THE LEVEL OF AGREEMENT BETWEEN PARENTS/CAREGIVERS AND SCHOOL STAFF ON THE SHORT SENSORY PROFILE COMPLETED FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER

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A research project submitted in partial fulfillment of the requirements of the University of Lincoln for the Doctorate in Clinical Psychology

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ABSTRACT

Background

Sensory sensitivity (SS) is defined as the level to which an individual is able to regulate their responses to sensory input. Children with Autistic Spectrum Disorder (ASD) have been found to display unusual and abnormal levels of SS. These variabilities in SS have been associated with poorer levels of adaptive behaviour, behavioural difficulties and emotional problems. Parental questionnaires are frequently used to assess children's SS. However concern has been raised regarding the use of parents as the sole informant. This study aimed to assess whether parental reports of children's SS were consistent with alternative informants' (school staff) reports.

Methods

The Short Sensory Profile (SSP: Dunn, 1999) was administered to 72 pairs of parents/caregivers and school staff, to be completed for children with ASD (aged 4 to 18 years). This 38 item questionnaire highlights variations of sensory modulation and provides a total score, and 7 factor/subsection scores relating to different aspects of sensory processing (e.g. auditory filtering). This study utilised intraclass correlation coefficient (ICC) values to assess the level of agreement.

Results

Significant ICCs indicated: moderate agreement (correlation of 0.3-0.5) on SSP total scores and 3 factor scores ('movement sensitivity', 'underresponsiveness/ seeks sensation' and 'auditory filtering'); high strength agreement (correlation is >0.5) on the 'taste/smell sensitivity' factor, and low strength agreement (correlation is <0.3) on the factors, 'low energy/weak' and 'tactile sensitivity'. There was no significant ICC found for the factor, 'visual/auditory sensitivity.'

Discussion

The level of agreement between caregivers and school staff was found to be variable. Findings suggest that different caregivers, taking on different roles, may have differing perceptions of each child's sensory sensitivity. In addition, sensory influences on a child's behaviour may be context dependent. Therefore, to assess the SS of children with ASD, assessment across contexts with more than one informant is advocated.

KEY WORDS: Autistic Spectrum Disorder; agreement; sensory sensitivity; Short Sensory Profile; informants; context

STATEMENT OF CONTRIBUTION

This research project is a product of my own, original, work. It makes no use of previously published material, except where references have been acknowledged within the texts. The contents of this research project are the result of the work I have carried out since I commenced the Trent Doctorate in Clinical Psychology in 2006. Within this work I was responsible for the design of the project, the application for ethical approval from the University of Lincoln and the writing of the literature review.

I was responsible for recruiting two schools, namely Sutherland House School (SHS) and Rosehill School. Mr Phil Christie (Director of SHS), Maria Allen (Principal of SHS) and Mr Andy Sloan (Deputy Head Teacher of Rosehill School) kindly contacted possible participants on behalf of the research, asking if they would like to participate (as detailed in the recruitment appendices). Following recruitment, I contributed solely to the scoring of questionnaires, the entering of the scoring data onto a statistical package, and the subsequent analysis, write up of results, and discussion.

RESEARCH PAPER TITLE PAGE

(for Journal of Autism and Developmental Disorders)

Title

The level of agreement between parents/caregivers and school staff on the Short Sensory Profile completed for children with Autistic Spectrum Disorder

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ABSTRACT

Background

Children with Autistic Spectrum Disorder (ASD) display unusual sensory sensitivity (SS), associated with behavioural and emotional problems. Concern has arisen regarding the sole use of parental questionnaires to assess children's SS. Thus, the study aimed to assess agreement between parents' and alternative informants' reports of the SS of children with ASD.

Methods

The Short Sensory Profile (SSP: Dunn, 1999) was administered to 72 pairs of parents/caregivers and school staff, completed for children with ASD (4 to 18 years). This study utilised intraclass correlation coefficient (ICC) values to assess agreement.

Results

Significant ICCs indicated: moderate agreement (0.3-0.5) on SSP total and 3 factor scores ('movement sensitivity', 'underresponsiveness/ seeks sensation' and 'auditory filtering'); high strength agreement (>0.5) on the 'taste/smell sensitivity' factor; and low-no agreement (<0.3) on the remaining 3 factors.

Discussion

Different caregivers may have differing perceptions of each child's SS, and SS may be context dependent. Therefore assessment with more than one informant is advocated.

KEY WORDS: Autistic Spectrum Disorder; agreement; sensory sensitivity; Short Sensory Profile.

THE LEVEL OF AGREEMENT BETWEEN PARENTS/CAREGIVERS AND SCHOOL STAFF ON THE SHORT SENSORY PROFILE COMPLETED FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER

A diagnosis of Autistic Spectrum Disorder (ASD) is based on impairments relating to social interaction, communication and repetitive or stereotyped behaviours (APA, 2000). In addition to these key impairments, sensory sensitivity (SS) and ASD have also been strongly associated (Baranek, David, Poe, Stone, & Watson, 2006). SS can be defined as the level to which an individual is able to regulate their responses to sensory input. Research has linked ASD to the experiences of hypersensitivity (abnormally high sensitivity) and hyposensitivity (abnormally low sensitivity) (e.g. O'Neill & Jones, 1997; Iarocci & McDonald, 2006; Rogers & Ozonoff, 2005). These studies have shown that children and adults with ASD display variable responses when processing sensory input, such that both hypersensitive and hyposensitive responses have been observed (Baranek, 2002).

The variable responses to sensory input found in children with ASD have been considered in relation to deficits in sensory attention and/or arousal modulation, but further research is required (Baranek, 2002). Moreover, these variable responses to sensory input are thought to be a result of "poor sensory integration and/or arousal modulation in the central nervous system" (Baranek, 2002, p. 398). However, it is not clear as to what aspects of the central nervous system are directly related to the problems of poor sensory integration or arousal modulation (Baranek, 2002). Other explanations provided suggest that sensory difficulties are related to impairments in both attention and integration of perceptual input at a cognitive level (Mottron & Burack, 2001). (For theories of sensory processing please see a later section within Appendix A.) Despite these suggestions, Rogers and Ozonoff (2005), who conducted a review of the sensory difficulties in ASD, have stated that there is still no clear explanation of why these individuals experience problems with sensory regulation.

Research has shown that difficulties with sensory processing are associated with: poorer levels of adaptive behaviour (Schaff & Miller, 2005); behavioural difficulties (Miller, Schoen, Coll, Brett-Green, & Reale, 2005; Rogers et al., 2003); and emotional problems (Pfeiffer, Kinnealey, Reed, & Herzberg, 2005). For example, Miller, Reisman, McIntosh and Simon (2001) reported increased levels of anxiety and depression, alongside increased levels of SS, in individuals with ASD in comparison to typically developing individuals. Moreover, in a recent study, exploring the link between SS levels and affective symptoms in toddlers with ASD, the researchers found that children experiencing high levels of hypersensitivity and hyposensitivity also showed higher levels of negative emotions such as anxiety and depression, in comparison to the children who did not have as high levels of SS (Ben-Sasson et al., 2008).

The above association between SS and emotional problems suggests that measurement of the SS of children with ASD is an important component of comprehensive clinical assessments. Parental/caregiver questionnaires have frequently been used within research on SS and ASD (Rogers et al*.,* 2003) and it is likely that this is also the case in clinical settings. However, concern has been raised regarding the sole use of parental questionnaires for adequately identifying a child's level of SS. For example, Dahlgren and Gillberg (1989) suggested parents may be influenced by their child's diagnosis and be inclined to respond in ways consistent with its associated symptoms, rather than consistent with their child's presentation, and may thus overestimate their children's symptoms of SS. Conversely, Parush, Doryon and Katz (1996) suggested that parents may underestimate the SS of their children. This is possibly due to parents adapting their home environment to accommodate their child's sensory needs, over time, making their SS less apparent.

Furthermore, discrepancies have been noted between parents and other informants (in regular contact with the children) reporting on the SS of children with ASD. For example, in one study teachers' reports identified 30% of children with ASD as auditory hypersensitive (Baranek et al*.,* 1997) and this contrasts with an earlier study where parental/caregiver reports suggested over 50% of children with autism were auditory hypersensitive (Volkmar, Cohen & Paul, 1986). Baranek et al*.* (2006) suggested these differences may be due to unknown variability in the two samples, such as the age of the children and differing additional diagnoses related to SS. It is also possible that differences in reported levels of SS were related to the different contexts in which children were observed.

Some studies have compared parents' and teachers' reports on other variables (unrelated to SS), for children without ASD. Often these studies have shown parents and teachers to have differing perceptions. For example, Brown et al*.* (2006) found teachers reported twice as many children as having mental health problems, than parents reported. Furthermore, Ferdinand, van der Ende and Verhulst (2007) found significant discrepancies between parent and teacher reports on behavioural and emotional problems in children, and highlighted the need to use multiple informants for assessment.

