 years) with regards to median age.

Table 4.26: Kruskal-Wallis Pairwise Multiple-Comparison Z-value Test between Age and Attrition Groups: Site 2

Attrition	Current n = 29	Resigned n = 12	Transferred n = 12
Current	0.000	2.119	1.692
Resigned	2.119	0.000	0.358
Transferred	1.692	0.358	0.000

- The z-values confirmed a significant difference between resigned and current agents with regards to age. Resignations were more prevalent in the younger agents, as validated by the p- and z-values.

Attrition data only showed significance with Q2 and is displayed below. No significant relationships were found between Q1, Q3 and Q4 and attrition groups.

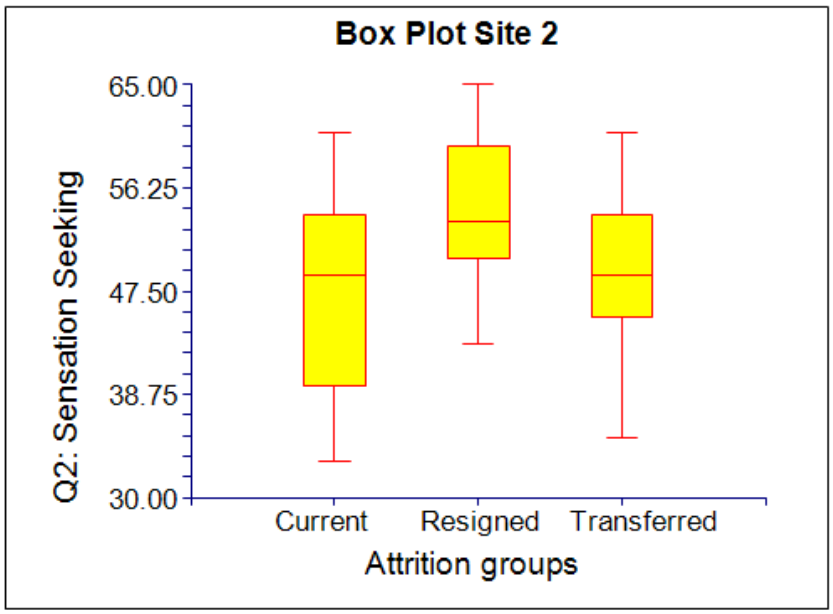

Figure 4.8: Side by Side Box Plots of Q2 and Attrition Groups for Site 2

- The *Resigned* group had a higher Q2 score.

Table 4.27: Median and P-values between Q2 scores and Attrition Groups: Site 2

Attrition	Current n = 29	Resigned n = 12	Transferred n = 12	p-value (Kruskal-Wallis)
Median	49	53.5	49	0.048

- The *Resigned* group had a significantly larger median for Q2 when compared to the current and transferred groups, with the p-value (Kruskal–Wallis test) confirming the results.

Table 4.28: Kruskal-Wallis Pairwise Multiple-Comparison Z-value Test between Q2 and Attrition Groups: Site 2

Attrition	Current n = 29	Resigned n = 12	Transferred n = 12
Current	0.000	2.446	0.4311
Resigned	2.446	0.000	1.694
Transferred	0.4311	1.694	0.000

- The z-values confirmed the significant difference between *Resigned* and *Current* agents with regard to AASP Q2 scores. Site 2's attrition data indicated that agents with higher scores on Q2 had more resignations.

4.7.2 Attrition data: Site 4

For Site 4 the attrition groups were: *No attrition data*, (n = 46); *Current*, (n = 47) and *Resigned*, (n = 14). The group with missing data were likely to still be employed, but they were not treated as such and compared as a different data set. Age and thereafter the associations with Q3 are displayed.

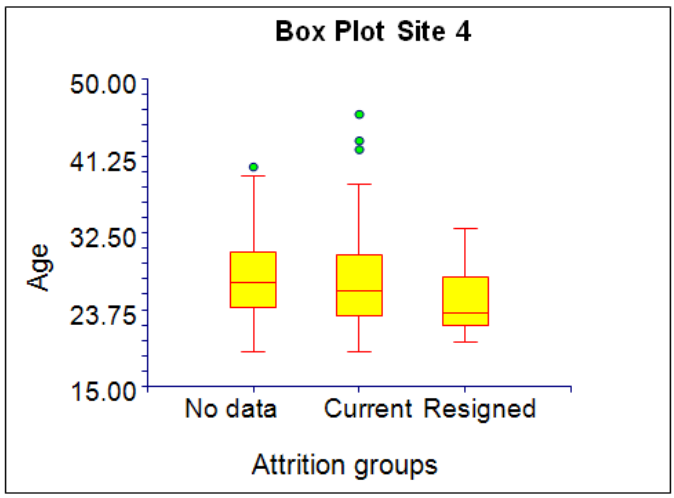

Figure 4.9: Side by Side Box Plots of Age and Attrition Groups for Site 4

The *Resigned* group were younger and outliers towards the higher age values were noted for the *Current* and *No data* group.

Table 4.29: Median, Mean and P-values between Age and Attrition Groups: Site 4

Age	No data n = 46	Current n = 47	Resigned n = 14	p-value (Kruskal-Wallis)
Median	27	26	23.5	0.08

- The median for the *Resigned* group was lower with a significant p-value at 0.08.

Table 4.30: Kruskal-Wallis Pairwise Multiple-Comparison Z-value Test between Age and Attrition Groups: Site 4

Age	No data n = 46	Current n = 47	Resigned n = 14
No data	0.000	0.775	2.206
Current	0.775	0.000	1.683
Terminations	2.206	1.683	0.000

- The z-values confirmed a significant difference between *Resigned* and *Current* agents with regard to age with resignations more prevalent among younger workers.

Attrition data showed significance with Q3 only and is displayed below. No significant relationships were found between Q1, Q2 and Q4 and attrition groups.

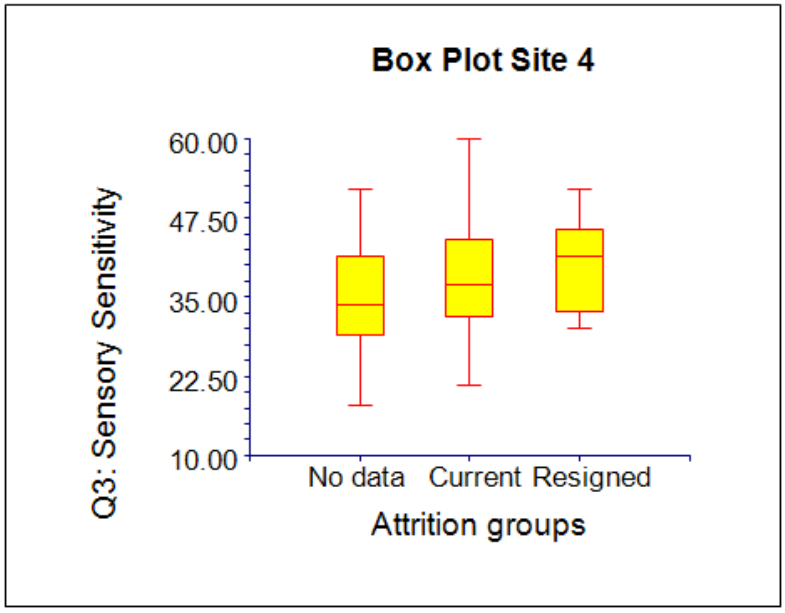

Figure 4.10: Side by Side Box Plot of Q3 and Attrition Groups for Site 4

- The *Resigned* group had a higher Q3 score.

Table 4.31: Median and P-values between Q3 Scores and Attrition Groups: Site 4

Age	No data n = 46	Current n = 47	Resigned n = 14	p-value (Kruskal-Wallis)
Median	34	37	41.5	0.049

- According to the p-value (Kruskal–Wallis test) the medians of the 3 groups were different, with a larger median for the *Resigned* group. The most significant pair wise difference was between the *No data* and the *Resigned* group.

Table 4.32: Kruskal-Wallis Pairwise Multiple-Comparison Z-value Test between Q3 Scores and Attrition Groups: Site 4

Age	No data n = 46	Current n = 47	Resigned n = 14
No data	0.000	1.7598	2.2027
Current	1.7598	0.000	1.0094
Terminations	2.2027	1.0094	0.000

- Resignations were more prevalent amongst agents with higher AASP Q3 scores.

4.7.3 Consolidated summary of the attrition results across all 4 sites

The attrition data contained much smaller numbers due to its nature, was more difficult to collect and potentially could be the most biased due to the manual collection process. To provide an overview of locality of the AASP and attrition results, the same method as applied with the performance and absenteeism results was used. However, the % calculations were not used as it would confound the structures.

Age had a significant association with attrition for Site 1 and 4, with younger agents being more likely to resign. As young people are generally employed by the call centre industry (Russell, 2008) this was expected.

Table 4.33: Summary of Differences in Location between Attrition and AASP Results as Observed in All Sites

AASP Attrition and Tenure Associations	Passive Responses		Active Responses	
High Threshold	**Low Registration Q1** Site 2: 0 data fields Site 4: 0 data fields	None	**Sensation Seeking Q2** **Site 2: 1 data fields** Site 4: 0 data fields	1 out of 4
Low Threshold	**Sensory Sensitivity Q3** Site 2: 0 data field **Site 4: 1 data field**	1 out of 4	**Sensation Avoiding Q4** Site 2: 0 data fields Site 4: 0 data fields	None

- Agents with high Q2 scores in Site 2 had a higher attrition rate, and agents with high Q3 scores in Site 4 had a higher attrition rate. No relationships were found in Quadrants 1, 3 or 4.

STAGE 2: Development of AASP Subsets

The objective of this stage was to develop a subset structure in response to the multidimensionality of the agent's baseline AASP results obtained in stage 1.This was the first juncture towards achieving study objective 2; to determine the potential validity of the AASP as a recruitment tool for the call centre industry.

4.8 Subset Structure Development for the AASP

4.8.1 Introduction and rationale

The study hypothesis was that low sensory threshold agents would have poorer performance indicators, be more absent, more prone to leave the industry and deemed unsuitable to work as call centre agents, and that agents with high sensory thresholds would be the opposite. To recap, sensory thresholds as observed by the AASP quadrants are Q1 (Low registration) and Q2 (Sensation seeking) representing high sensory thresholds while Q3 (Sensory sensitivity) and Q4 (Sensation Avoiding) resemble low sensory thresholds. The study hypothesis was that agents with high Q1, Low Registration scores are potentially more suited to call centre work because of their passive behavioural response than those with high Q4, Sensation Avoiding scores, the latter because of their counteractive response to sensory stimuli. However, the baseline data showed strong, consistent and significant relationships between Quadrants 1, 3 and 4 of the AASP (see paragraph 4.4.2, pg 96) which posed a challenge for interpretation of the data. This observed multidimensionality of the AASP complicated the differentiation between the quadrants, making it difficult to determine their potential relationships with performance, absenteeism and attrition in fulfilment of the study objectives. The interrelationship of Q1, Q3 and Q4 was not surprising as it was observed in clinical practise by the researcher when using the AASP and has also been confirmed by other study evidence (Refer to Table, pg 54). The relationship between Q3 and Q4 was expected as they both reflect low thresholds, but the main question that arose was how to understand the interplay between the high Q1 profile scores with and without high Q3 and Q4 profile scores.

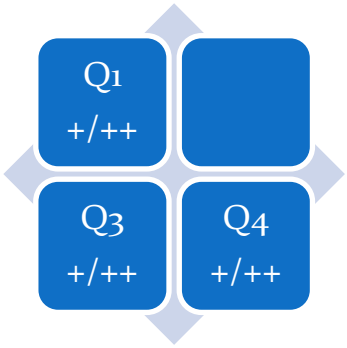

Figure 4.11: High Q1, Q3, Q4 Scores

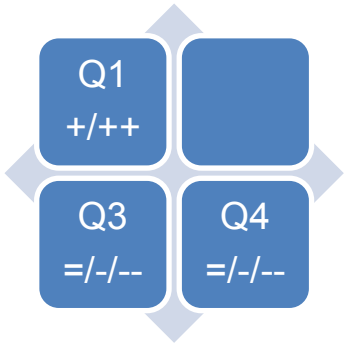

Figure 4.12: High Q1 and Normal (Low) Q3 and 4 Scores

The above figures demonstrate the question deliberated, which was whether Q1 had a dual outcome when scores corresponded with Q3 and Q4 (Figure 4.11), or not (Figure 4.12). A decision was consequently made to expand on the data and form subsets within the AASP, to observe the quadrants more distinctly; using the following three main themes:

- The baseline results of this study showed strong, consistent and significant interrelations amongst 3 AASP quadrants (1, 3 and 4) in a sample of 459 study participants;
- The multi-dimensional properties of Q1 in being either a low threshold indicator in coping with too much sensation (Jerome & Liss, 2005) illustrated in Figure 4.11, versus being a high threshold indicator (Brown et al., 2001; Brown & Dunn, 2002; W. Dunn, 1997), as illustrated in Figure 4.12 and;
- The researcher's experience in working with the instrument in clinical practise and consequent reasoning.

A subset structure development process, using the statistical principles of nearest neighbour and interval location, was applied to group the AASP quadrant score results on a continuum of 6 different subsets. The AASP score configuration of all four sites' study participants were then used to group each according to the six subsets. Further analysis was performed using the performance, absenteeism and attrition data already collected and measured against the subsets rather than the AASP quadrant score results in stage 3

of the study. The relationships between the subsets and performance were explored to determine potential value of the subset structure. The subset allocation process reduced the sample sizes significantly and as a result only Sites 1 and 4 could be used for statistical analysis. A comprehensive analysis was imperative if a deeper understanding of this instrument for use in the call centre industry was to be achieved. The approach which was adopted supplied a preliminary method to account for the multidimensionality of the AASP and to make the instrument more accessible for use in the call centre industry as a recruitment tool.

4.8.2 Subset allocation of the AASP instrument

4.8.2.1 Statistical considerations, methods and process[60]

The 4 AASP quadrants each have 5 ordinal score categories: **--** (much less than most people); (less than most people); **=** (similar to most people); **+** (more than most people) and **++** (much more than most people). These score categories were allocated during the standardisation process in development of the AASP instrument (Brown & Dunn, 2002) and duplicated below as an imperative to understand the subset configurations.

Table 4.34: Quadrant Summary Score Chart of the AASP (Ages 18 – 64)

Quadrant	Quadrant Raw Score Total	Much less than most people	Less than most people	Similar to most people	More than most people	Much more than most people
		- -	-	=	+	++
1.Low Registration	/75	15-----18	19-----23	24-----35	36-----44	45-----75
2.Sensation Seeking	/75	15-----35	36-----42	43-----56	57-----62	63-----75
3.Sensory Sensitivity	/75	15-----18	19-----25	26-----41	42-----48	49-----75
4.Sensation Avoiding	/75	15-----19	20-----26	27-----41	42-----49	50-----75

The number of score possibilities, when using the 4 AASP quadrants across the 5 ordinal score categories, is 625 (5 to the power 4; 25 times 25) by means of the multiplication rule[61]. The score scales/categories could also be collapsed or summarised by means of symbols: '- -' and '-' (lesser scores); '=' (middle of the road); '+' and '+ +' (more scores). This approach described three groups, consisting of two extremes and a middle group.

[60] Although this section describes methodology and for procedural reasons should have been discussed in Chapter 3 it was not done for reasons described in the introduction to chapter 4.

[61] Explanation of the multiplication rule: 5 to the power 2 is equal to 25; 5 to the power 4 is equal to 5 to the power 2 times 5 to the power 2.

Combining results for the four quadrants in 'less', 'middle of the road' and 'more' would result in 81 distinct groups, also by means of the multiplication rule. The 625 possible groups were too many for any practical application, and yet the 81 groups were not distinct enough to describe the subsets. More emphasis was allocated to +/++ the positive (more) scores rather than the **- / --** negative (less) scores, because the prevalence (+/more) of a sensory threshold pattern was considered to be more relevant than the absence of that pattern (-/less). This resulted in 4 ordinal categories being chosen for each quadrant, namely '- or - -'; '=''; '+' and '++';only the - and - - scores were collapsed into one group. This reduced the number of combination categories to 256 (4 to the power 4),(4^4), again based on the multiplication rule and used to define the 6 subsets. Collapsing the -/-- negative (less) scores and the +/++ the positive (more) AASP scores to result in 3 groups of less, middle and more was also applied in the studies of (Engel Yeger, 2011; Engel-Yeger & Dunn, 2011a; Engel-Yeger & Dunn, 2011b; Kinnealey et al., 2011).

The 625 AASP score patterns were ordered in a lexicographical format (like the ordering of a dictionary) using Microsoft Excel® format (Refer to Appendix H for an example). The nearest neighbour principle and interval location were (extremely) applied to combine the various score combinations and therefore lessen the 256 score categories, resulting in six separate subsets. This structure was developed to group individuals based on their four quadrant AASP scores specifically particularly for the call centre environment.

Consideration was given to:

- The strong, consistent and significant positive bivariate relationships between Quadrants 3 and 4; Quadrants 1 and 3 ; and Quadrants 1 and 4;
- The face value and meaning of each quadrant;
- Quadrants 1 and 2,being high threshold indicators;
- Quadrants 3 and 4, being low threshold indicators;
- Mixed score category results;
- The positive ++, then + scores were considered first and thereafter the other scores; and
- The range of threshold patterns were grouped from the least sensory suitable (subset 1) to the most sensory suitable candidates (subset 6) for performing call centre work.

4.8.2.2 Subset development guidelines/rules:

Variations in quadrant scores were used to select the subsets based on reasonable expectations and the above considerations with regard to the main face value of each

quadrant. Each quadrant had a weighting towards a particular subset, with emphasis on the positive scores, with the exception of Subset 4 which used mostly =, - and -- results.

The main guidelines applied were the following:

- Subset 1: Quadrant 4 (Sensation Avoiding)
- Subset 2: Quadrant 3 (Sensory Sensitivity)
- Subset 3: Mixed patterns of scores with especially high scores for opposing Quadrants
- Subset 4: Normal =, - and -- score distributions across all 4 quadrants
- Subset 5: Quadrant 2 (Sensation Seeking)
- Subset 6: Quadrant 1 (Low Registration)

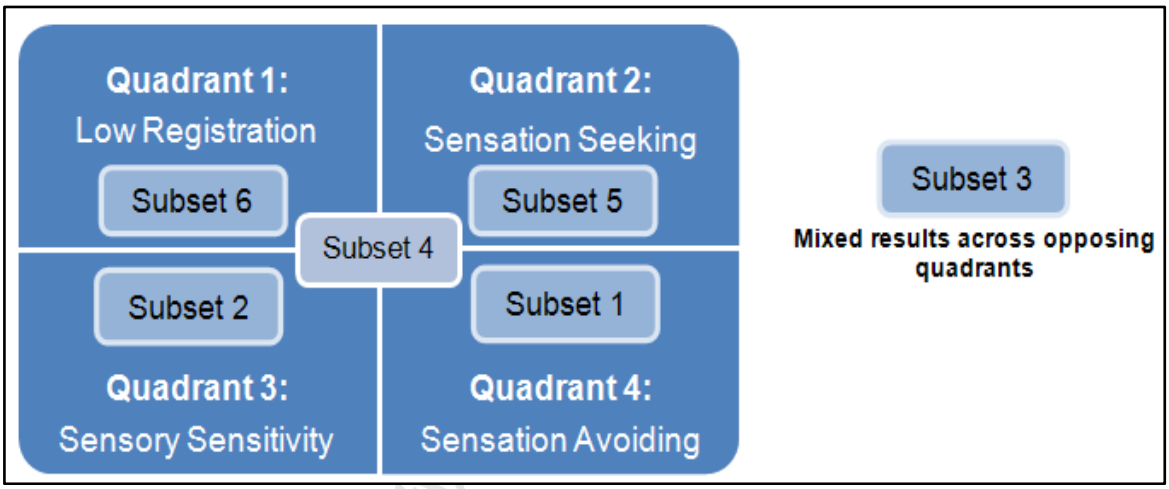

Figure 4.13: Main Rules Applied for Allocation of AASP Scores into the 6 Subsets

By using the above main guidelines (Figure 4.13) and the detailed guidelines (Table 4.35), the full 625 score possibilities (or groupings) of the AASP quadrants were used to determine the allocations to the 6 subsets. The symbols reflecting the score results (--; -; =; +, ++) determined by the AASP standardised classification system (C. Brown et al., 2001) for age group 18-64 was used to order the score groupings. Filters were used in the lexicographical ordering sheet of the 625 data groups, and a rule check for each field performed, to allocate the subset number. This was first applied theoretically to the inherent allocations of the testing instrument, and thereafter to the study population.

Table 4.35: Detailed Guidelines/Rules for Allocating Subsets to the AASP

Subset	Guideline	Q1	Q2	Q3	Q4	Number satisfying	Total allocation
1	1.1	--, -, =	--, -, =	--, -, =	+; ++	54	160
	1.2	--, -, =	--, -, =	+; ++	+; ++	36	
	1.3	+; ++	--, -, =	+; ++	+; ++	24	
	1.4	+; ++	--, -, =	--, -, =	++	18	
	1.5	+; ++	+; ++	+; ++	+; ++	16	
	1.6	--, -, =	+; ++	+; ++	+; ++	12	
2	2.1	--, -, =	--, -, =	+; ++	--, -, =	54	96
	2.2	--, -, =	+; ++	--, -, =	++	18	
	2.3	--, -, =	+; ++	+; ++	+	12	
	2.4	+; ++	+; ++	--, -, =	++	12	
3	3.1	+; ++	--, -, =	+; ++	--, -, =	36	114
	3.2	+; ++	--, -, =	--, -, =	+	18	
	3.3	--, -, =	+; ++	++	--, -, =	18	
	3.4	--, -, =	+; ++	--, -, =	+	18	
	3.5	+; ++	+; ++	++	--, -, =	12	
	3.6	+; ++	+; ++	--, -, =	+	12	
4	4.1	--, -, =	--, -, =	--, -, =	--, -, =	81	111
	4.2	--, -, =	+; ++	+	--, -, =	18	
	4.3	+; ++	+; ++	+	--, -, =	12	
5	5.1	--, -, =	+; ++	--, -, =	--, -, =	54	72
	5.2	+; ++	++	--, -, =	--, -, =	18	
6	6.1	+; ++	--, -, =	--, -, =	--, -, =	54	72
	6.2	+; ++	+	--, -, =	--, -, =	18	
							625

- 23 Main guidelines for score groupings were applied. Note the main guidelines, as applied for each quadrant weighting observed in 1.1 (Q4), 2.1 (Q3), 5.1 (Q2) and 6.1 (Q1), have a high allocation of 54 for each one. The highest grouping was for subset 4, guideline 4.1 with a total of 81 allocations, resembling typical sensory processing with neither high nor low threshold indicators.
- The higher number of allocations to groups 1 and 2 rather than to groups 5 and 6 was due to the strong correlation patterns between quadrants 1, 3 and 4. The hypothesis was made that high Q1 scores in combination with high Q3 and Q4 scores resembled a low threshold pattern, but in the absence of high scores for Q3 and Q4, suggested a high threshold pattern. Considering these associations, resulted in a higher degree of allocations to the low threshold continuum, being subsets 1 and 2. Subset 3 made allowances for mixed results across opposing quadrants and was potentially the most difficult to define or to anticipate behavioural outcomes.

- The process of development of the guidelines/rules as explained in Table 4.34 had an initial allocation for score results and was refined thereafter. Initial allocations in the first version were for: Guideline 2.2; 2.3 and 2.4 to be in subset 1 and guidelines 4.2 and 4.3 to be in subset 3. They were changed for 2 reasons: 1) the numbers satisfying each subset were too small for subsets 2 and 3 and 2) allocations were considered against suitability for the call centre industry.
- Rule 1.5 and 1.6 was still grouped in subset 1 even though Q2 had high results. With both Q3 and Q4 having high scores, the emphasis was on the low threshold presentation, again measured against the expectations of the call centre industry.
- The 6 suggested subsets are not necessarily considered a super classification of subjects in call centres and potential for other type of groupings are acknowledged. This approach was however chosen according to the experience of the researcher and it is necessary to evaluate the suggested 6 groups with respect to the subjects' performance. This was done in the stage 3.
- If the subset structure was designed with other samples/populations in mind, subset 5 and 6 would have been switched. The more active profiles would have been reflected by subset 1 and 6 and then grouped using the same guidelines and principles. However, the subset structure development had a particular application focus for the call centre industry.

4.8.2.3 Subset categories observed in Quadrants 1, 2, 3 and 4:

The pivot tables below describe the allocation of the above scores for each quadrant into the 6 subset groups after the guidelines in Table 4.34 were applied. The score categories describing the rows were not placed in ordinal order, where '++' were the highest interval; '+' the second highest; and '- -' the lowest interval of quadrant scores (Quadrant 1 to 4). Sections marked in grey highlight the main guidelines applied and resultant score intervals.

Table 4.36: Quadrant 1: Low Registration category distributions for the AASP

	Subset groups						
Scores	1	2	3	4	5	6	Total
-	34	28	12	33	18		125
--	34	28	12	33	18		125
+	29	6	39	6	9	36	125
++	29	6	39	6	9	36	125
=	34	28	12	33	18		125
Total	160	96	114	111	72	72	625

- The main guideline for Subset 6 was clearly represented in + and ++ scores for Quadrant 1 in the absence of other scores. The high ratings in Subset 1 (+ and ++ 29 each) appeared as the result of the interrelationships between quadrants 1, 3 and 4, which were regarded as a low threshold group and thus have lower subset ratings.

Table 4.37: Quadrant 2: Sensation Seeking Category Distributions for the AASP

	Subset groups						
Scores	1	2	3	4	5	6	Total
-	44	18	18	27		18	125
--	44	18	18	27		18	125
+	14	21	30	15	27	18	125
++	14	21	30	15	45		125
=	44	18	18	27		18	125
Total	160	96	114	111	72	72	625

- Using the guideline for positive Quadrant 2 scores as the highest indicator for Subset 5 is clearly represented. Again note the absence of scores in the -, -- and = categories for Subset 5.

Table 4.38: Quadrant 3: Sensory Sensitivity Category Distributions for the AASP

	Subset groups						
Scores	1	2	3	4	5	6	Total
-	24	10	16	27	24	24	125
--	24	10	16	27	24	24	125
+	44	33	18	30			125
++	44	33	48				125
=	24	10	16	27	24	24	125
Total	160	96	114	111	72	72	625

- Using the guideline for positive Quadrant 3 scores as the highest indicator for Subset 2 is clearly represented. The higher scores (44) in Subset 1 with + and ++ scores were when these score categories corresponded with a ++ score for Quadrant 4. Notice the empty cells for + and ++ scores for Subsets 5 and 6.

Table 4.39: Quadrant 4: Sensation Avoiding Category Distributions for the AASP

	Subset groups						
Scores	1	2	3	4	5	6	Total
-		18	22	37	24	24	125
--		18	22	37	24	24	125
+	65	12	48				125
++	95	30					125
=		18	22	37	24	24	125
Total	160	96	114	111	72	72	625

Using the guideline for positive Quadrant 4 scores as the highest indicator for Subset 1, the absence of -, -- and = scores is clearly represented. Notice the empty cells in Subsets 3, 4, 5 and 6 for ++ scores and Subsets 4, 5 and 6 for + scores.

4.8.2.4 Summary

The subset structure allowed for the multi-dimensionality of the AASP and functions as an alternative scoring method. It allows for observation of the quadrants according to an alternative configuration based on their interrelationships.

In summary, for final clarification, the subset group descriptions are:

Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6
Low threshold Active	Low threshold Passive	Mixed patterns	Medium thresholds	High threshold Active	High threshold Passive

Potential validity for the subset structure development was measured by expanding on the study analysis and associating the subsets with the agent performance data already collected.

4.8.3 Subset application for all 4 data sites

The AASP results of the four study sites were used to determine how the six subsets were distributed within each of the study sites using the rules as explained above. The subset distributions are displayed in tables and graphs below.

Table 4.40: Subset Distributions for Sites 1, 2, 3 and 4

SITE 1: n = 226						
Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
39	18	10	107	26	26	226
17%	8%	4%	47%	12%	12%	100%
SITE 2: n = 53						
Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
8	2	2	28	6	7	53
15%	4%	4%	53%	11%	13%	100%
SITE 3: n = 63						
Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
21	0	7	23	8	4	63
33%	0%	11%	37%	13%	6%	100%
SITE 4: n = 108						
Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
29	7	10	36	19	7	108
27%	6%	9%	33%	18%	6%	100%

- Sites 1 and 4 were deemed usable due to their larger groupings for further exploration of the potential relationships between the subsets and performance. Sites 2 and 3 were too small to allow for statistical comparison and were excluded from further analysis.

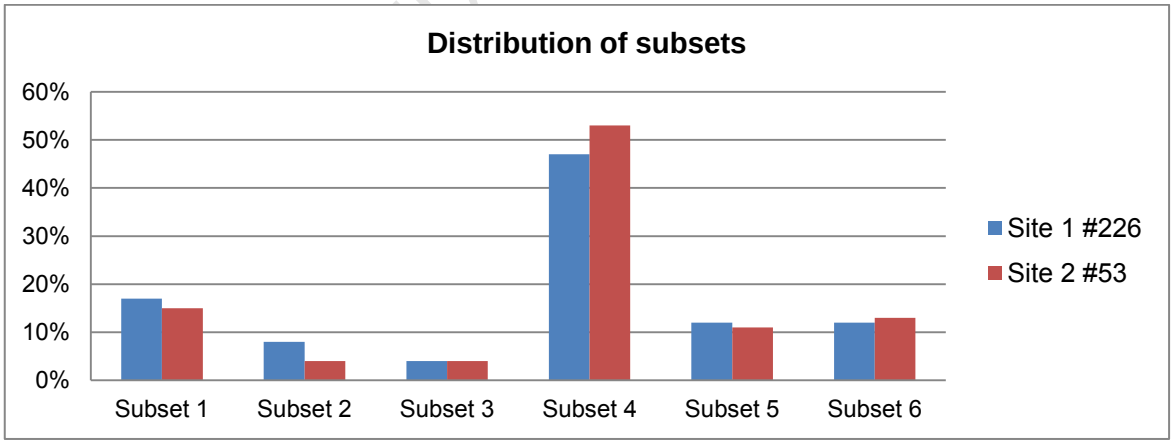

Figure 4.14: Six Subset Distributions (%) for Sites 1 and 2

- There were a higher percentage of agents in subset 4 and a more equal distribution across subsets 5 and 6. Subset 1 ranked second highest for most agents, and Subsets 2 and 3 had the fewest.

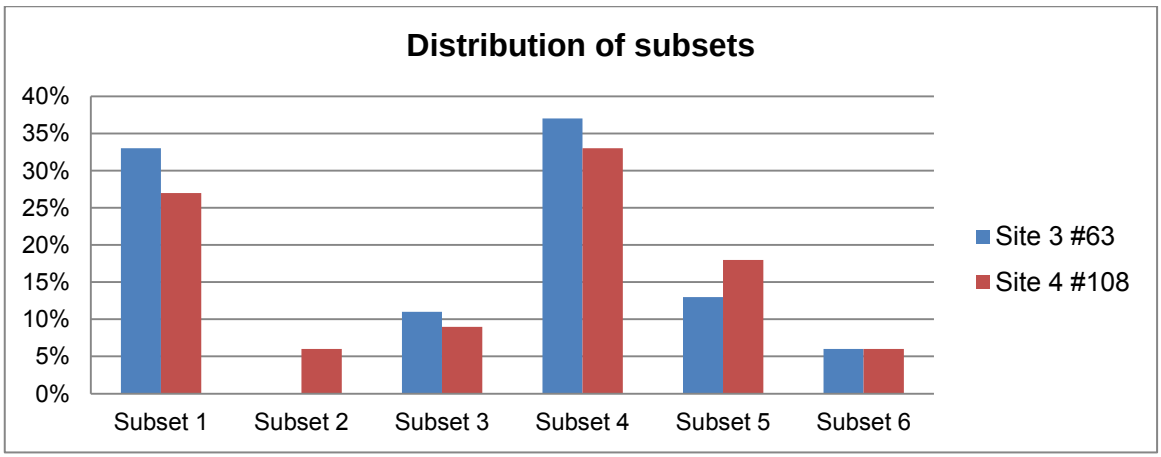

Figure 4.15: Six Subset Distributions (%) for Sites 3 and 4

- There were a higher percentage of agents in Subset 4 and the second highest represented group was Subset 1. Subsets 2, 3 and 6 were the smallest groups with zero allocations to Subset 2 in Site 3.

Considering the collective subset grouping for Sites 1 and 2 versus Sites 3 and 4, there was a higher representation for Subset 1 and Subset 5 in the outbound, outsourced call centres of Sites 3 and 4.

STAGE 3: Application

The objective of Stage 3 was to determine whether the subset structure developed in Stage 2 could predict performance and subsequently hold potential for use in call centre recruitment. This was the next juncture towards achieving study objective 2; to determine the potential validity of the AASP as a recruitment tool for the call centre industry.

4.9 Relationships between the Subsets and Performance

The potential for further relationships between the subsets (and not the quadrants) and performance was studied for Site 4 only. Site 1 was disregarded as the missing fields in performance data resulted in reduced subset groupings. Absenteeism data showed no significant relationships and were not displayed.

4.9.1 Overview of subsets and performance: Site 4

Due to missing performance data, values from 93 agents were divided into the 6 subsets and the subset grouping for Site 4 is displayed in Table 4.41.

Table 4.41: Final Subset Distribution for Site 4 Analysis

Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
27	6	10	28	17	5	93
25.11%	5.58%	9.3%	26.04%	15.81%	4.65%	100%

The largest group is Subset 4 (n = 27) and then Subset 1, representing 27 agents. Subset 2 (n = 6) and 6 (n = 5) were small.

The subset application is highlighted to assist with data interpretation:

- Subset 1 represented agents with high Q4, Sensation avoiding profiles and they were hypothesised to be (more) unsuitable for call centre work.
- Subset 6 represented agents with high Q1, Low registration profiles in the absence of high scores for Q3 and Q4, and were hypothesised to be better performers and more suitable.
- Subsets 1, 2 and 3 were viewed as potentially less suited to the industry and subsets 4, 5 and 6 potentially more suitable.

The ANOVA results when considering age, KPIs and AASP subsets are displayed in box plots and tables below, emphasising the medians and z-values.

- To ease the recording process, results were individually displayed or grouped where possible and ordered in the following manner:
    - The demographic of age is introduced.
    - The KPI sections 1 to 3, display box plots and tables of results where significance was observed in the Kruskal-Wallis Pair wise Multiple-Comparison Z-Value Test.
    - The KPI sections 4 to 7, display tables only, to illustrate the trends in median differences found, but not confirmed in the Kruskal-Wallis Pairwise Multiple-Comparison Z-Value Test.
    - Non-significant results were noted and documented.
    - Values were shaded to emphasise their significance. Where median trends were shaded, the high and low values were separated by different shades of grey.