The differing opinions of parents, teachers, and others were demonstrated in a review of 119 studies (Achenbach, McConaughy, & Howell, 1987). Using meta-analysis, Achenbach et al*.* found only modest agreement between the ratings of a child's social, emotional or behavioural difficulties as rated by parents, teachers, observers, mental health workers and peers. These discrepancies in ratings occurred despite the ratings from each informant being reliable and valid (Achenback et a., 1987).   For example, a mean correlation of .28 was found between pairs of informants who had contact with the children within different contexts (*e.g.* parents versus teachers). These findings need to be considered when carrying out assessment with children, as they suggest that each informant may have unique perceptions of the child's behaviour, and the child may behave differently in various contexts.

Nevertheless, there have been studies showing agreement between parents and teachers. In research evaluating medication, with a symptom rating scale, parents and teachers were found to agree that medication was effective for treating Attention-Deficit/Hyperactivity Disorder (ADHD), (Faraone, Biederman & Zimmerman, 2005). In addition, Voelker, Shore, Lee and Szuszkiewicz (2000) found teachers and parents had fair inter-rater agreement on 92% of the items within a questionnaire assessing the adaptive skills of children.

Existing research has not explored agreement between school staff and caregivers on the SS of children with ASD, using questionnaires (with established validity and reliability) such as the Short Sensory Profile (SSP; Dunn, 1999). In addition, more research has been advocated to assess whether parental reports of children's SS are consistent with other methods of assessing children's SS (Leekam et al*.,* 2007); thus assessing whether parents reports alone are adequate in assessing children's levels of SS. Therefore, this study aims to assess the level of agreement between caregivers and school staff rating SS using the SSP (Dunn, 1999) for the same children. These ratings will be assessed in order to determine whether there are consistencies in the ratings by adults who have regular contact with the children, but within different contexts. (For further literature see Appendix A.)

METHOD

Participants

Participants were recruited through two specialist schools for children with ASD, within Nottinghamshire (see procedure). Once consent to participate was granted, SSP data was collected from parents and teachers regarding the same children with ASD. Participants included all children with a diagnosis of ASD attending schools providing specialist education for children with ASD up to age 18. Exclusionary criteria included: children aged 19 years or over (n = 1); children without a formal diagnosis of ASD (n=0) and children for whom the SSP data was incomplete for every factor section (n=2). Overall the sample consisted of 72 pairs of parents/teachers completing the SSP on behalf of the same children with ASD (6 females and 66 males with ages ranging from 4 years to 18 years).

Procedure

As the participants were young and/or severely or profoundly disabled (as evidenced by their attendance at a specialist school), it was considered highly unlikely that they would understand information on the research, nor be able to utilise this in their decision-making process. Therefore the children were not considered competent to give consent for themselves. Consequently, the parents/caregivers of the children were considered competent to give consent on the children's behalf. This procedure was approved by Lincoln University Ethics Committee and was supported by both schools. (For further ethical considerations see Appendix B.)

Those with parental responsibility were contacted by letter (from the school), providing them with an information sheet about the study, a copy of the SSP (Dunn, 1999), a short questionnaire covering demographic and clinical information and a consent form. Parents/caregivers who wished to participate were asked to complete and return the SSP, questionnaire, and consent form to the researcher. If questionnaires had not been returned within three weeks, a reminder letter was sent to those who had not already responded. (For further details on recruitment see Appendix C.)

When parents returned consent forms, school staff directly involved in the education of these children, were asked to complete the SSP for the relevant child. The questionnaires were given to class teachers for completion by the individual/staff group considered to know the child best. Variation in the school staff completing the questionnaires included: teachers alone, class group (e.g. teaching assistants, support workers and teacher) and keyworkers. The researcher collected the questionnaires once they had been completed (see Appendix D). Thus, two informant raters were assigned to each participant; firstly the parent/caregiver and secondly, the school staff member(s).

Measures

The Short Sensory Profile (SSP) (Dunn, 1999) was designed to measure behaviours associated with SS and takes approximately 10 minutes to complete. The SSP has 38 items considered most important for highlighting sensory issues in children, and covers 7 factors (with the number of items in each factor varying from 3 to 7) such as tactile sensitivity, and visual/auditory sensitivity. The SSP was chosen as it highlights unusual levels of sensory modulation (not hypersensitivity and hyposensitivity) and is recommended for use in research (Dunn, 1999).

The construct validity of the SSP has been demonstrated by two studies, which found that physiological measurements of sensory disturbances correlated with the SSP for children with and without sensory modulation difficulties (McIntosh, Miller & Shyu, 1999), and for children with Fragile X Syndrome (Miller et al., 1999). Individual items on the SSP are scored from 1 to 5, indicating frequency of behaviour (ranging from always responds to never responds). The raw score totals on the SSP vary from 38 to 190, with lower scores indicative of greater impairment.

Analyses

The SSP has been standardised on children aged 3 to 10 years. The schools educated children aged 3 to 18 years. In order to make optimum use of the sample available, and to enable analysis of the data from all children up to 18 years, ordinal data from the raw scores was analysed. This was done instead of using the classification categories, which would have restricted analysis to participants aged 3 to 10 years.

When missing items occurred, they were replaced with the mean scores for the remaining non-missing items within that section (factor). This was only done when 20% or fewer of the items were missing within the section. This is in accordance with previous research which used a version of the SSP (Ben-Sasson et al*.,* 2008). Two participants were excluded from the study due to the level of missing data within the caregivers' ratings of the SSP (over 20%

data missing on each section). (For further information see Appendix F.)

The Statistical Package for Social Scientists (SPSS Inc. 1999) was used to provide descriptive and inferential statistics, analysing the SSP data. Previous studies exploring levels of agreement have utilised Intraclass Correlation Coefficients (ICCs) as the method of analysis. The researchers leading these studies have suggested, that by taking an average measure of the reports from different raters within the ICC analysis, one is able to analyse the level of linear correlation but also to identify the presence of any differences between the average measures of different raters (something which other statistical methods of correlation are unable to analyse) (Chang & Yeh, 2005; Yeh, Chang & Change, 2005). Hence, agreement between parent/caregiver and school staff scores (total scores and factor scores) on the SSP was assessed using ICC values.

The values of the ICCs were categorised as small (<0.3), as medium (0.3-0.5), and large (>0.5). The ICCs were categorised in this way, in accordance with previous research assessing level of agreement (Chang & Yeh, 2005).

RESULTS

72 pairs of parents/caregivers and school staff completed the SSP on behalf of 72 children (66 male and 6 female) with ASD. The data from the 72 caregiver-school staff pairs was utilised for analysis. The caregiver group included 59 mothers, 10 fathers, 2 caregivers who were not parents and 1 unidentified. (See Appendix J for further demographic information.) The school staff group included: 24 teachers, 15 class teams, 14 keyworkers, 6 teaching assistants and 13 unidentified.

Table I outlines the descriptive analysis for the age and scores on the SSP.

(Insert Table I)

Table I demonstrates the variability in the SS of the children as rated by both informants, with most factors having scores ranging from the lowest possible to the highest possible score in range.

Intraclass correlation coefficients (ICC) representing level of agreement on the SSP are displayed in Table II. Significant ICCs indicated: moderate agreement on SSP total scores and 3 factor scores (‘movement sensitivity’, ‘underresponsiveness/ seeks sensation’ and ‘auditory filtering’); and high strength agreement on the ‘taste/smell sensitivity’ factor. However, significant ICCs were lower for the factors, low energy/weak and tactile sensitivity. There was no significant ICC found for the factor, visual/auditory sensitivity.

(Insert Table II)

DISCUSSION

This study explored the level of agreement between caregivers and school staff reports on the Short Sensory Profile (SSP), completed for children with ASD. A statistically significant level of agreement (medium correlation; 0.3-0.5) was found for total scores on the SSP and for ‘movement sensitivity’, ‘underresponsive/seeks sensation’ and ‘auditory filtering’. A large correlation (>0.5) was found for ‘taste/smell sensitivity’. These findings suggest that for the above factors and for overall SS levels, children may respond fairly consistently across contexts, or they are perceived in similar ways by those who care for them. When assessing SS relating to the above factors or when screening for SS, the use of one informant (e.g. parent) may be adequate.

However, there were weaker correlations found for two factors (‘tactile sensitivity’ and ‘low energy/weak’) and a non-significant correlation found for ‘visual/auditory sensitivity’ factor. The weaker correlations may reflect the differing opinions or observations of informants as highlighted in the meta-analysis carried out by Achenbach et al. (1987). For the ‘tactile sensitivity’ and ‘visual/auditory’ factors, caregivers’ scores indicated higher levels of

SS than the teachers scores indicated. However for the 'low energy/weak' factor, the indications were reversed.