4.9.2 ANOVA between Subsets and AGE for Site 4

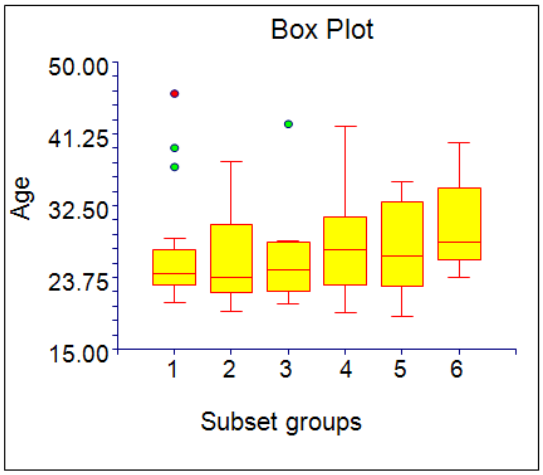

Figure 4.16: Side by Side Plot of Subsets and Age for Site 4

Table 4.42: Medians of Age across Subsets for Site 4

Subset	n	Median
1	27	24.39
2	6	23.87
3	10	24.80
4	28	27.29
5	17	26.42
6	5	28.19

- Subset 6 had the largest median *age* (28.19) and Subset 2 the smallest median age (23.87). Outliers towards the older ages were observed in Subsets 1 and 3. According to the Kruskal-Wallis Pair wise Multiple-Comparison Z-Value test (not displayed), there was no significant difference in the medians between the 6 groups.

4.9.3 ANOVAs between subsets and KPIs[62] for Site 4 with significance in z-values

4.9.3.1 ANOVA between subsets and ACTIVITY KPIs section 1 for Site 4

For this first section, *RPC (right party contact)* was measured against the subsets and results displayed in box plots and tables to show medians and z-values.

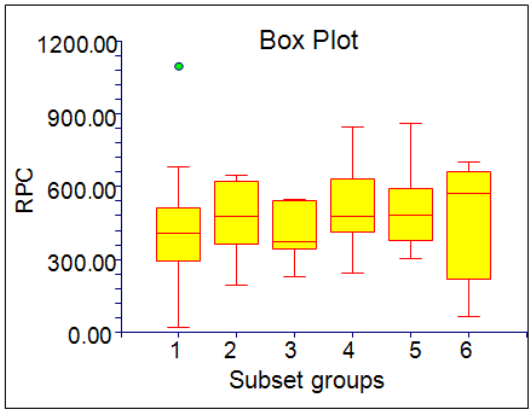

Figure 4.17: Side by Side Plot of Subsets and RPC for Site 4

Table 4.43: Medians of RPC across Subsets for Site 4

Subset	n	Median
1	27	413.33
2	6	482.07
3	10	374.00
4	28	478.79
5	17	483.50
6	5	577.43

[62]Refer to Table 3.7 (pg 80) for review of the KPI descriptions.

Table 4.44: Kruskal-Wallis Pairwise Multiple-Comparison Z-Value Test of Subsets and KPI Section 1 (RPC) for Site 4

RPC	1	2	3	4	5	6
1	0	1.123	0.212	2.309	1.733	1.163
2	1.123	0	1.134	0.257	0.062	0.098
3	0.212	1.134	0	1.903	1.543	1.177
4	2.309	0.257	1.903	0	0.281	0.116
5	1.733	0.062	1.543	0.281	0	0.059
6	1.163	0.098	1.177	0.116	0.059	0

- Subset 6 had the largest median *RPC* (577.43) and Subset 3 the smallest median RPC (374.00). Significant pair wise differences could be deduced and are marked in grey in Table 4.44 above. The difference between the smallest RPC, Group 3 and the largest RPC, Group 6 was non-significant, most likely due to the full dispersion of scores and potentially small sample size. The pair wise difference between Subset 1 and Subset 4 was significant and marked in grey in Table 4.44.

4.9.3.2 ANOVA between Subsets and ACTIVITY KPIs Section 2 for Site 4

For section 2, *Total Points Scored* (for the activity section of performance) was measured against the subsets and results displayed below:

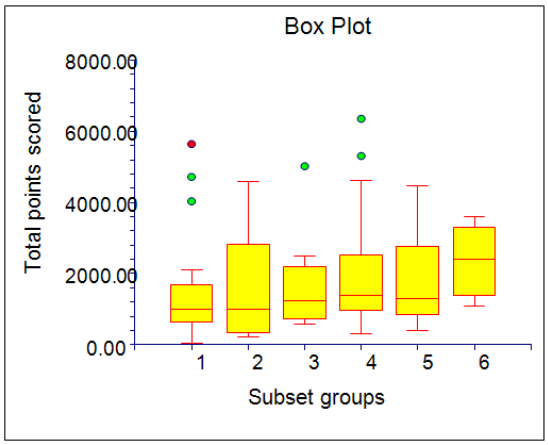

Figure 4.18: Side by Side Plot of Subsets and Total Points Scored for Site 4

Table 4.45: Medians of Total Points Scored across Subsets for Site 4

Group	n	Median
1	27	1009.5
2	6	1019.4
3	10	1247
4	28	1415.81
5	17	1321.143
6	5	2424.286

Table 4.46: Kruskal-Wallis Pairwise Multiple-Comparison Z-Value Test of Subsets and KPI Section 2 (Total Points Scored) for Site 4

Points Scored	1	2	3	4	5	6
1	0	0.020	0.83	1.661	1.049	2.085
2	0.020	0	0.612	1.016	0.703	1.691
3	0.83	0.612	0	0.382	0.044	1.292
4	1.661	1.016	0.382	0	0.401	1.168
5	1.049	0.703	0.044	0.401	0	1.356
6	2.085	1.691	1.292	1.168	1.356	0

Total points scored for the activity section was an important KPI as it provided an indication of the overall performance of the agent in the activity section. The median for Subset 1 was the smallest (1009.5) and largest for Subset 6 (2424.286). The z-value confirmed this relationship with a significant difference between Subsets 1 and 6.

For the remainder of the ANOVA results between KPIs and subsets of Site 4, a more condensed table grouping system was used to summarise results for easier review.

4.9.3.3 ANOVA between Subsets and ACTIVITY KPIs section 3 for Site 4

Section 3 considered *RPC (right party contact) %* and *RPC Points %* against the subsets and results displayed in Table 4.47.

Table 4.47: Subsets and KPIs with both Medians and Significant Z-values: Site 4

		ACTIVITY Section 3 of KPIs	
		RPC%	Points RPC %
Subset	**n**	**Median**	**Median**
1	27	25.61	25.71
2	6	25.98	26.04
3	10	18.84	18.79
4	28	27.03	27.07
5	17	29.32	29.29
6	5	30.88	31.00
z-values		z=2.006 between 3 and 4 z=2.294 between 3 and 5	z=1.960 between 3 and 4 z=2.307 between 3 and 5

- Both median and z-value significance were confirmed in *RPC%* and *Points RPC%.* Subsets 4, 5 and 6 had increasingly higher medians, suggesting more success with RPC. The z-values confirmed significant differences between Subsets 3 and 4 and Subsets 3 and 5.

4.9.4 ANOVAs between subsets and KPIs for Site 4 without significance in z-values

For the following section, the z-values, (determined by the Kruskal-Wallis Pairwise Multiple-Comparison z-Value Test) were not statistically relevant. This was most likely due to the small number of subjects in the subsets, especially observed in Subsets 2 and 6. However, the median trend observed in the performance data are displayed as it supports the subset structure development.

4.9.4.1 ANOVA between Subsets and ACTIVITY KPIs 4 for Site 4

In Section 4, *Matters worked*, *Adjusted matters worked*, *Seconds worked*, *In call connected talk*, *Out call connected talk* and *Points Talk %* were considered for subset significance and the medians displayed in Table 4.48.

Table 4.48: AASP Subsets and Activity KPIs Section 4 Medians Comparisons: Site 4

		ACTIVITY Section 4 of KPIs					
		Matters Worked	**Adjusted matters worked**	**Seconds worked**	**In Call connected talk**	**Out Call connected talk**	**Points talk %**
Subset	**n**	Median	Median	Median	Median	Median	Median
1	27	1830	1618	352148.8	6386.43	93368.57	33.00
2	6	1879	1708	348418.9	6552.06	91786.71	29.74
3	10	1919	1705	369532.7	7197.00	90288.96	31.14
4	28	1928	1646	361705.0	6384.45	109418.40	35.64
5	17	1855	1718	341902.5	8919.25	94446.57	39.14
6	5	1914	1625	371852.5	7709.75	99052.86	40.14

- As shown above; the medians were higher for Subsets 4, 5 and 6 in various patterns and shaded to draw attention. On 2 of the KPIs the medians for Subset 1 were smallest.
- The trend in the medians was not observed in: *Standard matters worked*, *Adjusted seconds worked*, *Points seconds worked*, *Talk %*, *PTP due*, *Cost on PTP created* and *failed*, and *Average score for Activity* section (not displayed).

4.9.4.2 ANOVA between subsets and ACTIVITY KPIs section 5 for Site 4

PTP failed is the only low/poor KPI displayed in this section and is demonstrated in Table 4.49.

Table 4.49: PTP Failed and Medians across Subsets for Site 4

		ACTIVITY Section 5 of KPIs
		PTP Failed
Subset	n	Median
1	27	68.142
2	6	87.857
3	10	64
4	28	82.214
5	17	69
6	5	60

- The median results showed the opposite for PTP failed, which is a *NEGATIVE indicator* for performance, low medians indicate better results for this KPI (PTP failed). This result confirmed better performance for Subset 6.

4.9.4.3 ANOVA between subsets and RESULTS KPIs section 6 for Site 4

Section 6 consisted of the *Number of first time payers*, *Number of full and final*, *Points for Number of full and final*, *Standard Number of PTPs* kept, *Adjusted Number of PTPs* kept and *Points for Number of PTPs kept* and shown below.

Table 4.50: KPIs of Results Section 6 and Medians across Subsets for Site 4

		RESULTS Section 6 of KPIs						
		No of first time payers	No of full and final	Points for no of full and final	No of PTPs kept	Standard no of PTPs kept	Adjusted no of PTPs kept	Points no of PTPs kept
Subset	n	Median	Median	Median	Median	Median	Median	Median
1	27	12.00	3.71	1.00	101.00	160.00	106.86	57.25
2	6	17.86	3.27	11.21	106.17	176.00	119.14	44.76
3	10	15.35	2.24	6.59	86.68	158.83	137.07	53.86
4	28	14.71	3.05	6.57	111.29	190.17	145.83	69.80
5	17	12.14	4.57	14.29	109.50	208.00	137.17	59.28
6	5	22.43	5.14	15.71	140.00	202.66	147.57	58.25

- The KPI medians were again higher for Subsets 4, 5 and 6 in various patterns and marked in grey. On 2 KPIs the medians for Subset 1 was smallest.

4.9.4.4 ANOVA between Subsets and RESULTS KPIs Section 7 for Site 4

Current PTPs kept, *Current PTP payment*, *Standard PTP payment*, *Adjusted PTP payment*, *Current total collections*, *Standard total collections*, *Adjusted total collections* and *Points total collections* are grouped in section 7 below.

Table 4.51: KPIs of Results Sections 2 and Medians across Subsets for Site 4

		RESULTS Section 7 of KPIs 2							
		Current PTPs kept	Current PTP payment	Standard PTP payment	Adjusted PTP payment	Current Total collections	Standard Total collections	Adjusted Total collections	Points Total collections
Subset	**n**	**Median**	**Median**	**Median**	**Median**	**Median**	**Median**	**Median**	**Median**
1	27	18602.22	252.40	331.42	285.01	30864.67	51250.00	41852.40	54.00
2	6	19083.91	294.38	346.88	320.68	23655.70	63774.11	44757.09	56.42
3	10	27149.57	278.17	380.00	363.52	30150.67	56428.57	52522.30	55.11
4	28	28762.84	269.79	332.14	298.82	33514.38	59002.48	42909.56	60.21
5	17	23805.81	290.70	342.16	262.39	37363.28	70000.00	53750.00	55.40
6	5	27465.63	348.56	470.00	446.51	48837.86	75000.00	50752.85	62.71

- The median distribution showed a tendency to be higher for Subsets 4, 5, and 6, and lower for Subsets 1 and 2.
- This was not observed in *Standard Number of first time payers*, *Adjusted Number of first time payers*, *Points Number of first time payers*, *Standard Number of full and final*, *Adjusted Number of full and final*, *Points PTP payment* and *Average score for the Results* section. The BONUS sections of KPI data did not show any significance between the medians across the 6 Subsets.

4.9.4.5 Summary of Subsets and performance results

Although the sample groups for the subsets were small, there were significant differences observed in the z-values when comparing the KPIs of Site 4 to the 6 AASP subsets. Particular data trends were observed in the medians, often showing lower medians for groups 1, 2 and 3 as opposed to higher medians for groups 4, 5 and 6. The subsets appear to have potential value with regard to performance predictions in the call centre environment, particularly with regard to outbound calling.

STAGE 4: Validation

The objective for stage 4 was to analyse the AASP and subset results of call centre managers to determine if they have a distinctive sensory profile different to those of the agents. This would provide further validation for the AASP as a recruitment tool for the call centre industry.

4.10 Predictive Validity of the AASP for the Call Centre Industry

Studying a management group who functioned as team leaders amidst the agents provided an opportunity to determine whether they had a particular sensory profile. Site 1's larger but more heterogeneous group of managers (n = 48) were less ideal to study compared to Sites 3 and 4 who only consisted of team leaders.

4.10.1 Relationship between Age of Managers and Agents: Site 1

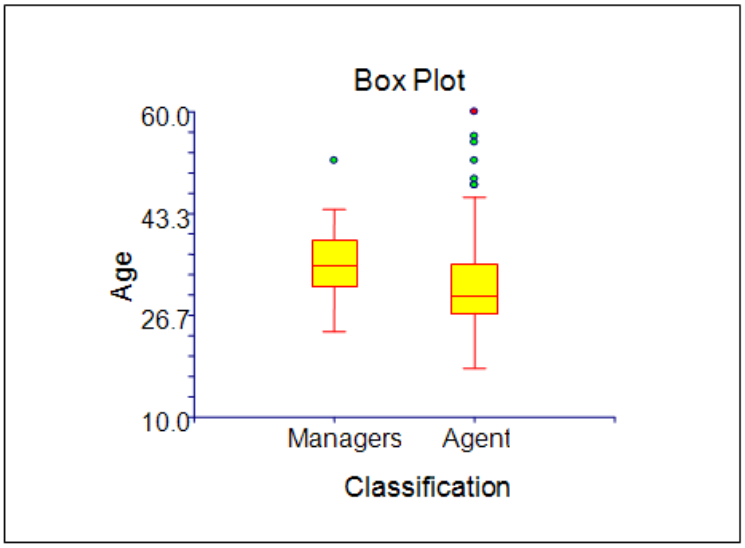

Figure 4.19: Box and Whisker Plot: Age of Managers and Agents for Site 1

Table 4.52: Descriptive Statistics of Age between Managers and Agents for Site 1

Age	Managers n = 48	Agents n = 178	
Median	35	30	
Mean	35.48	31.54	
p-value (Kruskal-Wallis)			0.00002

- As expected the age difference between agents and managers for Site 1 was significant, with managers older than agents and skewed towards the larger values. Outliers were observed towards the older ages, especially for the agent group.

4.10.2 Relationship between AASP quadrants of Managers and Agents: Site 1

Table 4.53: AASP Quadrant Scores of Managers and Agents for Site 1

	Managers n = 48	Agents n = 178	
Q1: Low Registration			
Median	32	30	
Mean	31.02	31.03	
p-value (Kruskal-Wallis)			Not significant
Q2: Sensation Seeking			
Median	49.5	50	
Mean	50.52	50.61	
p-value (Kruskal-Wallis)			Not significant
Q3:Sensory Sensitivity			
Median	36	35	
Mean	36.5	35.66	
p-value (Kruskal-Wallis)			Not significant
Q4: Sensation Avoiding			
Median	35	35	
Mean	35.5	35.75	
p-value (Kruskal-Wallis)			Not significant

- There was no significant difference between managers' and agents' AASP results on all 4 quadrant scores for Site 1.

4.10.3 Relationship between Age of Managers and Agents: Sites 3 and 4

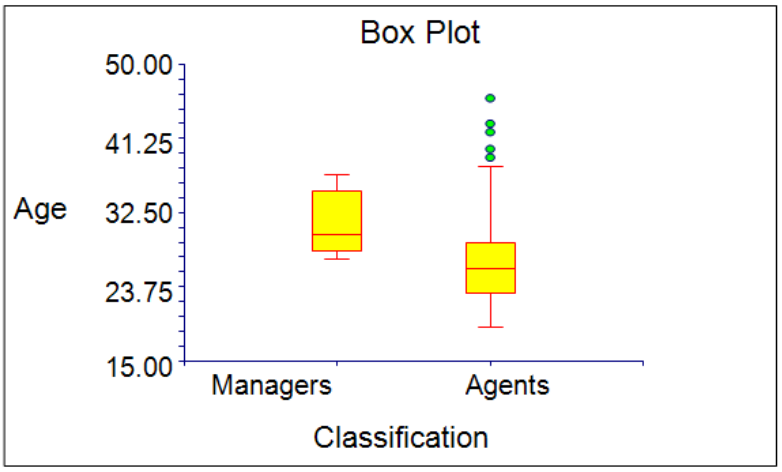

Figure 4.20: Box and Whisker Plot: Age of Managers and Agents for Sites 3 and 4

Table 4.54: Descriptive Statistics of Managers and Agents for Sites 3 and 4

Age	Managers n = 9	Agents n = 101	
Median	30	25	
Mean	31.43	27.05	
p-value (Kruskal-Wallis)			0.01088

- The age difference between agents and managers for Sites 3 and 4 was significant, with managers older than agents and the age distribution of the managers skewed towards the higher values. Outliers were observed for the agent group towards the older ages.

4.10.4 Relationship between AASP results of Agents and Managers: Sites 3 and 4

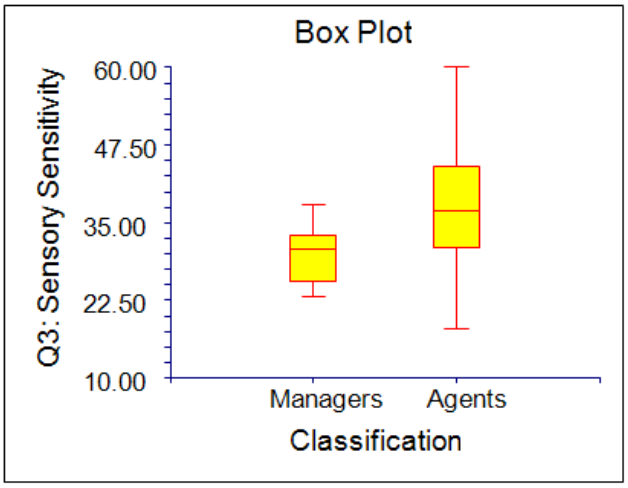

Figure 4.21: Box and Whisker Plot Q3 of Managers and Agents Sites 3 and 4

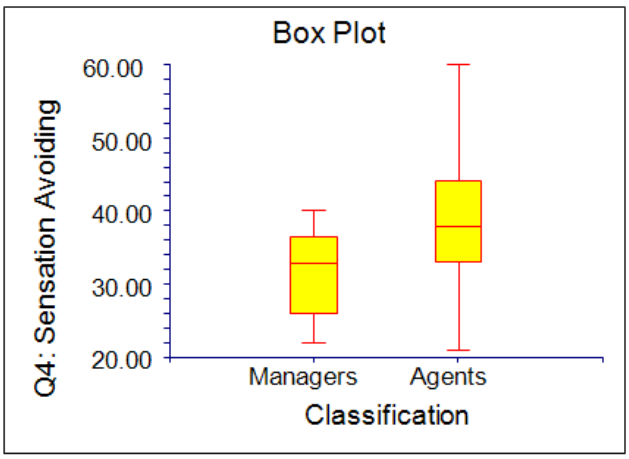

Figure 4.22: Box and Whisker plot Q4 of Managers and Agents for Sites 3 and 4

Table 4.55: AASP Scores of Managers and Agents for Sites 3 and 4

	Managers n = 9	Agents n = 101	
Q1: Low Registration			
Median	27	28	
Mean	29.78	28.79	
p-value (Kruskal-Wallis)			Not significant
Q2: Sensation Seeking			
Median	54	50	
Mean	51.44	50.69	
p-value (Kruskal-Wallis)			Not significant
Q3:Sensory Sensitivity			
Median	31	37	
Mean	30.22	37.66	
p-value (Kruskal-Wallis)			0.00981
Q4: Sensation Avoiding			
Median	33	38	
Mean	31.33	38.39	
p-value (Kruskal-Wallis)			0.01278

- There was a significant difference for AASP results between managers and agents. The managers scored lower on Q3 (Sensory Sensitivity) and Q4 (Sensation Avoiding), observed in the box plots and confirmed by the p-values. The AASP results were not significant for the high threshold Q1 and Q2 indicators. Although the medians were higher for Sensation Seeking for the manager group, this difference was not confirmed by the p-value.

4.10.5 Subset distributions for management group Sites 3 and 4

The AASP results of the managers were grouped according to the subsets, to determine any particular relationship.

Table 4.56: AASP Subset Distribution for Team Leaders Sites 3 and 4

Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6	Total
0	0	0	6	0	3	9
0%	0%	0%	67%	0%	34%	100%

- All managers (team leaders), although a small group, were in the 'more suitable' Subsets of 4 and 6. Interesting to note was the absence of any team leaders in Subset 5 (sensation seeking), possibly due to the small number of subjects in this group. Absence of managers in Subsets 1, 2 and 3 was noted.
- The subset structure for the management sample of Site 1 was not compiled as their heterogeneous assemblage has potential to confound the findings.

4.10.6 Summary

Although the sample size for this stage was small, the collective results showed the management group to have significantly lower scores on Q3 and Q4 (low thresholds) than the agents. They did not present with higher scores on Q1 and Q2. The subset configuration for the managers group was focused on Subset 4 and 6 and thus both could be regarded as suitable for the industry.

4.11 Conclusion

The findings from the four layered process of data analysis concluded sensory processing to be associated with agent performance, absenteeism and attrition as observed in the four call centres sites. The subsequent subset structure development supplied an extension for an advanced use of the multidimensionality of the AASP. Applying the subset structure to the performance data further showed its significance to deploy variations in performance ratings. A final stage confirmed team leaders promoted from high performing agent positions to have a particular sensory profile. The collective results indicated the AASP to have potential validation for call centre agent recruitment.

Chapter 5 Discussion

5.1 Introduction

Based on the multi-layered four stage framework, this chapter contains the overall interpretation and discussion of the study results aligned with the hypothesis and objectives. Interdisciplinary evidence for sensory processing as a novel application in the call centre industry was obtained by integrating the findings of this study with pertinent information from six distinct study fields. The empirical study findings and their value and contribution to the body of knowledge with respect to sensory processing and employment practices are discussed. The study strengths, limitations and stakeholder recommendations follow thereafter.

5.2 Study Purpose and Objectives

The purpose of the study was to demonstrate the value of sensory processing as a new and revolutionary human resource practice for the call centre industry. Incessant sensory stimuli paired with high stress levels are present in call centres which as a work environment can be detrimental to the performance and health of some workers. The use of sensory profiling, determining sensory processing as a neuropsychological, stable trait of individuals, may therefore be used effectively to determine the suitability for such environments. The value of this approach can enhance performance and operational profits, reduce absenteeism and attrition but also make a positive contribution to employee wellness.

Aligned with the study objectives, the relationships between sensory processing, performance, absenteeism and attrition, were explored and the following concluded based on the study findings:

- There are significant relationships between sensory processing and call centre agent performance, absenteeism and attrition as established through analysing baseline data in Stage 1.
- The Adolescent/Adult Sensory Profile (AASP) (Brown & Dunn, 2002) has predictive validity for use as a recruitment tool for call centres as established through the expanded data results of Stages 2 – 4.

While the study objectives were met, the results showed a more composite application for call centres and the potential for use not only in recruitment, but also retention and performance enhancing strategies. Additionally the study findings and principles have the

potential to be used for performance and wellness incentives in other worker settings while expanding the sensory processing and occupational therapy body of knowledge.

5.3 Literature Support and Interdisciplinary Insights

Call centres are operated fairly similarly across the world (Batt et al., 2009; Benner et al., 2007; Dimension Data, 2011; Holman et al., 2007) and regarded as stressful and emotionally exhausting workplaces (Chevalier et al., 2011) due to their unique constellations of job requirements. The impact on the workforce is renowned and can be observed in high absenteeism and attrition levels (Bain & Taylor, 2000; Hannif et al., 2008; Russell, 2008) resulting in productivity and financial losses for the industry but also impacting on worker health and wellbeing. Environment studies provided support for this by reporting the high noise levels and distractions observed in open plan office environments (De Croon et al., 2005; Rashid & Zimring, 2008; Szalma & Hancock, 2011) which impact certain individuals more than others, resulting in poor performance and reduced job satisfaction (Maher & von Hippel, 2005). Call centre and environment studies provided a clear understanding of the study problem, and an understanding of why this population merits studying. The psychology literature, where sensory processing is studied as temperament traits, provided substantive information enabling a closer comparison with sensory processing as studied in Occupational Therapy (OT). Industrial psychologists consider temperament in worker settings for performance and recruitment purposes, providing the link for occupational therapists to study sensory processing from their perspective in the call centre industry.

In order to summarise the evidence in support of the study, a multiple analysis approach was undertaken by approximating the results to identify similarities and differences. This is presented as two conceptual frameworks; “Interdisciplinary associations with sensory processing” in Figure 5.1, pg 149 (Framework A) and Figure 5.2, pg 151 (Framework B). Framework A demonstrates the associated evidence to support sensory sensitive and avoiding profiles as a high risk group as call centre workers. Framework B illustrates the associated evidence for sensation seeking sensory profiles to be the opposite; a lower risk group when employed as a call centre agent. High risk in this context is considered as lower performance and worker wellbeing with increased absenteeism and attrition, and low risk as the opposite.

The principles applied in developing the conceptual frameworks (A and B) were the following:

- Sensory processing is studied as different constructs in the temperament and OT literature, but the analysis allowed for observing the connected evidence from both fields. Sensory Sensitivity (Aron & Aron, 1997; Brown et al., 2001; Brown & Dunn, 2002) and Sensation Avoiding (Brown et al., 2001; Brown & Dunn, 2002) are grouped as low threshold sensory profiles (Brown et al., 2001; Brown & Dunn, 2002) and Sensation Seeking (Brown et al., 2001; Brown & Dunn, 2002; Zuckerman, 1994; Zuckerman & Kuhlman, 2000) to signify high threshold profiles. Low Registration was excluded due to its multidimensionality and dual position in groupings with both high and low threshold patterns. The direct relationships between sensory processing as observed through the psychology and occupational therapy fields were the focus. Indirect associations, observed in the fields of call centre, environment and chemosensory threshold evidence, were assumed and distinguished by grey highlights.
- The arrows indicate the association paths between different construct groups.
- In the temperament literature neuroticism is regarded as the opposite of emotional stability. Neuroticism is the term most used in the temperament literature, whereas emotional stability is used in the call centre and worker literature. The inverse relationship between them is considered and combined for use in the conceptual frameworks.
- Less evidence refuted the matching process for both threshold groups. These are discussed following each diagram and the implications of the results are applied for the purpose of call centre recommendation (Refer to 5.10, pg 164).

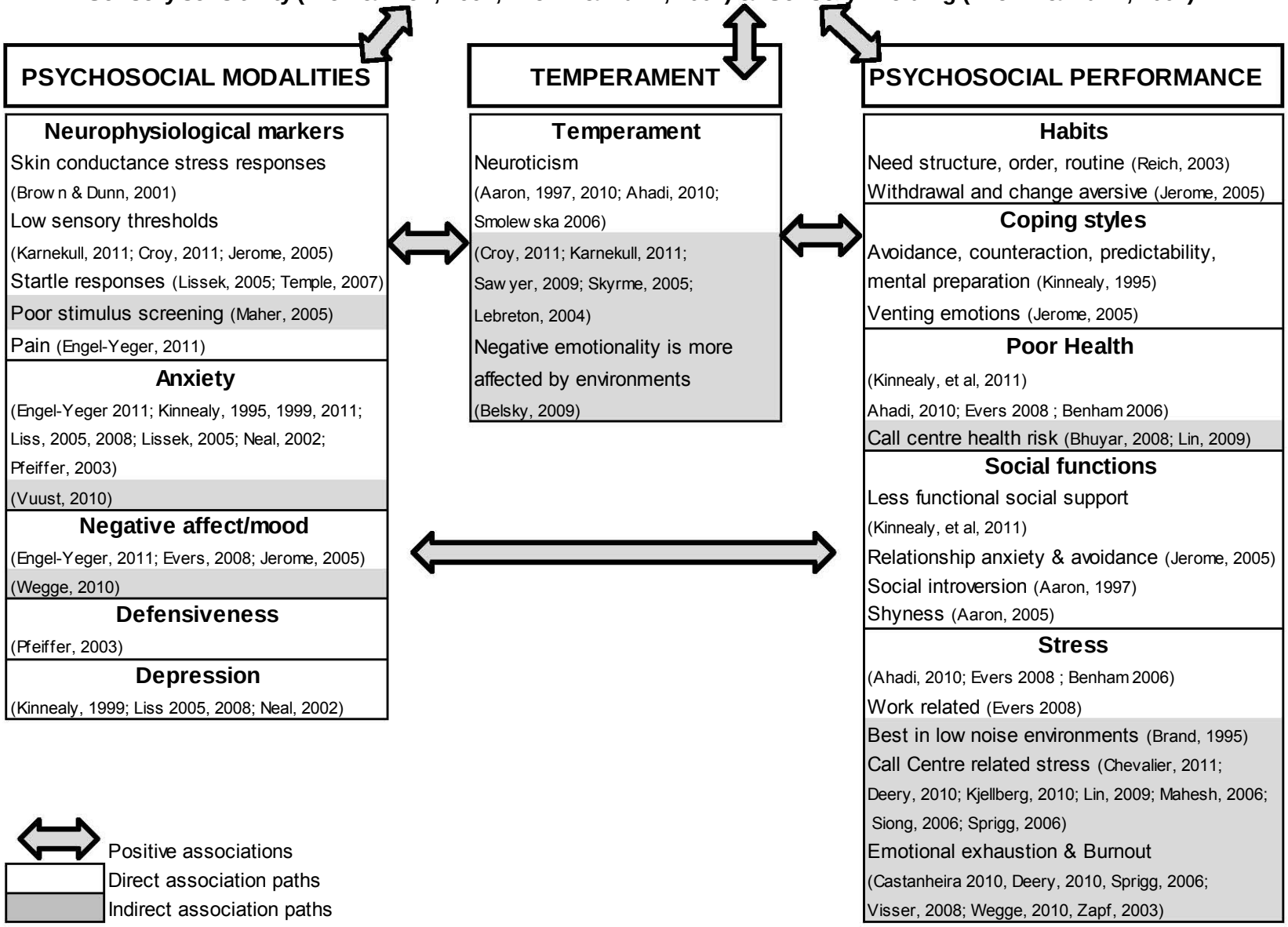

Figure 5.1: Interdisciplinary Associations with Low Thresholds as HIGH Risk Sensory Profiles for Call Centre Agents

Framework A is the culmination of the interdisciplinary evidence supporting **low threshold (sensory sensitive and sensation avoiding) profiles** as a high risk and poor match for the call centre industry. A high prevalence of anxiety, negative affect/mood, defensiveness and depression is manifested as psychosocial modalities. Neuro-physiological markers were found associated with such profiles, strengthening the evidence. Neuroticism (the opposite of emotional stability) as a temperament trait is more prevalent in this group while emotional stability was found to be the highest indicator for worker success in call centres, providing temperament trait support. The psychosocial performance of low threshold profiles was related to stress (both for work and daily life), depression, anxiety and ill-health. The applied coping styles, habits, social aversion and high stress levels paired with the documented emotional exhaustion and burnout experienced by agents in call centres, could place them at a significant health risk.

The evidence refuting the match (not displayed in the framework and therefore cited) is the associated high level of conscientiousness (Ahadi & Basharpoor, 2010) of sensory sensitive profiles, while the same trait was related to success as call centre agents (Lebreton et al., 2004; Nicholls et al., 2009; Sawyerr et al., 2009; Skyrme et al., 2005). High sensory sensitivity was also associated with attention to detail (Jagiellowicz et al., 2011; Liss et al., 2008), being open to new experiences (Ahadi & Basharpoor, 2010; Smolewska et al., 2006) and agreeableness (Croy et al., 2011).

Considering the collective evidence, the study hypothesis that sensory sensitive and avoiding individuals can become over-stimulated and stressed in a call centre environment is strongly supported. Psychosocial modalities and psychosocial performance pathways dominated in comparison to temperament findings. This suggests a stronger influence on health and wellbeing, performance, absenteeism and attrition and the associated higher risk, identifying sensory sensitive and avoiding individuals as a poor match for the call centre industry.

Figure 5.2 follows the same argument in determining the evidence that supports high threshold candidates as more suited for call centre work.