It is possible that these factors are more affected by varied contexts or perceived differently by caregivers and school staff. For example, the different roles of caregivers and school staff may result in different observations of a child's level of tactile sensitivity. Parents may engage in more one to one, tactile, interactions with children than school staff and previous research has demonstrated parents' frequently report tactile sensitivity in their children (Baranek et al*.,* 1997). Therefore items within this factor (e.g. reacts emotionally or aggressively to touch) may be perceived differently by these informants, explaining the low agreement. As different contexts (such as a quiet home or a busy canteen) are subject to different noise levels and possibly different visual input (e.g. different lighting), the reactions related to visual/auditory sensitivity may also vary across contexts, explaining the poorer agreement between caregivers and school staff. The factor 'low energy/weak' may also be experienced differently. For example, in school with a compulsory curriculum, demands placed on the child may be higher than at home and behaviours related to low energy (e.g. tires easily) and weakness may be more apparent. Case-Smith and Bryan (1999) found that many parents of children with ASD, made environmental alterations, at an early stage, to accommodate SS at home. These established alterations may also result in parents' decreased awareness of elements of children's SS (e.g. 'low energy/weak') as years progress.

School staff are responsible for several children over specific time periods, and consequently do not have the same observation time as a caregivers. This may explain some of the poorer levels of agreement between caregivers and school staff in areas of sensory processing. Hence, when assessing SS in children with ASD, it may be best to assess the children across contexts, rather than focussing solely on caregivers' reports, as advised by Dahlgren and Gillberg (1989). Furthermore, context specific influences have also been used as an explanation of poor levels of parent-teacher agreement seen in previous research, such as parent/teacher rating symptoms of ADHD in children (Gomez, 2007) and parent/teacher rating behavioural and emotional problems of children (Verhulst & Akkerhuis, 1989).

This research utilised a shortened version of the Sensory Profile (SP) advocated for research (Dunn, 1999), and shown to be valid (e.g. Miller et al., 1999). However, future research utilising longer, more detailed, questionnaires (e.g. Sensory Profile, Dunn, 1999) may contribute further to the exploration of the impact of context on children's responses to sensory input.

Strengths of this study included a good sample size (>50), response rate, and the real world nature of the study, utilising reports from a variety of caregivers and a variety of school staff. However, the nature of the SSP (the SSP gives the option of crossing out items which the reporter thinks do not apply to the child) meant that there was a high level of missing data, which resulted in exclusion of participants. Furthermore, the limited number of participants within the age group, for whom the SSP has been standardised, prevented analyses of the SSP categorical data.

The sample was not random with participants recruited from specialist schools who are likely to be more severely affected by their ASD. This may not truly reflect the heterogeneity seen in ASD (Szatmari, 2003), and in specialist schools there are higher staff-pupil ratios. Research including school staff from mainstream schools (where the value of inclusiveness is increasingly recognised) (UNESCO, 1994), specialist schools, and caregivers may be beneficial to gain a richer overview of the impact of context and role across the spectrum of ASD. Moreover, perhaps in future research, inclusion of physiological measures of sensory reactivity (alongside questionnaire reporting) would: enable a more thorough exploration of children's experience of SS; and indicate the level of agreement between objective (physiological findings) and subjective perceptions of the children's experiences (such as whether parents tend to over or underestimate their child's SS).

In summary, this study suggested that the level of agreement between caregivers and school staff was varied between sensory factors, highlighted by the SSP. This variation may be best explained as certain sensory factors being context dependent. Therefore, in light of the association between emotional/behavioural problems and SS, it is important to assess the sensory experiences of children with ASD, across various contexts with more than one informant to fully inform psychological assessment, and establish any possible impact of SS on the child's psychological wellbeing. (For further discussion please see Appendix I.)

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AUTHOR NOTE

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I wish to express my gratitude to the participating children, caregivers, and school staff of Sutherland House School, and Rosehill School, for their involvement in the collection of sensory data.

Table I. Descriptive Statistics for age and scores on the Short Sensory Profile

Sections/Factors	Rating	Number	Mini	Max	Median	Interquartile range (Upper-Lower)
Age		72	4	18.0	12.0	8.00-15.00
Total Score (scoring range: 38-190)	Caregiver	66	71	174.0	124.5	110.75-139.50
	School	57	80	181.6	133.0	120.00-154.00
Tactile Sensitivity (scoring range: 7-35)	Caregiver	70	12	35.0	25.0	21.00-29.00
	School	68	15	35.0	27.0	23.00-29.00
Taste/Smell Sensitivity (scoring range: 4-20)	Caregiver	70	4	20.0	10.5	8.00-16.25
	School	66	4	20.0	13.0	9.75-19.00
Movement Sensitivity (scoring range: 3-15)	Caregiver	70	3	15.0	14.0	11.00-15.00
	School	62	5	15.0	14.0	11.75-15.00
Underresponsive/Seeks Sensation (scoring range: 7-35)	Caregiver	72	7	33.0	17.0	14.00-22.00
	School	71	9	35.0	22.0	17.00-26.00
Auditory Filtering (scoring range: 6-30)	Caregiver	70	6	28.0	16.0	12.00-20.00
	School	69	6	27.6	17.0	14.00-22.00

Low energy/Weak (scoring range: 6-30)	Caregiver	69	6	35.0	28.0	23.00-30.00
	School	70	13	35.0	26.5	21.00-30.00
Visual/Auditory Sensitivity (scoring range: 5-25)	Caregiver	72	7	25.0	16.0	13.00-19.00
	School	70	8	25.0	17.0	14.00-20.00

Table II. Agreement between caregiver/parent ratings and school staff ratings on Short Sensory Profile

Factors	Number	ICC
Total Score	53	0.348**
Tactile Sensitivity	67	0.250*
Taste/Smell Sensitivity	64	0.530***
Movement Sensitivity	61	0.386***
Underresponsive/ Seeks Sensation	71	0.302***
Auditory Filtering	67	0.433***
Low energy/Weak	67	0.258*
Visual/Auditory Sensitivity	70	0.189

ICC-Intraclass Correlation

*$p<0.05$

**$p<0.01$

***$p<0.001$

JOURNAL GUIDELINES FOR AUTHORS

Journal of Autism and Developmental Disorders (JADD, 2008)

Checklist for Manuscript Submissions

The preferred article length is 20 - 23 manuscript pages (or 4500 words). Manuscripts of 40 pages (references, tables and figures counted as pages) have been published. The reviewers or the editor for your review will advise you if a longer submission must be shortened.

Review your manuscript for these elements

1. Order of manuscript pages [pgs 287, 296-303]

Title Page (separate page, numbered page 1

Abstract (separate page, numbered page 2) with 6 or fewer key words following

Text (start on separate page, numbered page 3.)

Reference List (start on separate page)

Appendix (if included)

Author note (separate page with centred title)

Footnotes (if needed; list together and start on separate page)

Table (start each on separate page)

Figure Caption sheet (list together, starting the list on a separate page)

Figures (start each on a separate page)

2. Typing Format: Double-spaced, 12 point font, pages numbered consecutively (except for figures). Two words from the Running Head may appear in the header of each page.

3. Title Page [pages 10-12]

The Title Page is page 1 and should contain: 1. a full title, 2. the authors' full names and institutional affiliations, and 3. a running head for publication. (see below). The preferred form for author’s name is first name, middle initial (s), and last name. Omit titles and degrees. The institutional affiliation is the location where the study was conducted. Full address for the corresponding author, location of the institutions and current affiliations (if changed since the time of the study) belong in the Author Note. JADD has an open review system (not a blind review) and the title page is required for submission—the data cover sheet created by the EM does not substitute for your title page.

4. Running Head

The running head is an abbreviated title that is printed at the top of the pages of a published article to identify the article for readers. The head should be a maximum of 50 characters, counting letters, punctuation, and spaces between words. Designation of the running head should be placed on the title page as “Running head:” Two words of this running head for publication can be added to the header of the typed manuscript.

5. Abstract [pages 12 -15]

“The abstract should be concise and specific, "Make each sentence maximally informative especially the lead sentence. Be as brief as possible. Abstracts should not exceed 120 words. Begin the abstract with the most important information (but do not waste space by repeating the title). This may be the purpose or thesis or perhaps the results and conclusions. Include in the abstract only the four or five most important concepts, findings, or implications." The abstract is found on page 2. Six or fewer key words should appear one line below the abstract (“Key Words:…:”). In addition, include the corresponding authors email address below key words and the reason for this is if someone searches on Medline, they can get the abstracts and it would be nice for them to be able to reach the authors. Please note: An abstract is needed for all submissions. Failure to provide an abstract, or providing one that is too long, will delay the publication of your manuscript.