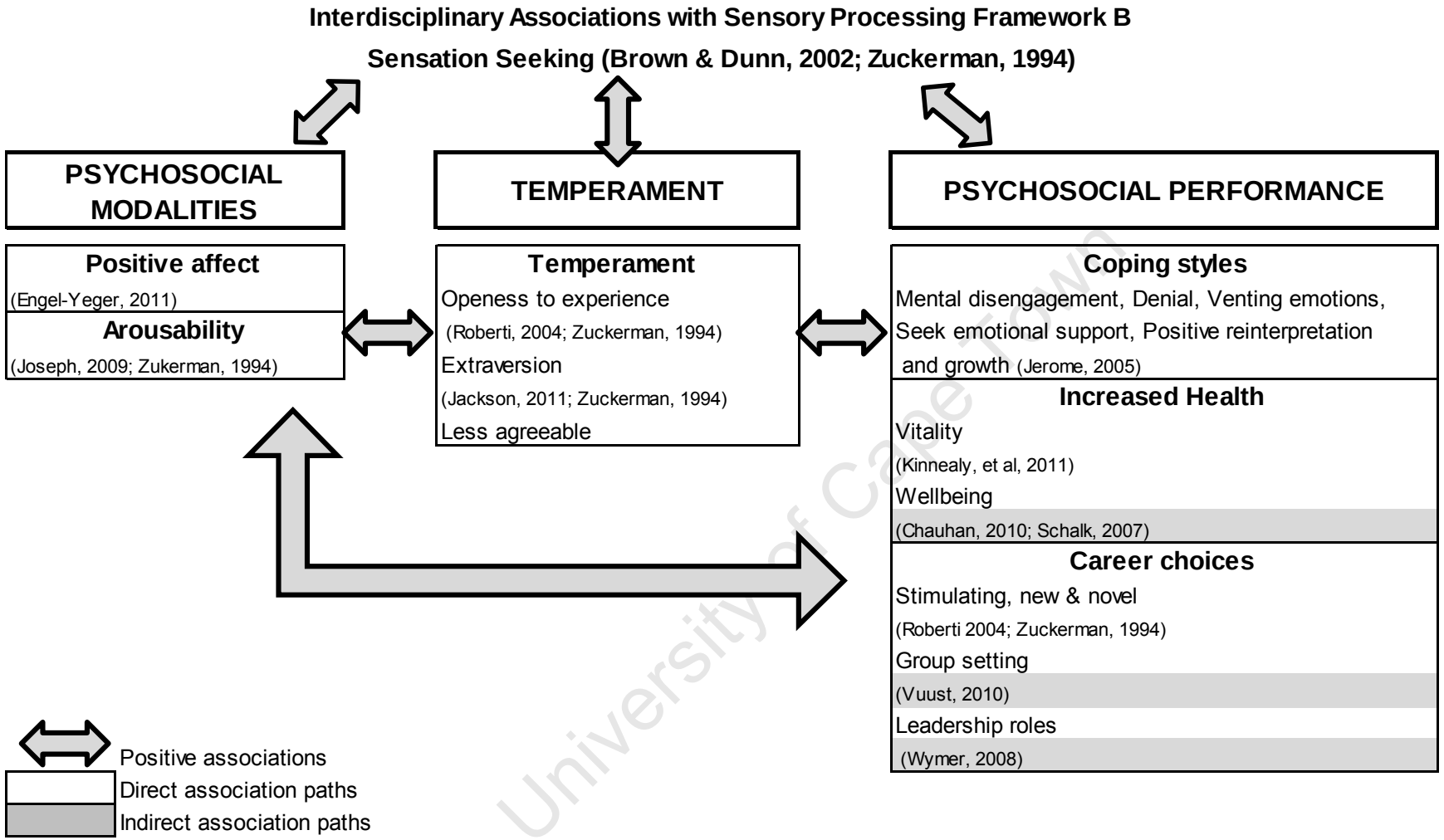

Figure 5.2: Interdisciplinary Associations with High Thresholds as LOW Risk Sensory Profiles for Call Centre Agents

Framework B culminates the interdisciplinary evidence supporting **high threshold** (**sensation seeking) profiles** as a low risk and a better match for the call centre industry.

The evidence is consistent with the inherent high arousability needs of sensation seekers and with call centres being typically busy and noisy; the environment provides continuous sensory stimuli to high threshold individuals. Positive affect associated with this group and the temperament traits of extraversion and openness to experiences increases the likelihood for their adapting to the call centre environment. With sensation seekers found to have increased health, vitality and wellbeing they might tolerate the stressful call centre environment better than the low threshold group who are more prone to stress. Their coping styles of mental disengagement, venting of emotions, seeking emotional support and positive reinterpretation can potentially be matched more easily with the call centre environment. Sensation seekers make career choices based on novel, stimulating environments in group settings and they are drawn to leadership roles, both of which can be an asset for the industry and improve the match.

The evidence refuting the match (not displayed in the framework and cited accordingly) is the high risk for substance abuse observed in this group (Kalichman, 2008; Kalichman et al., 2006; Roberti, 2004; Zuckerman, 1994) and the associated Human Immunodeficiency Virus (HIV) risk (Kalichman, 2008; Kalichman et al., 2006). This, when linked with substance abuse and explicit sexual behaviours negates the suitability of sensation seekers as call centre agents. Sensation seeking has also been associated with aggressive behaviours (Lynne-Landsman et al., 2011; Wilson & Scarpa, 2011) which can be problematic when working with clients and in groups of people. High boredom susceptibility (Jiang, 2009; Loukidou, 2009; Parmak, 2011) and inclination to change jobs, especially where high structure and low autonomy were observed, increase their attrition risk. However, with the openness to experience associated with sensation seekers considered as a success temperament in call centres this group could be stimulated, guided and coached when incorporated into varied tasks and leadership roles.

Although sensation seeking as a temperament trait has been studied for much longer than sensory sensitivity, the evidence is foremost in support of the latter, as can be observed in Figure 5.1 (pg 149) as opposed to Figure 5.2 (pg 151). Considering the evidence against the stressful and emotionally exhausting call centre industry, low threshold sensory profiles (sensory sensitivity and sensation avoiding) emerged as the high risk group for this industry. The evidence indicated a lower risk contention for high threshold sensory profiles as shown in Figure 5.2, pg 151.

5.4 Synopsis of Stage 1 Empirical Findings

After obtaining the demographics of the study sample and their Adolescent/Adult Sensory Profile bivariate distributions, the baseline data showed significant relationships between sensory processing, performance, absenteeism and attrition of call centre agents.

5.4.1 Demographics of the sample

The four study Sites are representative of the call centre industry both nationally and globally as measured against the local and global industry norms. The descriptive overview showed mostly similarities and some differences in the environment, processes and operations of the four call centres. The variations observed in the study results were interpreted against the differences between the Sites. A clear distinction was made between Sites 1 and 2 as service, inbound, captive call centres compared to Sites 3 and 4 as outbound, outsourced call centres. Site 1 was the biggest call centre with respect to surface area and Site 4 employed the largest number of agents. Site 2 had more cubicle space per person which may have helped people to feel more comfortable in their work space (Davis et al., 2011; De Croon et al., 2005). Site 3 was the smallest call centre without seat dividers but the highest team leader-agent ratio. Seat dividers can help to reduce distractions and noise (Davis et al., 2011; De Croon et al., 2005). Agents at Site 3, being the smallest call centre, and having more team leaders, however had the potential advantage of feeling part of the employment family rather than just being a number (K. Ahmad, 2011) and with more access to manager support. Site 3 and 4 played loud music while agents were working and the level of noise, distractions and activity levels were higher. Sites 3 and 4 also had different production targets in actively selling and debt collecting as opposed to the inbound calling client services at Sites 1 and 2 who waited for incoming calls. Considering the work environments and much lower salary structures in Sites 3 and 4, one can assume that these Sites had poorer working conditions and more stress. The literature provided support for the working conditions of outsourced, outbound call centres as being weaker in comparison to those of captive, inbound call centres (Gavhed, 2007; Kinnie et al., 2008; Kjellberg et al., 2010; Toomingas & Gavhed, 2008). Combining this literature evidence with the descriptive overview of the 4 Sites, it can be expected that agents in Sites 3 and 4 could potentially be more affected by the environment, perform worse and have more absenteeism and attrition than agents placed at more favourable sites.

The demographics of age showed a wider age range and the highest median age for Site 1, most probably due to the fact that this was the biggest sample and contained a group of managers. Sites 3 and 4 were similar with respect to distributional shape. Site 3

had the fewest older people. The full study sample contained a higher concentration of younger and female study participants, which is typical for the industry (Benner et al., 2007; Scholarios & Taylor, 2011).

5.4.2 Sensory profiles of the study sample

The dispersion of AASP quadrant results observed in all study participants was fairly similar. The medians for Quadrant 4 were slightly higher for Sites 3 and 4, but when compared to the cut scores of the standardisation sample (Brown & Dunn, 2002), still fell within the 'normal'/similar to most people's score range. This did not necessarily mean that this group contained a larger group of Sensation Avoiders.

The AASP data observed in all 4 study Sites showed significant and persistent similarity in bivariate correlations between Quadrants 3 and 4, Quadrants 1 and 3 and Quadrants 1 and 4. These inter-relationships between Quadrants 1 (Low Registration), 3 (Sensory Sensitivity) and 4 (Sensation Avoiding) were also observed in other studies (Bontempo, 2010; Engel Yeger, 2011; Engel-Yeger & Dunn, 2011a; Jerome & Liss, 2005; Kinnealey et al., 2011; Rieke & Anderson, 2009). The four quadrants observed in the AASP based on the model of sensory processing (Dunn, 1997) can therefore be regarded as multi-dimensional. This was the primary reason for expanding the study into a second Stage to develop six separate Subsets to observe the quadrants according to their bivariate relationships.

5.4.3 The association between AASP and performance, absenteeism and attrition of call centre agents

The overall results observed in the four study Sites were significant but not congruent across performance, absenteeism and attrition.

Each Site documented performance and absenteeism data differently through the use of advanced information technology systems which necessitated each Site's data to be analysed separately. In order to summarise the data, the association fields indicating good performance and poor performance were separated, counted and converted to a percentage score for a collective view. Associations between the AASP and poor performance indicators were more prevalent with 52 versus 27 association pairs between the AASP and good performance indicators. Considering this frequency of data association fields, the AASP presented with more evidence in support of poor performance, thus increasing its potential for use as a risk profile. The poor performance associations were more prevalent in the low threshold quadrants with Q4 (Sensation Avoiding) containing 44% of the association fields, Q1 (Low Registration) 35% and Q3

(Sensory sensitivity) a 17% allocation. Q2 (Sensation Seeking) only had 4% of poor performance indicators, making this the least indicative quadrant for poor performance. In contrast Q2 contained 59% of the good performance indicators, secondly Q3 had 19% allocation, Q1, 15% and the least associations found for Q4. The maximum associations were thus for Q4 (poor performance) and Q2 (good performance). As both these quadrants are indicative of more active profiles and more inclined to respond as a result of their thresholds, the evidence supports the face value of these quadrants as designed by Dunn (1997). Q3 had a more equal distribution of results in both good (19%) and poor (17%) performance associations. The good performance associations for Q3 were only observed in the captive, inbound industry; potentially indicate that agents with high sensory sensitivity (Q3), (the more passive profile) are better suited for the service, inbound industry.

Absenteeism was more prevalent for the Q2 in service call centre while Q3 agents were generally less absent. The boredom susceptibility of sensation seekers (Q2) (Jiang, 2009; Parmak, 2011) combined with call centre work being repetitive and structured (Bain & Taylor, 2000; Bohle et al., 2011; Castanheira & Chambel, 2010; Russell, 2008; Zapf et al., 2003) could be a contributing factor to Q2 agents being more absent. Q3 being the sensory sensitive group were the least absent which can potentially be attributed to the high level of conscientiousness (Ahadi & Basharpoor, 2010) observed in this profile in the temperament literature. Q4 (Sensation Avoiding) took more sick leave and, aligned with the literature, showed low threshold associations with poorer health (Ahadi & Basharpoor, 2010; Benham, 2006; Evers et al., 2008; Kinnealey et al., 2011), more anxiety and depression (Engel-Yeger & Dunn, 2011b; Kinnealey & Fuiek, 1999; Kinnealey et al., 1995; Kinnealey et al., 2011; Liss et al., 2005; Liss et al., 2008; Neal et al., 2002; Pfeiffer & Kinnealey, 2003).

Attrition was higher for Q2 (Sensation Seeking) agents. This was only observed in the service call centres and is supported by the literature which shows higher boredom susceptibility and this group changing jobs more often (Van Vianen et al., 2003). Attrition for Q3 (Sensory Sensitivity) was observed but only in the collections call centres. The stress, emotional exhaustion and industry pressure, grouped with their conscientiousness and sensitive nature, potentially create a need for agents to leave the industry.

Generally the literature does not make distinctions between Sensory Sensitivity (Q3) and Sensation Avoiding (Q4) but rather groups these 2 quadrants together (Brown et al., 2001; Brown & Dunn, 2002) and describes them as sensory processing sensitivity (Ahadi & Basharpoor, 2010; Aron et al., 2010; Aron & Aron, 1997; Evers et al., 2008; Jagiellowicz et al., 2011; Liss et al., 2005; Liss et al., 2008; Smolewska et al., 2006) in the

temperament literature, and as sensory over-responsivity in the OT literature (Miller et al., 2007; Schoen et al., 2008). It is however interesting to note how the performance, absenteeism and attrition results in this study differed significantly between Q3 and Q4. This supports the model of sensory processing as designed by Dunn (1997), which distinguishes between passive and active profile responses. However, the significant interrelationships between these quadrants (Q3 and Q4) observed in the baseline results necessitated consideration of their mutual function as low thresholds as well.

The combined results appear to indicate that Q2 (Sensation Seeking) agents are more suitable for outbound, outsourced sales and debt collection call centres. Q3 (Sensory Sensitivity) agents may be more suited to service, inbound call centres. This recommendation aligns well with the demographic insights of potentially lower stress levels, less pressure and better working conditions most likely associated with Sites 1 and 2, the service, inbound call centres. Generally Q4 (Sensation Avoiding) agents are deemed unsuitable for the call centre industry at large, confirming the study hypothesis. Q1 agents were mostly associated with poor performance but their dual position should be considered for full interpretation using the Subset structure, which is discussed below. Supported by the literature, Sensory Sensitive and Avoiding individuals can be regarded as unsuitable for agent work as call centres are emotionally exhausting and stressful environments (Kjellberg et al., 2010; Wegge et al., 2010).These individuals are likely to be susceptible to the environmental influences of open plan offices (Maher & von Hippel, 2005) and to stress and anxiety (Engel-Yeger & Dunn, 2011b; Kinnealey et al., 2011). Using the AASP to determine their predisposition for occupational distress and the associated health risk creates a clinical concern for matching these profiles with this type of work. Apart from being detrimental for the individual, the call centre work environment as an inappropriate placement also has the potential to create performance and financial losses for the industry.

Conversely, sensation seekers who thrive on sensory stimuli are inherently more suited to the high activity levels, sensory stimuli, distractions and arousability (Zuckerman, 1994) typical of the call centre environment. Such workers may have a reduced response to environmental stressors (Lissek, 2005; Roberti, 2004). Paradoxically, although suited to the call centre environment, the monotony and rigidity of call centre tasks, may add to boredom susceptibility of sensation seekers (Chauhan & Desai, 2010; Loukidou, 2009). The high prevalence of substance abuse reported in the call centre industry (not confirmed by evidence) paired with sensation seekers being more at risk (Hittner & Swickert, 2006; Lynne-Landsman et al., 2011; Roberti, 2004; Vuust et al., 2010) may generate an additional health risk for these agents and the topic therefore needs further consideration. However, with sensation seekers responding well to goal orientated

learning (Jackson et al., 2009; Jackson, 2011), the necessary coaching and training can provide the opportunities and insights for their career advancement and minimise the risks involved.

5.5 Synopsis of Stage 2-4 Empirical Findings

In consideration of the study objective to explore the AASP as a recruitment tool, the researcher was confronted with the complexity associated with the study instruments and the sample. As the results emerged the study expanded substantially and culminated in the 4 multi-layered stages. Stage 1 consisted of the baseline data analysis showing the strong bivariate distributions of the AASP and the relationships between sensory processing, performance, absenteeism and attrition. This was followed by the development of the six Subset structure of the AASP to account for the multi-dimensionality observed. Thereafter, the third stage applied the six Subset structure against the performance, absenteeism and attrition data to determine whether it had validation for use. Stage 4 assessed a management sample to determine whether a "best-profile" exists.

5.5.1 Subset development support

The AASP study results showed significant interrelationships between Q1, Q3 and Q4 which were also observed in other studies (Bontempo, 2010; Engel Yeger, 2011; Engel-Yeger & Dunn, 2011a; Kinnealey et al., 2011; Rieke & Anderson, 2009) but were never (according to the searched literature) explored further. The multi-dimensionality of the AASP was thus recognised and used to design the 6 Subsets, particularly to account for the complexity and dual position of Q1 (Low Registration). Q1 as a coping strategy in conjunction with high Q3 and Q4 scores (Jerome & Liss, 2005) was regarded as Subset 1. However, high Q1 scores in the absence of high Q3 and Q4 scores was regarded as Subset 6.

The multiplication rule was applied to determine that the 4 quadrant scores of the AASP, having 5 possible ordinal score categories, would result in a total of 625 score possibilities. By collapsing the score grouping (the **–** and **– –** score categories), the 625 score category possibilities were reduced to 256, making classification easier. The statistical principles of nearest neighbour and interval location were applied to group these 256 groupings into 6 Subsets. In order to form the Subsets, certain guidelines were used based on the learning from the AASP results of the study, the face value of each quadrant as designed by (Dunn, 1997) and the researcher's clinical reasoning. The Subset development also considered the call centre work environment as busy, noisy (Barnes, 2007), distracting, stressful ((Chevalier et al., 2011) with high levels of sensory stimuli.

This particular grouping was specifically developed for call centre suitability with Subset 1 as the least suitable and containing low threshold quadrant groupings of Q1, Q3 and Q4 combinations. Subset 6 was regarded as the most suitable containing high Q1 scores without high Q3 and Q4 scores. A continuum or range of threshold patterns was applied for Subsets 2, 3, 4 and 5. The Subsets indicated least suitability for Subset 1 and best suitability for Subset 6. With Subset 4 containing scores with typical or 'similar to most people' score groupings, Subsets 4 – 6 meant ranges of good suitability and Subsets 1 – 3 ranges of poor suitability for the call centre industry.

The Subset grouping, although not considered as a super or sole application, allowed for observing the quadrant groups according to their interrelationship with one another and in a potentially less multi-dimensional fashion. Another method of portraying the multidimensionality of the AASP could have been to group the results according to sensory systems (i.e. touch, auditory, movement). Although likely to be beneficial from an intervention perspective, this was not explored as a study option as the subsets based on quadrants rather than sensory systems had far more support in the literature and study findings.