6. Body

The body of the manuscript should begin on a separate page. The manuscript page header (if used) and page number 3 should appear in the upper right corner. Type the title of the paper centered at the top of the page, add a hard return, and then type the text using the format noted above. The body should contain:

Introduction (APA pgs 15-17) (The introduction has no label.)

Methods (APA pgs 17-20) (Center the heading. Use uncentered subheadings such as: Participants, Materials, Procedure.)

Results (APA pgs 20-26) (Center the heading.)

Discussion (APA pgs 26-27) (Center the heading.)

7. Reference citations [pgs 207-214]

Citations within the text guide the reader to the correct location on the reference list. Correct citation form is the surname of the authors and the year of publication, which are inserted in the text. For publications with one or two authors, cite one or two names. If there are multiple authors, cite all at first mention and only the first author at subsequent mentions. Separate multiple citations within parentheses with a semicolon. Basic style: "Dickens (2003) suggested that cognitive impairments…." "In a recent study of cognitive impairments in autism (Dickens, 2003)…."

8. Reference List format [general forms page 223; 313]

The reference list begins on a separate page with the heading "References" centered at the top. The references should be in alphabetical order, double spaced, with a hanging indent paragraph format (no extra space between references). Each listed reference should be cited in text, and each text citation should be listed in the reference list.

Periodical:

Author, A.A., Author, B.B, & Author, C.C. (1994). Title of article. Title of Periodical, xx, xxx-xxx.

Nonperiodical:

Author, A.A. (1994). Title of work. Location: Publisher.

Part of a nonperiodical (e.g. book chapter):

Author, A.A., & Author, B.B. (1994). Title of Chapter. In A. Editor, B. Editor, & C. Editor (Eds.), Title of Book (ppxxx-xxx). Location: Publisher.

9. Author Note Page 204-205

The Author note is double spaced and follows the references or appendix. The first paragraph contains a separate phrase for each author's name and the affiliations of the authors at the time of the study (include region and country). The second paragraph identifies any changes in the author affiliation subsequent to the time of the study and includes region and country (wording: "authors name is now at affiliation".) The third paragraph is Acknowledgments. It identifies grants or other financial support and the source, if appropriate. It is also the place to acknowledge colleagues who assisted in the study and to mention any special circumstances such as the presentation of a version of the paper at a meeting, or its preparation from a doctoral dissertation, or the fact that it is based on an earlier study. The fourth paragraph states, "Correspondence concerning this article should be addressed to…" and includes the full address, telephone number and email address of the corresponding author. Fax may be included.

10. Footnotes [300 – 302]

Center the label “Footnotes” at the top of a separate page. Type all content footnotes and copyright permission footnotes together, double-spaced, and numbered consecutively in the order they appear in the article. Indent the first line of each footnote 5-7 spaces. The number of the footnote should correspond to the number in the text. Superscript arabic numerals are used to indicate the text material being footnoted.

11. Tables (pgs. 147 – 176)

Tables should be numbered sequentially in the order that they are first mentioned in the text and referred to by number in the text. Each table is identified with the word “Table” and an arabic numeral and a descriptive title. Each table should be inserted on a separate page at the back of the manuscript in the order noted above. A call-out for the correct placement of each table should be included in brackets within the text immediately after the phrase in which it is first mentioned. Copyright permission footnotes for tables are typed as a table note.

12. Figure Caption Sheet [page 302]

The figure caption sheet should follow the tables and precede the figures. It contains a list of the captions for all figures used. Center the label "Figure Captions" in uppercase and lowercase letters at the top of the page. Begin each caption entry flush left, and type the word "Figure", followed by the appropriate number and a period, all in italics. In the text of the caption (not italicized), capitalize only the first word and any proper nouns. If the caption is more than one line, double-space between the lines, and type the second and subsequent lines flush left. Table notes [174-175]: Copyright permission footnotes for figures are typed as part of the figure caption.

13. Figures [pages 176 – 204]

Each figure should appear on a separate page. The page where the figure is found should have the figure number and the word "top" typed outside the field that will be copied for publication. Figures or illustrations (photographs, drawings, diagrams, and charts) are to be numbered in one consecutive series of arabic numerals. Figures may be embedded in the text of a Word or Wordperfect document. Electronic artwork submitted on disk may be in the TIFF, EPS or Powerpoint format (best is 1200 dpi for line and 300 dpi for halftones and gray-scale art). Color art should be in the CYMK color space. Assistance will be provided by the system administrator if you do not have electronic files for figures; originals of artwork may be sent to the system administrator to be uploaded. *** After first mention in the body of the manuscript, a call-out for the correct placement of each figure should be included in brackets on a separate line within the text.

14. Callouts

After first mention in the body of the manuscript, a call out for the correct placement of each table and each figure should be included in brackets on a separate line within the text: [place Table 1 about here] or [place Figure 1 about here]. Center the callout and add a hard return before and after your bracketed call-out.

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15. Seriation [Pages 115-116]

A series within a sentence is identified with lowercase letters in parenthesis. A series in separate paragraphs is identified with arabic numerals and followed by a period (not enclosed in parentheses and not bulleted). These items may be considered sequential. They are conceptually parallel (thus, the numbers mean the same as a bullet. Bullets are never used.).

16. Quotations [pages 292-293, 117-118]

Quotations of fewer than 40 words should be incorporated into the text and enclosed by double quotation marks ("…"). Quotations of 40 words or more should be displayed in a double spaced, indented block with no quotation marks. Indent the whole paragraph 5-7 spaces and omit the usual paragraph indent.

17. Abbreviations (pgs 103 -110)

Abbreviations used by psychologists may not be familiar to students or to readers from other disciplines or other countries. Therefore, they should be used sparingly. A term to be abbreviated must be written out completely on its first appearance and followed immediately by its abbreviation in parentheses. Thereafter, the abbreviation may be used in text without further explanation. Abbreviations in Figures must be explained in the caption or legend. Abbreviations in Tables must be explained in the table title or in the table note. Some standard abbreviations do not need to be written out at first use (pgs 106-108).

18. Headings (pgs. 111 - 115). This will guide the use of headings and subheadings ("outline" type letters and numbers are not used). Articles with two levels of headings require a level 1 and a level 3. For articles with 3 levels, use Level 1, Level, 3, Level 4. For 4 levels use Levels 1-4.

CENTERED UPPERCASE HEADING –Level 5 (only used if 4 other heading levels exist)

Centered Uppercase and Lowercase Heading – Level 1

Centered Italicized, Uppercase and Lowercase Heading – Level 2

Flush left, Italicized, Uppercase and Lowercase Side Heading – Level 3

Indented, Italicized, lowercase paragraph heading ending with a period-Level 4

Only 3 levels of headings are allowed in the Springer print format.

UNIVERSITY OF LINCOLN ETHICAL APPROVAL LETTER

UNIVERSITY OF
LINCOLN

Lincoln, 14-11-2008

Dear Michelle,

This is a letter to confirm that you had ethical clearance (granted in 2006) for your DClinPsy research project.

Yours sincerely,

Emile van der Zee, PhD
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APPENDIX A: EXTENDED LITERATURE REVIEW

Autistic Spectrum Disorder (ASD)

Autistic Spectrum Disorder (ASD) is the umbrella term used to describe a group of neurodevelopmental disorders sharing the same characteristics but showing variability in age of onset and individual history (Szatmari, 2003). ASD is characterised by deficits in social relations and communication and the presence of repetitive stereotyped behaviours (APA, 2000). However, ASD can also affect other areas of functioning such as motor skills and sensory sensitivity (Lord, Cook, Leventhal & Amaral, 2000). The cognitive abilities of children with ASD can vary greatly. Most children with ASD show moderate levels of impairment with islets of ability such as memory, and difficulties with aspects such as reasoning and planning (Burd, Fisher, Knowlton, & Kerbeshian, 1987).

The course towards a diagnosis of ASD usually begins with parental concern. This tends to arise when levels of communication expected from a young child do not appear (e.g. limited babbling and no development of first words). The term ASD usefully highlights the concept of a ‘spectrum’ of possible disorder and the heterogeneity within the presentation of ASD (Lord et al., 2000).

Although there are core features of ASD which can be observed and measured, children and adults with ASD do not present in identical ways and thus experience the world and sensory input in different ways. There are a range of abilities and difficulties observed within ASD, reflective of the various disorders covered by the term (Filipek et. al., 2000). For a full outline of the diagnostic criteria for the various disorders included within the term ASD see Table IV.

Research has suggested that the aetiology of ASD is early in onset and has genetic and biological causal factors (Volkmar, Lord, Bailey, Schultz, & Klin, 2004). However, the cause of ASD is far from clear and it has been described as “a paradigmatic, complex genetic disorder” (Lord et al., 2000, p.357).

Early diagnosis is considered crucial for children with ASD. However, diagnosis does not usually occur until a child is school age (Mandell, Novak & Zubritsky, 2005). The average age of diagnosis for autism is 3.1 years, for Asperger Syndrome is 7.2 years, and for pervasive developmental disorder not otherwise specified is 3.9 years (Mandell, et al., 2005). Identifying the prevalence of ASD has been difficult due to the changes in terminology and subsequent diagnostic criteria (inclusive of a wider range of disorders) over time. Nevertheless, the number of studies exploring epidemiology has increased over recent years.

A study by Yeargin-Allsopp et al. (2003) has been posited as strong in methodology, having a large sample size and multiple ascertainment sources (Fombonne, 2003). This American study identified the prevalence as 34 per 10,000 children between the ages of 3 and 10. However, Fombonne (2003) suggested that the prevalence rate is likely to be higher than that found in this study due to reasons such as higher functioning children with ASD and younger children not being identified. It may be that the actual prevalence is more in line with the British estimations of prevalence which identify 63 per 10000 individuals as having a diagnosis of ASD (Chakrabarti & Fombonne, 2001). ASD is found more frequently in boys. The male to female ratio in ASD found in the study by Yeargin-Allsop et al. (2003) was 4:1 which is in line with previous findings exploring the gender ratio in ASD (e.g. Fombonne, 1999; Lord & Schopler, 1985).

Table IV: DSM-IV Diagnostic Criteria for Autistic Spectrum Disorder

	Autistic Disorder	Rett's Disorder	Childhood Disintegrative Disorder	Asperger's Disorder	Pervasive Developmental Disorder- Not Otherwise Specified
Age of Onset	Delays or abnormal functioning in social interaction, language, or play by age 3	Seemingly normal development for 2 years minimum. Onset before age 4. Loss of skills progressive and persistent.	Seemingly normal development for at 2 years minimum. Onset before age 10	No clinically significant delay in language, cognitive development self-help skills, adaptive behaviour, and environment in childhood. Lifelong disorder	Severe and pervasive impairment in development of social interaction, communication skills or with the presence of stereotyped behaviour, interests, and activities. criteria not met for a specific disorder
Social Interaction	Qualitative impairment in social interaction, as manifested by at least two of the following: -marked impairment in using multiple nonverbal behaviours and gestures to regulate social interaction -failure to develop peer relationships -a lack of spontaneous seeking to share enjoyment, interests, or achievements with others -lack of social or emotional reciprocity	Loss of social engagement early in the course (although often social interaction develops later)	Possible loss of social skills. Possible qualitative impairment in social interaction.	Qualitative impairment in social interaction (as seen in autistic disorder)	
Commun-ication	Qualitative impairments in communication manifested by at least one of the following: -delay in, or total lack of, the development of spoken language -in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others -stereotyped and repetitive use of language or idiosyncratic language -lack of varied, spontaneous make-believe play or social imitative play	Severely impaired expressive and receptive language development	Possible loss of expressive or receptive language. Qualitative impairments in communication	No clinically significant general delay in language	

Behaviour	Restricted repetitive and stereotyped patterns of behaviour, interests, and activities, as manifested by at least one of the following: - preoccupation with one or more stereotyped and restricted patterns of interest -apparently inflexible adherence to specific, non-functional routines or rituals -stereotyped and repetitive motor mannerisms -persistent preoccupation with parts of objects	Loss of previously acquired purposeful hand skills between ages 5 and 30 months with the subsequent development of stereotyped hand movements	Possible loss of play and/or motor skills. Possible restricted, repetitive, and stereotyped patterns of behaviour, interests, and activities, including motor stereotypies and mannerisms.	Restricted, repetitive and stereotyped patterns of behaviour, interests, and activities as seen in Autistic Disorder.

(APA. 2000)

ASD and sensory sensitivity

A recent study showed that over 70% of children with ASD experienced difficulties in modulating sensory input (Adamson, O'hare & Graham, 2006). However, the study was limited by a small sample size (n = 44). In addition, another recent study with limited numbers (n=33) showed over 90% of children and adults with ASD (including low functioning and high functioning individuals) to have sensory difficulties or abnormalities (Leekam, Nieto, Libby, Wing & Gould, 2007). Furthermore, research utilising methods such as clinical evaluation (Gillberg et al., 1990) and retrospective video studies (Baranek, 1999) suggests that children with ASD show different patterns of sensory sensitivity than children with other developmental disorders. Children with ASD have been found to display difficulties with sensory input, resulting in unusual patterns of sensory processing being demonstrated (Baranek, 1999; Adrien et al., 1993).

Patterns of sensory processing in children with ASD which have been identified include: hypersensitivity (when an individual has extreme or exaggerated responses to sensory input in comparison to others); hyposensitivity (when an individual has minimal responses, or no response at all, to sensory input in comparison to others) and seeking behaviour (when an individual is drawn towards repeated or prolonged experiences of intense sensory stimulation) (Parush, Doryon & Katz, 1996; Watling, 1998; Miller, Anzalone, Lane, Cermak & Osten, 2007; Baranek, 2002; O'Neill & Jones, 1997). An example of a hypersensitive response to touch is an individual jumping in discomfort to a light touch. An example of a hyposensitive response to noise is an individual appearing completely unresponsive to a loud unexpected bang which elicited a response in others around her, and an example of a seeking behaviour is a child watching a video on fast forward, seeking the visual stimulation from the speeded up picture. Hypersensitive and hyposensitive responses to sensory stimuli have been noted in the same individuals depending on the context and sensory modalities affected (Baranek, David, Poe, Stone, & Watson, 2006; Dunn, Myles, & Orr, 2002; Iarocci & McDonald, 2006; Rogers & Ozonoff, 2005).

Autistic Spectrum Disorder and the specific sensory modalities affected

Autobiographical accounts of sensory sensitivity experiences, in individuals with ASD, have highlighted unusual experiences of auditory input, visual senses, tactile, taste and smell (Grandin, 1992; White & White, 1987; Stehli, 1991). However, it seems that despite the wealth of studies surrounding ASD and aspects of its development, there is a lack of detailed empirical research focussing on the sensory aspects of the disorder in both adults and children with ASD (Baranek et al., 2006). The processes (such as perceptual processing) considered to influence the experience of sensory input for individuals with ASD are still yet to be explored in any depth. Most of the research, within this area, appears to have been restricted to a focus on the visual senses (O'Riordan & Passetti, 2006). The findings of research has indicated that individuals with ASD show a superior ability, in comparison to typically developing individuals, to discriminate between visual stimuli (e.g. O'Riordan, Plaisted, Driver & Baron-Cohen, 2001; O'Riordan & Plaisted, 2001; Joliffe & Baron-Cohen, 1997). In addition, Leekam et al. (2007) found significant differences in the visual symptoms of children with autism in comparison to the visual symptoms of children without autism. Visual symptoms included behaviours such as excitement at viewing a spinning object and flicking hands near to the eyes.

However, exploration of the research investigating the sensory profiles of individuals with ASD has shown the auditory sense to be the most affected (e.g. Dahlgren & Gillberg, 1989; Adamson et al., 2006). One example of this is a study by Greenspan and Weider (1997) in which the researchers found that in every chart review they carried out of children and infants with ASD there was evidence of the young person experiencing some sort of auditory disturbance. Some researchers have even suggested that unusual responses to auditory stimuli should be included in the diagnostic criteria for ASD (Gillberg, 1990). In contrast to Greenspan and Weider's (1997) findings, Leekam et al. (2007) did not find a significant difference in the auditory symptoms of children with ASD and typically developing children. However, the authors noted that this may be related to a poorer level of sensitivity in the items of their assessment interview, the Diagnostic Interview for Social and Communication Disorders (DISCO) (Leekam, Libby, Wing, Gould & Taylor, 2002) exploring the experience of auditory input. It has been suggested that, similar to the enhanced discrimination found in the research on visual processing, there is also enhanced discrimination within the processing of auditory stimuli (e.g. O'Riordan & Passetti, 2006;

Heaton, Hermelin & Pring, 1998) but not necessarily of other sensory modalities, such as tactile processing (O'Riordan & Passetti, 2006).

In relation to patterns of sensory processing, researchers have noted hypersensitivity to auditory input in children and adults with ASD. This can result in individual distress in response to noise, whereas others do not find these noises distressing (O'Neill & Jones, 1997; Rosenhall, Nordin, Sandstrom, Ahlsen & Gillberg, 1999). Additionally, other researchers reported hyposensitive responses such as a lack of responsiveness to auditory input (Iarocci & McDonald, 2006; Rogers & Ozonoff, 2005).