In the psychology literature, the multidimensionality of sensory processing is well recognised and instrumentation has been developed accordingly. The Highly Sensitive Person Scale (HSPS), which measures sensory sensitivity (Aron & Aron, 1997) was designed as a one-dimensional construct at inception. Its one-dimensionality was questioned by various authors which led to a subsequent adaptation to a three separate subscale instrument (Smolewska et al., 2006) which seems to be the preferred method for use in research studies. The Sensation Seeking Scale (SSS-V) consists of four separate subscales (Zuckerman et al., 1980). The AASP contains four separate but related sensory processing quadrants and includes both sensory sensitivity and sensation seeking score ranges. The AASP is regarded as a well-designed instrument (see Chapter 3 , pg 64), and is widely used and popular in OT for measure sensory processing of adults. While the value of other instruments measuring sensory processing for adults in OT is acknowledged, construct validity does not necessitate the development of new tools when existing established tools could be used more diversely. As acknowledged by (Zuckerman, 2008), advancing existing standardised tools seems more reasonable than developing new tools, allowing for research efforts and resources to be directed elsewhere.

Drawing from psychology insights the Subset structure developed in this study potentially provides the necessary expansion needed to fill this gap by applying the multidimensionality of the AASP in a different way. This allowed for a more distinct

classification of the results and provided a novel and unique contribution for potential future use of the AASP.

5.5.2 Subset structure application

All Adolescent/Adult Sensory Profile results from all study sites were grouped according to the six subset groupings and compared to their respective performance and absenteeism data. Attrition data were not analysed due to small samples. The objective was to determine whether the Subsets had validity to show variations in performance results. The methodology of the Subset structure development meant that all samples were significantly reduced, and due to the small samples, only Site 4 could be used for expanded analysis.

Subsets 1, 2 and 3 comprised the low threshold groupings and hypothesised to be the groups less suited for call centre work. Q1 as a low threshold indicator was included in this group. The AASP results of agents grouped in Subsets 4, 5 and 6 as the 'typical' and higher threshold profiles were hypothesised to be more suited for call centre work. Q1 as a high threshold indicator was included in these groups.

Collectively, the analysis of the Subsets with the performance data showed that agents in Subsets 1, 2 and 3 performed more poorly than agents in Subsets 4, 5 and 6. Although the sample groupings were small, this data trend was visible in both z- and median values which confirmed the purpose that the Subsets set out to achieve. The dual position of Q1 as a high and a low threshold indicator was considered successfully dealt with in the Subset categories, and a distinction between the separate groupings was observed.

Although the Subset structure as a method to measure and predict performance in call centres is considered as preliminary and further research is needed with larger samples, there is adequate validation to support this development.

5.5.3 Manager sample

A small sample of managers, functioning as team leaders amidst agents and engaged with operational activities, was an ideal group to study. These team leaders were the best performing agents who had been promoted into leadership positions. Their AASP profiles and Subsets scores were studied to determine whether a 'best-profile' existed in order to further validate the use of sensory processing as a recruitment tool for call centre agents. This group differed from the agent group with respect to significantly lower score results for the low threshold quadrants of Sensory Sensitivity and Sensation Avoiding. Their sample contributed to the performance data insights in the low threshold group as a high risk profile (Refer to 4.10, pg 141).

5.5.4 Validation of the AASP and Subsets for recruitment purposes

Stages 3 and 4 of the study consisted of reduced sample sizes which could have potential impact on results. In the baseline data there were however consistent and significant associations to show the validity of the AASP as a recruitment tool to predict performance, absenteeism and attrition for the call centre industry. The Subset application paired with agent versus manager samples supported the AASP and Subsets for use in call centres. The reviewed literature and study results showed sensory processing to have best value when applied as a risk profile.

5.6 Value and Application of the Study

This study makes a unique and important contribution to the body of knowledge about sensory processing and worker profiling. It adds empirical support and new insights for the call centre industry and the occupational therapy profession.

The potential value of the study to the **call centre and other worker industries** is emphasised: Staff costs in the call centre industry are estimated between 60% (Dimension Data, 2011) and 70% (Holman et al., 2007) of the industries' total costs and absenteeism and attrition which are known human resource issues, escalate these associated costs. It is therefore critical for call centre decision makers to value human capital and find innovative ways to optimise the potential of their staff. This would not only benefit the industry financially but would also contribute to a much better health and wellbeing agent culture in this high stress work environment. Sensory processing is not currently considered as a recruitment, retention or performance management call centres practise and should be introduced based on these study findings. Considered best utilised as a risk profile, sensory profiling can protect prospective agents from stress and ill-health and gain profit for the industry in the form of higher performance, and less absenteeism and attrition. The study not only provides insights for call centre recruitment, but also adds information about how agents can best be best utilised to maximise their potential; this is expanded further in the study recommendations. Considering the use of temperament within the call centre situation as a human resource function, an OT contribution can provide a different, yet potentially far reaching impact. The literature also shows temperament as a contributor to worker performance, but is described as more disparate than the psychosocial functions as displayed in Figures 5.1 and 5.2.

If sensory processing holds value for predicting performance in the call centre industry, the same principles can be applied to other applications and industries. With the rapid changes in the workplace, increased stress and pressure, and focus on health and

wellness, the fundamental application of sensory processing may assist a variety of workers to be more successful and healthy.

The novel **Subset structure** development provided an expansion to the current use of the AASP and a continuum to match agents to the call centre environment, determining their level of suitability. The same principles and structure established in this study with regards to the expansion of the AASP instrument might be applied for other purposes, populations and contexts in the future. As the Subset structure in its current format has been designed for the call centre industry specifically, minor rule adaptations (Table 4.35, p.127) would be necessary for wider application. In such cases, Subsets 5 and 6 would also be switched so that the active profiles are at the end of the continuum. This could potentially be applied to other work environments and workers such as financial trading workspaces, emergency personnel, rock musicians or other busy open plan office environments, depending on a workplace analysis suggesting high levels of sensory stimuli present. The opposite however also holds potential: A match with Subset 1 indicates people who would be suited to environments that are quiet, contained and controlled, such as people who work in libraries, statisticians, and auditors, while Subset 6 (switched with 5 of the current call centre application) individuals would be best suited where workplace analysis indicates the need for stimulating, changeable and busy environments. In this format the subsets would not be primarily used as a risk profile but as a matching instrument with respect to career type and environmental choices. In such cases, different terminology for the Subset configuration would apply as shown in Table 5.1. A prerequisite for use would be initial environmental and workplace analysis to ensure optimal usage and benefit.

Table 5.1 Subset structure for general use

Number	Subset 1	Subset 2	Subset 3	Subset 4	Subset 5	Subset 6
Profile description	Low Active	Low Passive	Mixed	Medium	High Passive	High Active
Examples	Librarians, Statisticians, Auditors, Pure science researchers					Financial traders, Rock musicians, Emergency personnel

This study further **expands the sensory processing field in OT**. With the emphasis on studies within clinical paediatric populations, this novel, healthy study sample provided evidence to the value and application of sensory processing outside its original boundaries. It expands the use towards healthy worker behaviour, as sensory processing

has unique value to assist individuals with career choices, wellness strategies and stress management insights. The typical person-environment-occupation (P-E-O) approach in the occupational therapy profession provides for a much more holistic use of the study evidence. While the evidence is likely to be primarily applied for matching people optimally to a worker environment, the occupational therapy profession has an additional role for further application in order to maximise occupational performance. While observing workers in a particular environment, the occupational therapist can, apart from matching, make adaptations for the worker (i.e. wear bilateral headsets) or to the environment (i.e. change seating to a quieter corner) as an intervention strategy. This has potential to enable higher performance, successful output, to minimise risk and promote worker health. This study therefore provides an expanded scope of practise for the OT profession by applying the principles of matching, adapting or intervening from a primary health care focus in healthy worker environments. Sensory processing can therefore potentially have a greater success rate for use in call centres and paired with the P-E-O approach may provide opportunities to maximise potential for both current and prospective workers.

This study further emphasised a **strong interdisciplinary approach** by collaborating evidence between study fields. The holistic approach and consideration for evidence outside of the occupational therapy profession provided access to a wealth of information and strengthened the study, and showed that interdisciplinary corroborating evidence, supported in the occupational science literature, can benefit current and future research.

5.7 Assumptions

Certain assumptions were made at study inception which contributed to the choice of studying the call centre population and merit reviewing.

Assumption 1:
Call centres are high sensory overloaded work environments. Although no direct evidence to support 'sensory overload' was found, many studies reported the high stress , distractions and noise levels within the open plan call centres office environments. It seems reasonable that sensory overloaded can be a descriptor for such characteristics.

Assumption 2:
Call centre agents are healthy adults i.e. without any overt or chronic mental or physical illness. This remains assumed and while no obvious physical disabilities were visible, medical records of staff were not collected.

Assumption 3:

Worker health and wellness is a socioeconomic feature of commercial enterprises such as the call centre industry. Staff costs are well documented for the industry and the health and wellness industry is growing (although not reviewed extensively). Although some studies reported the health issues within call centres; this is not a focus in the industry. The call centre industry can be described as profit orientated as opposed to people orientated. It remains a challenge (in the experience of the researcher) to translate health and wellness benefits into financial profits for executive decision makers in the call centre industry. Neuroscience as a discipline may provide the platform to inform and educate the industry to be more humane and behaviour promoting in their operational approaches, in order to improve the health of workers while simultaneously gaining financial profit.

5.8 Study Strengths

- The researcher's familiarity with the AASP instrument and experience with its application enabled the development from the well-known paediatric focus into a new dimension of exploring worker behaviour. This study provides an innovative perspective on studying healthy populations at work from a sensory processing perspective. The Subset structure development, based on sound statistical extension of previously found relationships in other studies, provides a method to take advantage of the multidimensionality of the AASP and expand the use thereof.
- The performance and absenteeism data of the study were compiled through sophisticated computerised systems, likely accounting for a high accuracy rate in data and minimised the margin of error. True attrition was measured and not intent to turnover as seen in most of the call centre evidence reviewed.
- From a statistical point of view, only direct relations in study data were analysed and documented and no secondary mediation paths were explored.
- Site 4 had a large study focus and the random selection of agents applied at this Site, strengthened the results.

5.9 Study Limitations

- The use of the AASP as a main collection instrument gathered data through a self-questionnaire format could have introduced a subjective element. The AASP was also standardised in a westernised environment with a predominant Caucasian sample, potentially reducing the validity of this instrument for use in a South African context.
- Validation of the Subset structure had to contend with small sample sizes, reducing the power of the relationships found.

- Access to the call centre agents and records were limited due to the call centre staff's work environment, their pressured schedules, and their productivity expectations. Other potential variables of agents (personal details, work history, skills, knowledge, experience, training quality and motivation) were not considered, all of which may have had an impact on worker performance.
- As a researcher in South Africa, not employed by an academic institution, undertaking this research meant functioning in isolation without the support of colleagues who were doing similar work. A lack of access to funding opportunities translated into restrictions of sample size and geographical areas, and also meant that the study took longer to complete than anticipated.

5.10 Recommendations

5.10.1 For the OT field

This study expanded on the adult sensory processing literature, and normalised its application, by considering its impact on occupational behaviour at work. Although remaining embedded in the medical roots of the profession, OT can maximise worker potential in modern non-traditional work environments to keep pace with worker and employer imperatives. The study provided empirical evidence for the possibilities and opportunities of expanding the scope of OT practise into other settings outside of clinical applications.

5.10.2 For the call centre industry

This study provided a unique, novel and advanced methodology to optimise current and future workers suitability for the call centre industry, both locally and internationally:

- The AASP (Brown et al., 2001; Brown & Dunn, 2002) should be introduced as part of recruitment practises as it holds value for both the industry and its workers.
- The correct use and resourcing of agents based on their sensory profiles could contribute to personal and industrial success, sustaining both profits and improving occupational health. The recommendations below may provide useful retention strategies to ensure sustained high performance and success for agents.
- An evaluation of work demands and operational parameters is suggested for call centres to optimise the profiling results. It has the potential to use the recommendations and accommodations best as set out below.

    - High threshold, sensation seekers, should be stimulated by being given more authority and variation of tasks. Multi-skilling is another strategic focus for the

industry (Dimension Data, 2011), and training agents to perform different roles and types of tasks, would provide the variations that sensation seekers need. They are typically more suited for outbound positions and should be considered sooner for career path options in order to generate new challenges. Initial and on-going training programmes using a goal orientated style to inform these agents of substance abuse health risks is suggested.

- Low threshold, sensation avoiders could potentially be well suited for home-working or quality assurance positions as both entail more contained, familiar and quiet environments. They also have the potential to do well in data capturing or back office environments, which are more contained, routinised and detail orientated. Conversely, these positions would be less suited to sensation seekers.

- Considerations for use of physical workspace and electronic equipment could further provide best-fit scenarios for agents. Sensation seekers could potentially be best seated in the middle of open plan office clusters whereas sensation avoiders (if they are employed) might work better in corner positions where less distractions are likely to occur. Bilateral headsets for sensation avoiders could assist in blocking out excessive noise and distractions but sensation seekers might prefer unilateral headsets to be stimulated by the environment at the same time. Workplace and environmental analysis is suggested for further contribution towards achieving best-fit positions in order to consider other environmental factors (i.e. temperature, density, walkways, etc.).
- All call centre staff should have access to chill rooms or pause/rest areas, separate to cafeterias, to supply them with the necessary time and space to take a break and de-stress. Considering the characteristics, pressures and stress of call centre work, chill areas can be incorporated as a wellness incentive.

5.10.3 For further research

The Subset development provided preliminary yet significant evidence to distinguish the multidimensionality of the AASP successfully. Further studies to support the subsets, and the alternative use thereof, is recommended. Sensory processing studies in OT, considering single dimensions and confirmed by laboratory studies, may provide further fundamental support for the profession.

No studies were found which combined the AASP, Highly Sensitive Person Scale (HSPS), (measuring sensory sensitivity) and/or, Sensation Seeking Scale (SSS),(measuring

sensation seeking). Due to the rich data available in all 3, a combination study would be useful and make evidence more widely available.

Future adult studies for the call centre industry could enhance results by using multiple-sourced measures in particular recruitment and staff wellness categories. OT studies in healthy worker applications can expand the scope of practise significantly.

The neuroscience literature provides a wealth of opportunities to explore sensory processing in associative biomarker capacity for healthy adults and merit further exploration.

5.11 Conclusion

This study took sensory processing in occupational therapy to a new dimension and application in a role emerging practice context. It provided empirical evidence that sensory processing is associated with performance, absenteeism and attrition and can be utilised as a valuable staff recruitment and retention strategy for the call centre industry. The study also emphasises the unique contribution of an occupational therapist to both call centre and other worker industries by using sensory processing more diversely to predict worker success, health and wellbeing.

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Appendix A: Ethical Approval

UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Research Ethics Committee
Room E53-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: preaward@curie.uct..ac.za

27 October 2005

REC REF: 289/2005

Mrs A Lombard
34 Melina Street
Rosendal
7530

Dear Mrs Lombard

PROJECT TITLE: THE EFFECT OF SENSORY PROCESSING ON THE PERFORMANCE OF CALL CENTRE AGENTS IN THE SOUTH AFRICAN CONTEXT

Thank you for your letter to the Research Ethics Committee, dated 24 October 2005.

It is a pleasure to inform you that the Ethics Committee has **formally approved** the above-mentioned study on the 26 October 2005.

Your comments to the queries raised are noted with thanks.

Please quote the REC. REF in all your correspondence.

Yours sincerely

Signed by candidate

PROF T. ZABOW
CHAIRPERSON

lemjedi

UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
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28 April 2009

REC REF: 289/2005

Mrs A Lombard
34 Melina Street
Rosendal
7530

Dear Mrs Lombard

PROJECT TITLE: THE EFFECT OF SENSORY PROCESSING ON THE PERFORMANCE OF CALL CENTRE AGENTS IN THE SOUTH AFRICAN CONTEXT

Thank you for your letter to the Research Ethics Committee dated 18 March 2009.

Approval is granted to extend recruitment to include a further 200 participants.

Please note that research projects now require annual progress reports. The study is approved until 30 April 2010. Please submit an annual progress report before expiry of the approval period.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

lemjedi

Appendix B: Call Centre Management Informed Consent

ANNEMARIE LOMBARD
OCCUPATIONAL THERAPIST
B. OT (STELLENBOSCH) ● HPCSA Reg no: OT 17043 ● Practice no: 6606008
34 Melina Street, Rosendal, 7530
Phone (office) 084 661 1010 ● Phone (home) 919 6339
e-mail lombard@sensoryintelligence.co.za

CALL CENTRE MANAGEMENT INFORMED CONSENT

I am a PhD student and request your permission and cooperation for the collection of information needed in the study of Call Centre Agent's Sensory Profiles. Agents will be asked to complete a standardised questionnaire and their responses then used to gain insight into the role of sensory processing in individual agent's work performance. All research findings will be treated as anonymous and both agent and company details will not be publicised in any way. The researcher agrees to act in an ethical and professional manner and undertakes to impact on company and agent's time and energy as little as possible. The personal profile data of agents will not be made available to management in order to protect the ethical rights of the study participants. Instead you will receive a data report for which a non-identifiable numbering system will be used.