Within the limited research on the remaining sensory modalities, Leekam et al. (2007) found that the senses most affected in children with ASD in comparison to typically developing children, were tactile and taste domains, and these domains did not vary with age or level of intelligence. This finding is supported by Blakemore et al. (2006), who found that adults with Asperger's syndrome demonstrated tactile hypersensitivity of high frequency skin vibrations (whereas this hypersensitivity was not demonstrated by adults, from the general population). However, this hypersensitivity did not occur when the adults with Asperger’s Syndrome were exposed to low frequency skin vibrations. A further study (Cascio et. al., 2008) compared the tactile perceptions of adults with ASD to controls on the palm and forearm. The researchers found that the group with ASD and the control group displayed similar thresholds for the detection of light touch and varying heat sensations. However, Cascio et al. (2008) also found that the group with ASD showed higher levels of sensitivity to vibration on the forearm and higher levels of sensitivity to thermal pain on both the palm and the forearm. The authors concluded that individuals with ASD have elements of normal sensory sensitivity in relation to normal perception alongside areas of increased sensitivity (i.e. enhanced perception).

Generally, research has suggested that children with ASD have difficulties in multiple sensory domains (Leekam et al., 2007). For example, Kern et al. (2008) assessed individuals using the Sensory Profile (SP). They found that individuals with ASD were significantly different from controls on all four sections of the sensory profile, namely: modulation related to body position; modulation of movement affecting activity level; modulation of sensory input affecting emotional responses; and modulation of visual input affecting emotional responses and activity level. However, further research is required to further explore the specific domains affected and any changes as children get older.

The association of high levels of sensory sensitivity with emotional problems

Research has shown young people with ASD to have higher levels of emotional problems (e.g. Kim, Szatmari, Bryson, Steiner & Wilson, 2000) than typically developing peers. One of the suggestions given for these elevated levels is the association between ASD and higher levels of SS. However, there is limited research exploring this association (Ben-Sasson et al., 2008).

Pfeiffer, Kinnealey, Reed and Herzberg (2005) found an association between anxiety and hypersensitivity in children and adolescents with ASD; they also demonstrated an association between depression and both hypersensitivity and hyposensitivity in this group. It is possible that the experience of hypersensitivity and hyposensitivity can have an impact on the emotional state of the individuals. For example, hypersensitivity to auditory input may result in anxiety in busy, noisy environments. Nevertheless, this study found an association, rather than a causal link, and this should be considered when reflecting on the findings.

It is important to note that research discussed does not identify a causal relationship between SS and emotional problems. It may be that there is interplay between the symptoms of ASD, levels of SS and emotional symptoms and it is suggested that this interplay merits exploration when planning appropriate care and intervention for children with ASD (Ben-Sasson et al., 2008). One facet of this exploration may be the use of suitable profiling of the children's sensory needs.

Sensory sensitivity and age

Within existing research, contradictory findings suggest that SS levels increase (Talay-Ongan and Wood, 2000), decrease (Baranek Foster, & Berkson, 1997) and stay the same (Rogers et al., 2003) as children develop. In addition, Leekam, Nieto, Libby, Wing and Gould (2007) found that age affects SS in some sensory modalities but not others. For example, they showed increasing age was related to increases in tactile sensitivity (light touch) and reduced sensitivity within the visual and oral senses. While, Baranek et al. (2006) found sensory symptoms overall, decreased as developmental age increased. Baranek et al. proposed that this may be due to children developing effective coping strategies for SS, as they mature. These studies used different tools (such as parent reports and diagnostic interviews), for assessing SS in children and the inconsistent findings may be related to the poor reliability and validity of tools (Baranek et al., 2006). However, variation in the perceptions of those completing questionnaires or reviewing clinical charts with regard to the children's sensory experiences may also explain inconsistency.

In considering the varied research findings on the influence of age on children's SS, this study will examine the relationship between age and SS in individuals with ASD, utilising caregiver and school staff reports.

Sensory sensitivity and challenging behaviour

There is still much to research in terms of the sensory experience of individual with ASD. It is important to consider the possible psychological aspects of processing sensory stimuli in an abnormal way. For example, it has been proposed that altered SS and possible reactivity could result in an unpleasant experience for individuals with ASD and potentially trigger challenging behaviour (Adamson et al., 2006) such as self harming (Tordjman et al., 1999). This is particularly pertinent for individuals with ASD who do not have the ability to communicate verbally to others the reasons for their distress, as it has been suggested that there is a higher likelihood of SS in less verbal or non-verbal children, being underestimated by those around them (Baranek et al., 2006). Moreover, Pfeiffer et al. (2005) found that adaptive behaviours and social skills appeared to decrease as problems with sensory processing increased. In contrast, Rogers, Hepburn & Wehner (2003) found there to be no significant association between levels of sensory sensitivity and social-communicative scores in a standardised interview, concluding that these domains were independent of each other for children with ASD, developmental delays or typically developing children. Therefore, it appears that there is a need to further explore sensory processing and ASD; firstly to monitor any contextual differences in processing, in order to gain a full picture of sensory sensitivity, and then to explore further the links between sensory processing difficulties and behavioural/emotional problems.

Theories of sensory processing

Over-arousal theories hypothesise that children with ASD are more sensitive (over-aroused) and thus more reactive to sensory stimuli than children without ASD. These theories also suggest that children with ASD do not habituate to sensory stimuli or take longer to habituate to sensory stimuli than other children without ASD (Rogers & Ozonoff, 2005). There have been many advocators for the over-arousal theory (e.g. Tinbergen & Tinbergen, 1972; Dawson & Lewy, 1989). However, this theory does not explain aspects of hyposensitivity (lowered sensitivity and lowered arousal) in children with ASD. In addition, research suggests there is little evidence in support of over-arousal theory, explaining sensory processing difficulties in individuals with ASD (e.g. Goldberg, Landa, Lasker, Cooper, & Zee, 2000).

Under-arousal theories do provide an explanation for hyposensitivity. The under-arousal theory proposed by Rimland (1964) posits that a deficit in the reticular activating system results in the child struggling to connect past experiences of sensory input with current ones, thus preventing learning and habituation. This, in turn, is thought to result in the child not responding in a typical way or under-reacting to sensory stimuli. DesLauriers and Carlson (1969), along similar lines, proposed that there was an imbalance in the reticular activating system that related to activity in the limbic system. This would mean that some children with ASD who had over-active reticular activating systems would be over aroused, while those with under-active systems would be under aroused. This theory (although under the umbrella term of under-arousal theory) goes some way in providing an explanation for both hypersensitive and hyposensitive responding. There does appear to be a greater level of support for under-arousal theories with studies finding greater evidence of hyposensitive responses to sensory stimuli (Miller et al., 2001; Niwa, Ohta & Yamazaki, 1983). Nevertheless, both over-arousal and under-arousal theories of sensory processing are still utilised within clinical considerations of ASD (e.g. Greenspan et al., 1997)

One of the more popular theories of sensory processing is the perceptual inconstancy theory (Ornitz & Ritvo, 1968). This theory is based on the concept of brainstem dysfunction. The authors propose that in ASD there are abnormal levels of arousal due to this dysfunction and that these abnormal levels can result in fluctuating experiences of over-inhibition and over-excitation. These levels consequently impact upon the child's ability to maintain an even and familiar experience of sensory input. However, no empirical research has been undertaken to evaluate this theory (Rogers & Ozonoff, 2005)

More recently, Waterhouse, Fein and Modal (1996) have proposed a crossmodal impairment theory of sensory processing. The authors concentrate their theory on hippocampul abnormalities found in individuals with ASD (Kemper & Bauman, 1998). Waterhouse et al. (1996) suggested that difficulties with sensory processing in ASD are related to difficulties with crossmodal integration of sensory input (failure to integrate sensory input and spacio-temporal information from the same context) and that these difficulties may be explained by abnormalities in the hippocampus. Rogers and Ozonoff (2005) reviewed research exploring crossmodal impairment theory and found that there was little support from the existing research. However, they advocated further research, as the existing research is limited in quantity.

A prominent model to be developed regarding sensory processing was proposed by Dunn in 1997. This model, which Dunn describes as derived from neuroscience and behavioural science, considers the influence of sensory processing on a child’s experiences and behaviour. The primary aim of this model is to provide a framework within which to understand each child’s behaviour. Dunn (1997) proposes that there is an interaction between a child’s neurological thresholds for sensory input and their behavioural responses (both of which are on a continuum).

The neurological thresholds are considered the level of stimuli necessary for a child’s neurological system to register the stimuli (e.g. react to the stimuli). Whereas, the behavioural responses are the way in which the child responds to the sensory input in light of their neurological threshold. The interaction of the neurological thresholds and the behavioural responses are considered to result in four discrete patterns of sensory processing: poor registration, sensation seeking, sensitivity to stimuli and sensation avoiding (Dunn, 1997). These patterns then enable a child’s experiences to be interpreted. Poor registration occurs when a child has a high neurological threshold, is thus habituated to the stimuli and acts in accordance with the threshold (lowered reaction to stimuli – passive responding).

Sensation seeking is noted to occur when a child has a high neurological threshold, is thus habituated to the stimuli and consequently acts to counteract the threshold by actively seeking out sensory stimulation. Sensitivity to stimuli occurs when a child has a low neurological threshold, is thus sensitized to the sensory stimuli, and acts in a passive manner. Whereas sensation avoiding is when a child has a low neurological threshold but acts to counteract the neurological threshold by actively avoiding sensory stimuli. Dunn (1999) suggests that this model demonstrated the different ways in which children may process sensory input and can be useful when planning relevant interventions. This model is used as the basis for the Sensory Profile (SP) (Dunn, 1999) and studies utilising the SP support this model of sensory processing (e.g. Ermer & Dunn, 1998; Keintz & Dunn, 1997).

As mentioned previously the research on sensory sensitivity and ASD is limited in quantity and at times has been found to have methodological problems (e.g. utilising measures with poor reliability and validity). Furthermore, when Rogers and Ozonoff (2005) reviewed the research regarding sensory dysfunction in ASD they concluded that the available literature does not strongly support any one theory of sensory processing. Therefore, it seems that further research which is methodologically sound is required, in order to further explore the experience of sensory processing in ASD.

The importance of assessing Sensory Sensitivity

In consideration of the evidence suggesting that children with ASD experience higher levels of sensory sensitivity and display unusual patterns of sensory processing, it appears useful to assess and explore these experiences further. This is in light of the association identified between sensory sensitivity and emotional problems, as well as the association between sensory sensitivity and challenging behaviour. Furthermore, as everyday experiences are likely to involve a great deal of sensory input (particularly in educational and busy family environments) it is important to consider the sensory experiences of each child with ASD (Baranek, 2002). Therefore, professionals may rely on parental/caregiver reports to obtain the most accurate overview of the child's difficulties in order to incorporate this into the formulation and planning of treatment. In order to do this, one must feel confident in the reliability and validity of the method of assessing sensory sensitivity and confident in the validity of the informants perceptions used in assessment (e.g. parental reports and clinical observers).

Methods of assessing Sensory Sensitivity

One of the difficulties in assessing sensory sensitivity is the subjective nature of the process. This means that it can not be directly measured with ease. For example, children with ASD have difficulties with communication and may not be able to express their experiences of sensory sensitivity adequately. As a consequence, the primary methods for assessing sensory sensitivity and responses are through observation or interview of children with ASD by individuals such as caregivers and health clinicians.

Common clinical interview methods used when assessing for autism, such as the Autism Diagnostic Interview Revised (ADI-R) (Lord, Rutter & Le Couteur, 1994) do not collect a sufficient level of detail regarding the sensory processing of the individual being assessed (Leekam et al., 2007). Moreover, there are few reliable and standardised instruments available for the assessment of sensory sensitivity. The majority of sensory processing assessments require direct observation of a child or require that the child carries out a task while observed.

An example of this is the Sensory Integration and Praxis Test (SIPT) (Ayres, 1996). This is a standardised battery of tests requiring a child to carry out a number of tasks. The SIPT is designed to explore the various elements of sensory processing including vestibular, tactile, kinaesthetic and visual processing (Ayres, 1996). It is standardised on children aged four to eight years of age (Bundy, Lane, & Murray, 2002; Dunn 1994). The limitation with this battery is that it can take several hours to administer. This is a very long time to expect a child with ASD to attend and participate and it is thought that children with ASD will not readily meet the standardised requirements of this battery of tests (Keintz & Dunn, 1997). In addition, the SIPT requires extensive training and certification through Western Psychological Services making it more difficult to access and administer on a regular basis; making the SIPT difficult to use as part of routine clinical practice.

The Test of Sensory Functions in Infants (DeGangi & Greenspan, 1989) explores five aspects of sensory processing (reactivity to tactile deep pressure, adaptive motor functions, visual-tactile integration, ocular-motor control, and reactivity to vestibular stimulation). However this test is limited in its administration to infants from the age of 4 to 18 months.

Another test of sensory processing also developed by DeGangi is the DeGangi-Berk Test of Sensory Integration (TSI). This standardised assessment is administered on children aged 3 to 5 years (Berk & DeGangi, 1983; Keintz & Dunn, 1997). This test explores three key areas, namely bilateral motor integration, postural control and reflex integration. However, the TSI does not explore tactile processing (Dunn, 1994). Furthermore, both this test and the previous assessments mentioned rely on immediate direct observation of a child and are, therefore, not conducive to assessing the child within a real life context as experienced on a day to day basis (Dunn, 1994)

Other methods of exploring sensory processing are the Peabody Developmental Motor Scales, 2nd edition (PDMS-2) (Folio and Fewell, 2000) and the Bruininks-Oseretsky Test of Motor Performance (TMP) (Bruininks, 1978). However, these tests focus solely on the motor skills related to sensory processing and are restricted to assessing young children up to 6 years of age. Furthermore, the norms for the TMP have not been revised for many years which may affect the validity of the test.

Due to the fact that many children with ASD will be unlikely to manage attending and taking part in direct assessments, some therapists choose to use non-standardised forms of assessment, such as clinical interviews and checklists for observations, to assess sensory processing (Cook, 1991). Examples of checklists include the Touch Inventory for Preschoolers (TIP) (Royeen, 1987) and the Touch Inventory for Elementary School Aged Children (TIE) (Royeen & Fortune, 1990). Combined, these assessments can be administered on behalf of children up to the age of 12 years. The only difference in administration is that the TIP is completed by the child’s teacher, whereas the TIE is a self report measure. The TIP and the TIE are designed to measure solely aspects of tactile sensory processing and thus do not explore the many facets of sensory processing (something which most clinicians would be interested in) (Dunn, 1994).

Another method of assessing sensory processing is with a sensory history questionnaire. The key benefit of these types of questionnaires is that they aim to examine sensory processing within a child's natural environment and everyday life (Dunn, 1994). As a child's behaviour is related to the context within which they live, approaches which take a child's natural environment into account are considered useful (Dunn, Brown, & McGuigan, 1994).

In 2006, Baranek et al. proposed a new caregiver report assessment, named the 'sensory experiences questionnaire'. The developers of this assessment proposed that it identifies patterns of sensory processing (including indication of hyper- and hypo-responsiveness). Initial indications suggest that this 21 item questionnaire has good internal consistency (reliability) and that it is able to outline patterns of sensory processing that are distinguishable between clinical groups (Baranek et al., 2006). However, this measure is quite new and the authors noted that a revised version of the questionnaire is currently being developed in order to balance items more appropriately across the various sensory subscales.

The use of caregiver questionnaires, such as the Sensory Profile (Dunn, 1997), has confirmed the significant difference in the SS of children with ASD and age matched typically developing children (e.g. Keintz & Dunn, 1997) as well as the significant difference in SS of toddlers with ASD and typically developing toddlers (Rogers et al., 2003; Ornitz, Guthrie & Farlie, 1977). The Sensory Profile (Dunn, 1999) is a well established, history questionnaire which takes a child's natural environment into account. This profile and the shortened version, the Short Sensory Profile (SSP) utilised in the methodology, will be discussed in more depths in Appendix E.

The usefulness of profiling the sensory sensitivity of children with ASD

When considering the variability in the presentation of children with ASD, it is expected that each child will experience sensory stimuli in their own distinct way. Therefore, it is informative to profile the SS of these children. This profiling would then contribute to: further exploration of sensory issues within this group; assessment of the clinical needs of the children; and consideration of the best approaches to take in the management of each child's needs

(Adamson et al., 2006). This is particularly pertinent in light of research showing maladaptive behaviour and emotional problems to be related to symptoms of SS (e.g. Rogers et al., 2003; Kim et al., 2000).

Therefore, the value of profiling the sensory responses of this particular group, through reports from parents, carers and other adults involved in their lives is important, in order to identify the possible levels of SS that these individuals experience. By developing a greater understanding of the impact of SS on the emotional and behavioural presentation of children, clinical psychologists can incorporate this knowledge into their formulations and thus tailor their clinical intervention accordingly.

Furthermore, the SS levels of children with ASD may affect how others perceive them and their behaviour. For example, any hypersensitive responses to touch can have an effect on a child’s social responses (e.g. avoiding closeness and moving away from close contact) to others in their environment and, importantly, to their parents. This can be a very upsetting experience for parents, who may often wish to share affection with their children. However, through profiling the children’s sensory needs, an explanation as to why their children respond in this way may be developed, and this may provide some comfort to parents, as well as providing parents with a better understanding of how their children experience the busy and unpredictable word around them (Leekam et al., 2007).