Management is asked to make an Internet online facility available to participating agents in order for them to complete the Adult Sensory Profile at a time that is suitable for call centre staff and management. Since all collected information will be regarded as confidential, management will not benefit directly from this particular research process. However, the outcome of the research will add additional data to the current results, allow for validity testing, and benefit the call centre industry at large. Management is requested to assist with the following:

- The sampling process so as to ensure a representative sample.
- To ask all the agents who are chosen through the sampling process to complete an informed consent form. Agents will be free to either participate or not. This decision must not impact on their job security in any way.
- Allow agents to complete the Adult Sensory Profile on line with the use of secure user names and passwords that ensure anonymity; the researcher will supply both of these.

- Make performance rating findings, absenteeism and attrition data available to the researcher. These will be used to correlate the agent's performance with their sensory profiles.

As a representative of management for _____ please will you give consent to Annemarie Lombard, PhD student, UCT to collect information about your call centre and to gain access to the call centre agents who work for you? If you agree kindly complete the following section.

Date: _____
Name: _____
Position: _____
Company name: _____
Company address: _____
_____
_____
Phone number and contact details: _____
Department: _____

Please specify the business processes within the contact centre:

Type of call centre: _____
Available Seats: _____
Filled Seats: _____
Inbound: _____
Outbound: _____
Back office: _____
Front office: _____
IT: _____
Other: _____

AGREED:
Name of Company: _____Researcher: Annemarie Lombard

Name of Manager: _____

Signature: _____Signature: _____

Date: _____ _____

Appendix C: Participant Informed Consent

ANNEMARIE LOMBARD
OCCUPATIONAL THERAPIST
B. OT (STELLENBOSCH) ● HPCSA Reg no: OT 17043 ● Practice no: 6606008
34 Melina Street, Rosendal, 7530
Phone (office) 084 661 1010 ● Phone (home) 919 6339
e-mail lombard@sensoryintelligence.co.za

INFORMED CONSENT FORM FOR STUDY PARTICIPANTS:

INFORMATION SHEET:

Research title:

The effect of sensory processing on the work performance of call centre agents in the South African context

Researcher:

Annemarie Lombard, 34 Melina Street, Rosendal, 7530, phone number: 084 661 1010, lombard@sensoryintelligence.co.za

Supervisors:

Ms M Duncan & Prof. R. Watson &, University of Cape Town, phone number: 021-4066325. Dr. Theunis Kotze, consulting statistician, phone number: 021-9192807.

Dear Call Centre Agent

OCCUPATIONAL THERAPY RESEARCH PROJECT IN CALL CENTRES:

Your company has agreed to participate in a research project. I will test the effect of sensory processing on performance within a call centre environment. Sensory processing is the way our brains and bodies take in messages from our senses (sight, hearing, taste, smell, touch and movement) and how we respond as a result of this.

Your participation in this project is much appreciated and essential for providing information about the impact of the sensory environment in the call centre on the functioning and well being of agents. Your participation is completely voluntary and all information will be regarded as anonymous and confidential. No individual results will be made available to management. Your work and job security will not be affected in any way by participating or refusing to participate in the research study. Should you agree to participate:

1. You will be asked to complete a 60-point sensory profile questionnaire on line, which will take about 15-20 minutes. The computer equipment will be made available for you and the questionnaire will be completed during work hours. A log in sheet with detail will be provided to assist you. Please ensure that you complete all questions.
2. Your performance measurements on the sensory profile questionnaire will be submitted to the researcher for analysis.
3. The researcher (Annemarie Lombard) will manage the results of your sensory profile anonymously.
4. Should you have any questions or queries at any time during this process, you would be free to contact the researcher (see details above). Should you wish to withdraw from the project at any time, you are welcome to do so. This will not affect your position at work in any way.
5. As a participant in this research you will not receive any financial and/or other remuneration for participating.

If you agree to participate please would you indicate this by completing the consent form below.

With sincere thanks

Signed by candidate

_____

Annemarie Lombard, Occupational Therapist
Phone: 084 661 1010, lombard@sensoryintelligence.co.za

CONSENT REQUEST:

Do you consent to participate in the mentioned research project and complete the Adult Sensory Profile which will be used for analysis in our research?

☐ YES

☐ NO

Name: _____

Signature: _____

Date: _____

Appendix D: Adult/Adolescent Sensory Profile (AASP)

ADOLESCENT/ADULT

SENSORY PROFILE™

Catana Brown, Ph.D., OTR, FAOTA
Winnie Dunn, Ph.D., OTR, FAOTA

Self Questionnaire

Name: _____ Age: _____ Date: _____

Birthdate: _____ Gender: ☐ Male ☐ Female

Are there aspects of daily life that are not satisfying to you? If yes, please explain. _____

_____

_____

_____

INSTRUCTIONS

Please check the box that **best** describes the frequency with which you perform the following behaviors. If you are unable to comment because you have not experienced a particular situation, please draw an X through that item's number. Write any comments at the end of each section.

Please answer all of the statements. Use the following key to mark your responses:

ALMOST NEVER	When presented with the opportunity, you **almost never** respond in this manner (about 5% or less of the time).
SELDOM	When presented with the opportunity, you **seldom** respond in this manner (about 25% of the time).
OCCASIONALLY	When presented with the opportunity, you **occasionally** respond in this manner (about 50% of the time).
FREQUENTLY	When presented with the opportunity, you **frequently** respond in this manner (about 75% of the time).
ALMOST ALWAYS	When presented with the opportunity, you **almost always** respond in this manner (about 95% or more of the time).

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Item		A. Taste/Smell Processing	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	1	I leave or move to another section when I smell a strong odor in a store (for example, bath products, candles, perfumes).					
	2	I add spice to my food.					
	3	I don't smell things that other people say they smell.					
	4	I enjoy being close to people who wear perfume or cologne.					
	5	I only eat familiar foods.					
	6	Many foods taste bland to me (in other words, food tastes plain or does not have a lot of flavor).					
	7	I don't like strong tasting mints or candies (for example, hot/cinnamon or sour candy).					
	8	I go over to smell fresh flowers when I see them.					

Comments

Item		B. Movement Processing	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	9	I'm afraid of heights.					
	10	I enjoy how it feels to move about (for example, dancing, running).					
	11	I avoid elevators and/or escalators because I dislike the movement.					
	12	I trip or bump into things.					
	13	I dislike the movement of riding in a car.					
	14	I choose to engage in physical activities.					
	15	I am unsure of footing when walking on stairs (for example, I trip, lose balance, and/or need to hold the rail).					
	16	I become dizzy easily (for example, after bending over, getting up too fast).					

Comments

Item		C. Visual Processing	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	17	I like to go to places that have bright lights and that are colorful.					
	18	I keep the shades down during the day when I am at home.					
	19	I like to wear colorful clothing.					
	20	I become frustrated when trying to find something in a crowded drawer or messy room.					
	21	I miss the street, building, or room signs when trying to go somewhere new.					
	22	I am bothered by unsteady or fast moving visual images in movies or TV.					
	23	I don't notice when people come into the room.					
	24	I choose to shop in smaller stores because I'm overwhelmed in large stores.					
	25	I become bothered when I see lots of movement around me (for example, at a busy mall, parade, carnival).					
	26	I limit distractions when I am working (for example, I close the door, or turn off the TV).					

Comments

Item		D. Touch Processing	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	27	I dislike having my back rubbed.					
	28	I like how it feels to get my hair cut.					
	29	I avoid or wear gloves during activities that will make my hands messy.					
	30	I touch others when I'm talking (for example, I put my hand on their shoulder or shake their hands).					
	31	I am bothered by the feeling in my mouth when I wake up in the morning.					
	32	I like to go barefoot.					
	33	I'm uncomfortable wearing certain fabrics (for example, wool, silk, corduroy, tags in clothing).					
	34	I don't like particular food textures (for example, peaches with skin, applesauce, cottage cheese, chunky peanut butter).					
	35	I move away when others get too close to me.					
	36	I don't seem to notice when my face or hands are dirty.					
	37	I get scrapes or bruises but don't remember how I got them.					
	38	I avoid standing in lines or standing close to other people because I don't like to get too close to others.					
	39	I don't seem to notice when someone touches my arm or back.					

Comments

Item		E. Activity Level	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	40	I work on two or more tasks at the same time.					
	41	It takes me more time than other people to wake up in the morning.					
	42	I do things on the spur of the moment (in other words, I do things without making a plan ahead of time).					
	43	I find time to get away from my busy life and spend time by myself.					
	44	I seem slower than others when trying to follow an activity or task.					
	45	I don't get jokes as quickly as others.					
	46	I stay away from crowds.					
	47	I find activities to perform in front of others (for example, music, sports, acting, public speaking, and answering questions in class).					
	48	I find it hard to concentrate for the whole time when sitting in a long class or a meeting.					
	49	I avoid situations where unexpected things might happen (for example, going to unfamiliar places or being around people I don't know).					

Comments

Item		F. Auditory Processing	ALMOST NEVER	SELDOM	OCCASIONALLY	FREQUENTLY	ALMOST ALWAYS
	50	I hum, whistle, sing, or make other noises.					
	51	I startle easily at unexpected or loud noises (for example, vacuum cleaner, dog barking, telephone ringing).					
	52	I have trouble following what people are saying when they talk fast or about unfamiliar topics.					
	53	I leave the room when others are watching TV, or I ask them to turn it down.					
	54	I am distracted if there is a lot of noise around.					
	55	I don't notice when my name is called.					
	56	I use strategies to drown out sound (for example, close the door, cover my ears, wear ear plugs).					
	57	I stay away from noisy settings.					
	58	I like to attend events with a lot of music.					
	59	I have to ask people to repeat things.					
	60	I find it difficult to work with background noise (for example, fan, radio).					

Comments

Summary Score Sheet

Quadrant Grid

Instructions: Transfer from the *Self Questionnaire* the item raw score that corresponds with each item listed (refer to the *User's Manual* for directions on how to obtain item raw scores). Add the Raw Score column to get the Quadrant Raw Score Total for each quadrant.

QUADRANT 1	
Low Registration	
Item	Raw Score
3	
6	
12	
15	
21	
23	
36	
37	
39	
41	
44	
45	
52	
55	
59	
Quadrant Raw Score Total	

QUADRANT 2	
Sensation Seeking	
Item	Raw Score
2	
4	
8	
10	
14	
17	
19	
28	
30	
32	
40	
42	
47	
50	
58	
Quadrant Raw Score Total	

QUADRANT 3	
Sensory Sensitivity	
Item	Raw Score
7	
9	
13	
16	
20	
22	
25	
27	
31	
33	
34	
48	
51	
54	
60	
Quadrant Raw Score Total	

QUADRANT 4	
Sensation Avoiding	
Item	Raw Score
1	
5	
11	
18	
24	
26	
29	
35	
38	
43	
46	
49	
53	
56	
57	
Quadrant Raw Score Total	

SCORE KEY	
1	Almost Never
2	Seldom
3	Occasionally
4	Frequently
5	Almost Always

ICON KEY	
	Low Registration
	Sensation Seeking
	Sensory Sensitivity
	Sensation Avoiding

Quadrant Summary

Instructions: Choose the appropriate Quadrant Summary Chart and then transfer the Quadrant Raw Score Total from the previous page to the corresponding Quadrant Raw Score Total box. Plot these totals by marking an X in the appropriate classification column (Much Less than Most People, Less than Most People, etc.).*

Quadrant Summary Chart for Ages 11–17

Quadrant	Quadrant Raw Score Total	Much Less Than Most People	Less Than Most People	Similar To Most People	More Than Most People	Much More Than Most People
		– –	–	=	+	+ +
1. Low Registration	/75	15 ---- 18	19 ---- 26	27 ---- 40	41 ---- 51	52 ---- 75
2. Sensation Seeking	/75	15 ---- 27	28 ---- 41	42 ---- 58	59 ---- 65	66 ---- 75
3. Sensory Sensitivity	/75	15 ---- 19	20 ---- 25	26 ---- 40	41 ---- 48	49 ---- 75
4. Sensation Avoiding	/75	15 ---- 18	19 ---- 25	26 ---- 40	41 ---- 48	49 ---- 75

*Classifications are based on the performance of individuals without disabilities ($n = 193$).

Quadrant Summary Chart for Ages 18–64

Quadrant	Quadrant Raw Score Total	Much Less Than Most People	Less Than Most People	Similar To Most People	More Than Most People	Much More Than Most People
		– –	–	=	+	+ +
1. Low Registration	/75	15 ---- 18	19 ---- 23	24 ---- 35	36 ---- 44	45 ---- 75
2. Sensation Seeking	/75	15 ---- 35	36 ---- 42	43 ---- 56	57 ---- 62	63 ---- 75
3. Sensory Sensitivity	/75	15 ---- 18	19 ---- 25	26 ---- 41	42 ---- 48	49 ---- 75
4. Sensation Avoiding	/75	15 ---- 19	20 ---- 26	27 ---- 41	42 ---- 49	50 ---- 75

*Classifications are based on the performance of individuals without disabilities ($n = 496$).

Quadrant Summary Chart for Ages 65 and older

Quadrant	Quadrant Raw Score Total	Much Less Than Most People	Less Than Most People	Similar To Most People	More Than Most People	Much More Than Most People
		– –	–	=	+	+ +
1. Low Registration	/75	15 ---- 19	20 ---- 26	27 ---- 40	41 ---- 51	52 ---- 75
2. Sensation Seeking	/75	15 ---- 28	29 ---- 39	40 ---- 52	53 ---- 63	64 ---- 75
3. Sensory Sensitivity	/75	15 ---- 18	19 ---- 25	26 ---- 41	42 ---- 48	49 ---- 75
4. Sensation Avoiding	/75	15 ---- 18	19 ---- 25	26 ---- 42	43 ---- 49	50 ---- 75

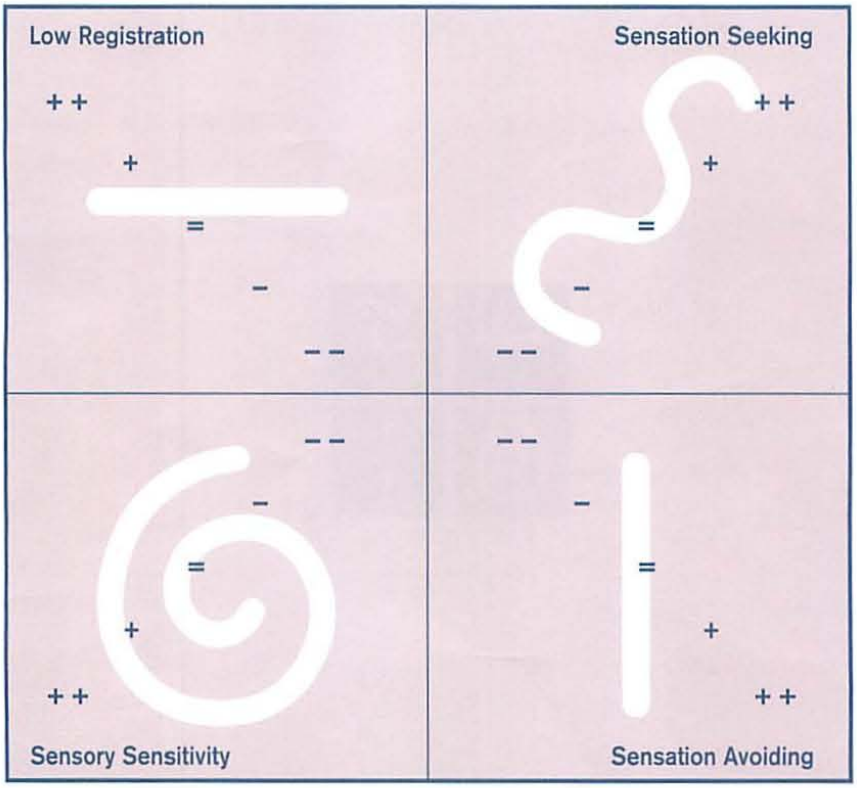
*Classifications are based on the performance of individuals without disabilities ($n = 261$).

Quadrant Profile

Instructions: Transfer the information from the classification columns of the Quadrant Summary Chart (the areas marked with an X) to the Quadrant Profile. Circle the classification symbol in each quadrant below that corresponds with the classification information for that quadrant. Finally, check the appropriate age box.

The following symbols are used to represent the classifications on the Quadrant Profile:

- – – Much Less Than Most People
- – Less Than Most People
- = Similar to Most People
- + More Than Most People
- + + Much More Than Most People



See chapter 5 for more information regarding interpretations and intervention.

Check the correct age:

- ☐ 11–17 years
- ☐ 18–64 years
- ☐ 65 years and older

Appendix E: Sensory Overload Risk Assessment Rating

Sensory overload refers to the amount of noise, artificial lighting, clutter, people, activity, smells and crowds in our immediate environment. In any work situation we are exposed to stimulation through the senses that can be intense, frequent, fast and long lasting. We all experience sensory overload in various ways, forms and intensity. This sensory overload risk assessment rating has been established to measure individuals' responses to sensations within the work environment.

Circle the number that corresponds with the level of your sensory comfort/discomfort: Please add any further information in the comment section.

NAME:_____SUBJECT NUMBER: _____

DATE: _____

A: AUDITORY (hear)					
1 Not noisy at all, it is calm and quiet, I feel my environment is noisy less than 5% of the time	2 Very little noise in my experience, I feel my environment is noisy about 25% of the time	3 I am experiencing a fair amount of noise in my environment, about 50% of the time	4 I am experiencing a lot of noise in my environment, about 75% of the time	5 Extremely noisy, I feel my environment is noise polluted 95% and/or more of the time	Comments
B: VISUAL (see)					
1 Visual input fine, I am not bothered by any clutter, people, colour, objects or equipment, my visual environment bothers me less than 5% of the time	2 My visual environment is tranquil and free of too much clutter, colour, objects, equipment and bothers me very little for about 25% of the time	3 I am bothered a fair amount by my visual environment and experience 50% of discomfort from too much clutter, colour, objects and equipment	4 I am bothered a lot by my visual environment and experience 75% of discomfort from too much clutter, colour, objects and equipment	5 Too much input – clutter, people, colour, objects, equipment, around me that tends to overwhelm me 95% and/or more of the time, my eyes often feel it "hurt"	Comments

C: TACTILE (touch)					
1 I have adequate space around me and never feel squashed in by others, I am uncomfortable with others close to me less than 5% of the time	2 I have adequate space around me and seldom feel squashed in by others, I am uncomfortable with others close to me about 25% of the time	3 I feel squashed and caged-in by others around me and experience discomfort a for about 50% of the time	4 I feel squashed and caged-in by others around me quite a lot for about 75% of the time and often need to get up and move away	5 Too many people around me shuffling, touching, I feel caged- in 95% and/or more of the time, and often get up to take a break to get away	Comments
D: SMELL					
1 Smells in my environment bother me for less than 5% of the time	2 Smells in my environment bother me very little for about 25% of the time	3 Smells in my environment bother me for a fair amount of time, about 50% of the time	4 Smells in my environment bother me quite a lot for about 75% of the time	5 Very smelly, I often smell odours that overwhelm and bother me 95% and/or more of the time	Comments
E: MOVEMENT					
1 I can move - up, down, use stairs, escalators and bend down with only 5% or less dizziness and/or discomfort	2 I can move – up, down, use stairs, escalators and bend down with only a mild degree 25% of dizziness and/or discomfort	3 I move – up, down, use stairs, escalators and lifts and bend down with a fair amount 50% of dizziness and/or discomfort	4 I experience a lot of discomfort and dislike to move – up, down, use stairs, escalators and lifts and bending down 75% of the time	5 I dislike movement, and get dizzy from moving, bending or using stairs, escalators and avoid it 95% and/or more of the time	Comments
F: MULTI-SENSORY					
1 My environment is calm and harmonious and I only experience sensory overload 5% of the time	2 My environment is calm and harmonious and I experience mild feelings of sensory overload which bothers me 25% of the time	3 My environment tends to be fairly busy and hectic and I experience feelings of sensory overload which bothers me 50% of the time	4 My environment is very busy, noisy and full and I experience feelings of sensory overload which overwhelms me 75% of the time	5 My environment is too busy, noisy, full and I experience feelings of sensory overload which overwhelms me 95% and more of the time	Comments

Thank you!

Scoring:

A: _____

B: _____

C: _____

D: _____

E: _____

F: _____

Total: _____

Score Distribution:

0_____5; 6_____10; 11_____15; 16_____20; 21_____25; 26_____30.

None Slightly Mild Significant Extensive Severe

Appendix F: Demographic and Personal Questionnaire

The following questionnaire has the purpose of establishing further information regarding your work preferences and personal background. Please note that this information will be regarded as confidential.

Please complete the following questionnaire by marking the appropriate blocks that most closely refer to you:

Date: _____ Questionnaire/Subject Number: ☐

1. Name of agent: _____

2. Job description: 1 □ *Agent*; 2 □ *Supervisor;* 3 □ *Manager*; □ *Other*

3. Type of work: 1 □ *Inbound;* 2 □ *Outbound;* 3 □ *Both*

4. Type of process: 1 □ *Front office;* 2 □ *Back office;* 3 □ *Both*

5. Date of birth: _____

6. Age: 1 □ *16- 20*; 2 □ *21-25;* 3 □ *26-30;*4 □*31-35;*
5 □ *36-40;* 6 □ *41-45;* 7 □ *46 and older*

7. Gender: 1 □ *Male;* 2 □ *Female*

8. Race: 1 □ *Black;* 2 □ *Coloured;* 3 □ *Asian ;* 4 □ *White*

9. Education level: Grade completed at school: 1 □ Grade *10 and lower;*
2 □ *Grade 11;* 3 □ *Grade 12*
Post-graduate education: 4 □ *Technikon diploma;*
5 □ *University bachelor degree*; 6 □ *University masters degree*

10. Contract: 1 □ *Temporary staff*; 2 □ *Permanent staff*

11. Employment start date: Date: _____
Time at current company within contact centre:
1 □ *0-3 months*; 2 □ *4-7 months*; 3 □ *8-11 months;*
4 □ *1-2 years*; 5 □ *3-4 years*; 6 □ *5 + years*

12. Marital status: 1 □ *Single;* 2 □ *Married*; 3 □ *Divorced*

13. Dependants: 1 □ *None;* 2 □ *1 child;* 3 □ *2 children;* 4 □ *3 or more children*

14. Do you regard yourself? as an 1 □ *Extrovert (outgoing, gregarious, lively);*
2 □ *Introvert (shy, quiet, withdrawn);* 3 □ *Neither*

15. Are you organised? 1 □ *Yes;* 2 □ *No;* 3 □ *Sometimes;* 4 □ *Don't know*

16. Do you find it difficult to sit still and concentrate for long periods of time?
1 □ *Yes;* 2 □ *No;* 3 □ *Sometimes;* 4 □ *Don't know*

17. Do you need a lot of time by yourself?
1 □ *Yes;* 2 □ *No;* 3 □ *Sometimes;* 4 □ *Don't know*

18. Do you exercise regularly? 1 □ *Yes;* 2 □ *No;* 3 □ *Sometimes*

19. If yes, what kind of exercise: 1 □ *gym;* 2 □ *running;* 3 □ *walking;*

4 □ *swimming;* 5 □ *team sport i.e. cricket, rugby, hockey;* 6 □ *water sport (surfing, diving, etc.);* 7 □ *other, please specify* _____

20. How often do you exercise? 1 □ *Every day;* 2 □ *3+ times a week;*

3 □ *1-2 times a week;* 4 □ *1-2 times a month;* 5 □ *Less than once a month*

21. What kind of activities do you do in your free time?

_____

22. Do you smoke? 1 □ *Yes;* 2 □ *No*

23. Do you partake in/enjoy/or would like to do adrenaline sport (i.e. rock climbing, sky diving, parachuting, bungee jumping)? 1 □ *Yes;* 2 □ *No;* 3 □ *Don't know*

Appendix G: Dunn's Sensory Processing Model

An illustration of Dunn's sensory processing model (1997) as displayed in (Brown & Dunn, 2002) are described below. Table G.1 shows the relationships between behavioural responses (self-regulation) and neurological thresholds:

Table A.1: Sensory processing model used in adult sensory processing

Neurological threshold continuum	Behavioural response/Self-regulation continuum	
	PASSIVE	ACTIVE
HIGH (habituation)	Low Registration (LR)	Sensation Seeking (SS)
LOW (sensitisation)	Sensory Sensitivity (Ssens)	Sensation Avoiding (SA)

Dunn's (1997) model provides the integration between the neuro-physiological functions as expressed through thresholds (a continuum ranging from low to high) within the nervous system, and behavioural functions as expressed through self-regulation actions (a continuum ranging from passive to active). Thresholds, as displayed on the vertical axis, refer to how readily the nervous system detects and reacts to sensory stimuli. A low threshold would mean that the nervous systems sensitises to the incoming stimuli more frequently and intensely and recruits more cellular activity to respond. A high threshold means the opposite in that the nervous system habituates to the incoming stimuli and stops the cellular process. Self-regulation actions are displayed on the horizontal axis and refer to either passive or active behaviours as a response to the incoming sensory stimuli. Passive behavioural responses would mean that the individual acts in accordance with their thresholds and makes no attempt to alter or control the stimuli. Active responses would mean that the individual acts to counteract the thresholds and proceeds to self-regulate by altering and/or controlling the incoming sensory stimuli.

Low Registration – describes individuals with high neurological thresholds and a passive behaviour strategy. They are less likely to notice stimuli that others do, would disregard or respond slowly to sensation. People with low registration are generally good at tolerating a wide range of environments and are less likely to be distracted by stimulating environments. They are also described as easy going, withdrawn, inattentive and/or self-absorbed (Brown et al., 2001; Brown & Dunn, 2002; Brown, 2001; Engel-Yeger & Dunn, 2011b).

Sensation Seeking – describes individuals with high neurological thresholds and an active behaviour strategy. They experience pleasure from rich sensory environments, enjoy novelty, would seek out sensory input and create sensation to cause the neurological system to respond. They are also described as exuberant, curious and energetic but do get easily distracted and bored in sedate, quiet environments (Brown et al., 2001; Brown & Dunn, 2002; Brown, 2001; Engel-Yeger & Dunn, 2011b).

Sensory Sensitivity – describes individuals with low neurological thresholds and a passive behaviour strategy. They are likely to notice sensation faster and more intensely, being aware of sensations and their environments more acutely. They can be distracted by sensation, experience discomfort and are described as picky, precise and detail focused (Brown et al., 2001; Brown & Dunn, 2002; Brown, 2001; Engel-Yeger & Dunn, 2011b).

Sensation Avoiding – describes individuals with low neurological thresholds and an active behaviour strategy. They also notice sensation faster and more intensely, would experience discomfort and then engage in behaviours to limit the stimuli. They are also described as introspective, reclusive and prefer consistency and routines (Brown et al., 2001; Brown & Dunn, 2002; Brown, 2001; Engel-Yeger & Dunn, 2011b).

Appendix H: AASP Score Patterns (Lexicographical Format)

AASP score patterns ordered in a lexicographical format, subset allocation and rule check.

Line #	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding	Subset	Subset revise	Rule check
1	--	--	--	--	4	4	4.1
2	--	--	--	-	4	4	4.1
3	--	--	--	=	4	4	4.1
4	--	--	--	+	1	1	1.1
5	--	--	--	++	1	1	1.1
6	--	--	-	--	4	4	4.1
7	--	--	-	-	4	4	4.1
8	--	--	-	=	3	4	4.1
9	--	--	-	+	1	1	1.1
10	--	--	-	++	1	1	1.1
11	--	--	=	--	3	4	4.1
12	--	--	=	-	3	4	4.1
13	--	--	=	=	3	4	4.1
14	--	--	=	+	1	1	1.1
15	--	--	=	++	1	1	1.1
16	--	--	+	--	3	2	2.1
17	--	--	+	-	3	2	2.1
18	--	--	+	=	3	2	2.1
19	--	--	+	+	1	1	1.2
20	--	--	+	++	1	1	1.2
21	--	--	++	--	2	2	2.1
22	--	--	++	-	2	2	2.1
23	--	--	++	=	2	2	2.1
24	--	--	++	+	1	1	1.2
25	--	--	++	++	1	1	1.2
26	--	-	--	--	4	4	4.1
27	--	-	--	-	4	4	4.1
28	--	-	--	=	4	4	4.1
29	--	-	--	+	1	1	1.1
30	--	-	--	++	1	1	1.1
31	--	-	-	--	4	4	4.1
32	--	-	-	-	4	4	4.1

Line #	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding	Subset	Subset revise	Rule check
33	--	-	-	=	4	4	4.1
34	--	-	-	+	1	1	1.1
35	--	-	-	++	1	1	1.1
36	--	-	=	--	4	4	4.1
37	--	-	=	-	4	4	4.1
38	--	-	=	=	3	4	4.1
39	--	-	=	+	1	1	1.1
40	--	-	=	++	1	1	1.1
41	--	-	+	--	2	2	2.1
42	--	-	+	-	2	2	2.1
43	--	-	+	=	2	2	2.1
44	--	-	+	+	1	1	1.2
45	--	-	+	++	1	1	1.2
46	--	-	++	--	2	2	2.1
47	--	-	++	-	2	2	2.1
48	--	-	++	=	2	2	2.1
49	--	-	++	+	1	1	1.2
50	--	-	++	++	1	1	1.2
51	--	=	--	--	4	4	4.1
52	--	=	--	-	4	4	4.1
53	--	=	--	=	4	4	4.1
54	--	=	--	+	1	1	1.1
55	--	=	--	++	1	1	1.1
56	--	=	-	--	4	4	4.1
57	--	=	-	-	4	4	4.1
58	--	=	-	=	4	4	4.1
59	--	=	-	+	1	1	1.1
60	--	=	-	++	1	1	1.1
61	--	=	=	--	4	4	4.1
62	--	=	=	-	4	4	4.1
63	--	=	=	=	4	4	4.1
64	--	=	=	+	1	1	1.1
65	--	=	=	++	1	1	1.1
66	--	=	+	--	2	2	2.1
67	--	=	+	-	2	2	2.1

Line #	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding	Subset	Subset revise	Rule check
68	--	=	+	=	2	2	2.1
69	--	=	+	+	1	1	1.2
							
625							

Appendix I: Sensory Overload Risk Assessment Rating - Results

The SORAR was used to determine whether study participants had a subjective experience of sensory overload when working in a call centre. Questions were asked relating to different types of sensory input to determine how each agent experienced this in their work environment. Spearman Rank Correlation analysis between the AASP and the Sensory Overload Risk Assessment Rating (SORAR), was performed for Site 1 only. The SORAR was compiled by the researcher and not standardised and completed by a total of 182 staff at Site 1. Missing values resulted in some data fields showing discrepancies in totals.

Table I. 1: Spearman Rank Correlation Coefficients between SORAR Ratings and AASP Quadrant Scores for Site 1

	Age	Quad 1	Quad 2	Quad 3	Quad 4
Auditory	0.021 0.77694 182	0.037 0.62465 182	-0.065 0.38689 182	0.088 0.23953 182	0.091 0.21935 182
Visual	0.072 0.33414 182	0.058 0.43816 182	-0.036 0.63294 182	0.303 0.00003 182	0.237 0.00126 182
Tactile	0.052 0.48445 182	-0.006 0.93502 182	0.019 0.80086 182	0.166 0.02476 182	0.224 0.00232 182
Smell	-0.054 0.46645 182	0.145 0.05094 182	0.058 0.44038 182	0.093 0.21149 182	0.171 0.02088 182
Movement	0.087 0.24064 182	0.249 0.00069 182	0.018 0.80564 182	0.272 0.00020 182	0.217 0.00324 182
Multisensory	0.081 0.27933 181	0.190 0.01052 181	-0.007 0.92714 181	0.193 0.00907 181	0.176 0.01782 181
TOTAL	0.058 0.44183 181	0.184 0.01300 181	-0.009 0.90443 181	0.308 0.00002 181	0.308 0.00002 181

- Significant positive correlations were found between the different sensory systems irritations/overload experiences and Quadrants 1, 3 and 4.
- Q1 ranked third for association significance (4 shaded p-value fields) with all systems (except for auditory, visual, tactile) and the total score. High Q1 scores also had high sensory overload experiences due to the *positive* correlations.
- Q2 had no association fields for sensory overload experiences.
- Q3 had the second most associations of significance (5 shaded p-value fields) with all systems (except for auditory and smell) and the total score, all positively

correlated. Agents with high Quadrant 3 scores had higher subjective experiences of sensory overload.

- Q4 revealed the most association significance (6 shaded p-value fields) with all systems (except auditory) and the total score, all *positively* correlated. Subjective sensory experiences of overload were thus high where Quadrant 4 scores were high.
- It was interesting to note the strong correlation in the visual and movement system where none showed in the auditory system.

Agents with low threshold quadrant results (Q1, 3 and 4) thus experienced more subjective experiences of sensory overload.

Demographic and Personal Questionnaire

Spearman Rank Correlation analysis between the AASP and self-identified characteristics of personality, habits and lifestyle choices was done. Results were useful for supplementary purposes and were initially included, based upon the researcher's knowledge at the time.

For interest sake, and because this had revealed associations in other studies outside of the occupational therapy field, smoking habits were observed in relation to the AASP results.

Relationship between Age, Smoking and AASP Quadrants

The potential relationship between Smoking habits and AASP quadrants were observed and displayed below. This was observed with the exact months agents were working at the call centre, their current age and the age at start to work for the call centre.

Table I. 2: Spearman Correlation Coefficients between Smoking Habits and the AASP Quadrants Scores for Site 1

SMOKE YES	Q1	Q2	Q3	Q4
Exact Months	0.020 0.88164 60	-0.120 0.36096 60	0.127 0.33177 60	0.042 0.74981 60
Age Current	-0.083 0.52892 60	0.172 0.18905 60	0.060 0.64804 60	-0.107 0.41782 60
Age Start	0.029 0.82620 60	0.255 0.04947 60	-0.064 0.62621 60	-0.248 0.05565 60
SMOKE NO	**Q1**	**Q2**	**Q3**	**Q4**
Exact Months	0.108 0.24427 118	-0.104 0.26265 118	0.140 0.12932 118	0.161 0.08088 118
Age Current	0.181 0.04945 119	-0.004 0.96607 119	0.277 0.00226 119	0.152 0.09975 119
Age Start	0.092 0.31783 119	0.139 0.13205 119	0.227 0.01301 119	0.069 0.45770 119

- Age start had a positive correlation with Q2 and a negative correlation with Q4 in the smoking group. Smoking were thus more observed for agents with higher Q2 scores (sensation seeking) and lower Q4 scores (sensation avoiding).
- The non-smoking group had more positive correlations with Quadrant 1, 3 and 4.
- If one assumes that Quadrant 2 is the true high threshold group with more smoking behaviour than the low threshold groups of Quadrant 1, 3 and 4, it correlates with other literature (Zuckerman, 1994).
- Smoking as an addictive type of behaviour and linked with sensation seeking (Roberti, 2004; M. Zuckerman, 1994) were thus supported by the above findings.