As educational and care environments for children with ASD will often contain significant levels of sensory stimuli, it is appropriate to carefully consider the planning of care and interventions for this group. It is vital to adapt approaches to accommodate, or work with, the particular sensory needs and difficulties that each child may have. Thus profiling may contribute to this planning and may also allow a better understanding of how individuals with ASD perceive the world around them and in what way they make sense of it.

When working in a health setting, observation of children is time limited. Therefore, it would be beneficial to use the reports of those who observe the children on a regular basis in order to determine the children’s response levels to sensory input and to guide clinicians in their plan of treatment.

Caregiver reports profiling SS and reactions of children with ASD are considered useful as they provide a foundation to build a sensory profile, such as highlighting triggers and environmental stressors, and identifying possible coping strategies. By using caregiver reports, there is likely to have been much observation of a behavioural response that may be of low frequency, over a long period, as the child develops. This is in contrast to the observational time available in a clinical setting. Caregiver reports have been advocated because: parents observe children in their natural environment; reporting encourages parent participation; and parents can often be "uniquely intuitive" about their children's presentation (Ermer & Dunn, 1998, p.287).

Parental/caregiver reports have often been used to profile children's SS within the limited literature on children with ASD (Rogers et al., 2003). However, concerns have been raised about the exclusive use of parental /caregiver questionnaires. For example, Goldstein (2000) focussed on the potential pitfalls in methodology of parental questionnaires. Such pitfalls included possible limitations in the psychometric properties (e.g. poor reliability) of some questionnaires, the possible difficulty in verifying the diagnoses of children and the variability that can be introduced when considering comorbidity and the varying levels of intelligence of the child.

The use of multiple informants to assess sensory sensitivity

Kraemer et al. (2003) proposed that when there is no single, objective, method of measuring a particular variable (such as SS in children with ASD), then information from more than one informant should be used. This is said to be particularly important within processes such as psychological or psychiatric evaluation and assessment. However, it can be said that when using more than one informant, the information gleaned can often be incongruent from one informant to another. Thus, researchers have concluded that in order to ensure agreement within one measure, it is not vital to use an optimal number of informants, but rather it is important to select the appropriate informants for measuring the variable (Kraemer et al., 2003).

Kraemer and her colleagues put forward an approach in which the most appropriate informants should be identified by considering the environments or contexts, in which the variable to be measured is likely to be influenced and observed. For children, it seems likely that the home and school environments are most influential in terms of their experience of sensory stimulation. Therefore, it appears appropriate to consider educational staff and parents or caregivers as appropriate informants for the Short Sensory Profile (SSP).

In order to assess the appropriateness of the common informants (i.e. parents, carers and school staff) used in the assessment of children, it seems useful to assess whether the information gleaned using the SSP with these informants is congruent for the children they care for (as both parties have extended contact with, and observation of, the children). This will possibly give an indication as to whether children display the same levels of SS across different settings and/or whether adults perceive children's behaviour and SS in similar ways within different environments.

Caregivers and school staff may consider the children's sensory needs in very different ways as they are rating children based on their observation of the children within different environments. In addition, their perceptions of the children's sensory needs may vary due to their different experiences. For example, school staff in specialist schools, tailoring their education to the needs of children with ASD, may have received training regarding autism and consideration of sensory issues may have been included within this. Thus school staff may be more attuned to the sensory needs of the children. Moreover, specialist schools are likely to follow a specialist approach called the Treatment and Education of Autistic and related Communication-handicapped CHildren (TEACCH; Schopler, & Van Bourgondien 1991) which advocates low sensory stimulation within the school environment.

However, with approaches such as TEACCH adopted within schools, staff may actually become less aware of the children's sensory needs as the environment is already adapted to meet their needs. Furthermore, with staff responsibility spread across more than one child with ASD (who are all likely to require high levels of support), there may be fewer opportunities to focus on each child's individual needs and sensory sensitivities (despite small classroom sizes in specialist schools). In contrast to this, parents may care for fewer children with ASD and thus have increased opportunity to focus on each particular child's sensory needs; learning their child's particular sensory profile. In addition, parents are privy to the consistent contact with the child throughout his/her development without extended breaks during school holidays and weekends. This may mean that parents/caregivers have developed more awareness of their child’s sensory needs than school staff.

Conversely, parents/caregivers may also have gradually adapted their environment to the sensory needs of their child and this may even have been done with limited awareness of the process. Subsequently, they too may not be fully aware of their child’s current levels of sensory sensitivity. In addition, parents may be balancing a busy lifestyle, such as work, caring for more than one child and coordinating the family routine which may limit their opportunities to attend to the sensory needs of their child or children with ASD.

The above considerations suggest that there are many variables which may be impacting upon caregivers’ and school staff’s awareness of the sensory sensitivity levels of children with ASD. Assessing the level of agreement between these two groups on the SSP may allow further reflection on the opportunities which school staff and caregivers have to consider the children’s sensory needs. Moreover, the findings may provoke consideration of the appropriateness of parents and/or school staff as raters, in assessing the sensory sensitivities of children with ASD. It may also show whether reporting from one particular adult or more than one adult, involved in a child’s care, is most informative for clinical practice.

Level of agreement between parent and teacher reports

An older study, looked at mothers reports of their children’s’ social competence in comparison to teachers reports of the social competence of the same children (using a standardised questionnaire). This study found that the response patterns of the mothers differed to those of the teachers (Gray, Clancy & King, 1981). This may be related to the different contexts and interpersonal interactions that the children experience. For example, children may have very different social behaviours in front of many peers at school, than they would do in front of family members in the home.

In addition, researchers have demonstrated that when parents and teachers are asked the same questions regarding the same child’s behaviour, their responses tend to have a low level of correlation, suggesting that these different informants have differing views of the same child (e.g. De Los Reyes & Kazdin, 2005; de Nijs et al., 2004). However, a study on medication for ADHD concluded that parents’ reports were just as sensitive as teacher reports in assessing the efficacy of the medication being trialled (Biederman, Gao, Rogers and Spencer, (2006). The difference in findings regarding agreement may be related to the particular variable being explored. For example, in the medication trials, mentioned previously, a child's difficulties with attention may be observed in different contexts and thus when medication is effective, this effectiveness may also be observed in different contexts. Conversely, the findings of Gray et al. (1981) may reflect the varying levels of social skills displayed by children relating to their environment. For example, children could behave very differently in the presence of their peers at school, in comparison to their social behaviour in the presence of their parents at home.

The choice of analysis used to explore level of agreement

The most frequently used method, for assessing level of agreement, (e.g. between parents' and children's ratings of the children's own quality of life) has been the Pearson's product-moment correlation coefficient (Eiser & Morse, 2001). However, this method has been criticised as a tool for measuring level of agreement, as it measures levels of covariation but not levels of absolute agreement (Ottenbacher, 1995). This means that Pearson's correlation coefficient can highlight levels of linear covariation but that significant differences in actual levels of agreement may not be appropriately highlighted. Consequently, researchers have suggested that a more appropriate method of statistical analysis for level of agreement is the Intraclass Correlation Coefficient (ICC). The ICC values produce an index that represents the ratio between the level of subject variability and total variability (De Civita et al., 2005).

Hypotheses

Parents/caregivers will have a strong level of agreement with teachers/keyworkers on overall ratings of the sensory sensitivity of their children. This will be evidenced by the total scores on the SSP for each child, rated by both a teacher and a parent.

Parents/caregivers will have a strong level of agreement with teachers/keyworkers on ratings of discrete aspects (factors) of the childrens' sensory sensitivity (e.g they will have a strong level of agreement on their children's levels of taste/smell sensitivity). This will be evidenced by the factor scores for each child, rated by both a teacher and a parent.

Overall levels of sensory sensitivity (as measured by the SSP total scores, with teachers and parents as raters) will decrease as the age of children with ASD increases.

Factor levels (namely tactile sensitivity, taste/smell sensitivity, movement sensitivity, underresponsive/seeks sensation, auditory filtering, low energy/weak and visual auditory) of sensory sensitivity (as measured by the SSP factor scores, with teachers and parents as raters) will decrease as the age of children with ASD incea

APPENDIX B: ETHICAL ISSUES

The main ethical issue was that the participants were children (some of whom were very young) who were severely or profoundly disabled by their ASD. Therefore, it was considered inappropriate to ask the children directly for their consent as it was unlikely that any one of them would understand the purpose or process for the research project.

Research with children who have impairments limiting their understanding and/or communication such that they are unable to give their real consent requires special safe-guarding procedures (British Psychological Society, 2007). This research was considered to maintain the safety of the participants as the process of filling in the questionnaire was considered to have no impact upon the participants (children with ASD). Moreover, the process may actually have been beneficial, in getting parents and caregivers to actively reflect on the sensory needs of their children. Ethical approval for this approach was granted by the University of Lincoln Ethics Committee.

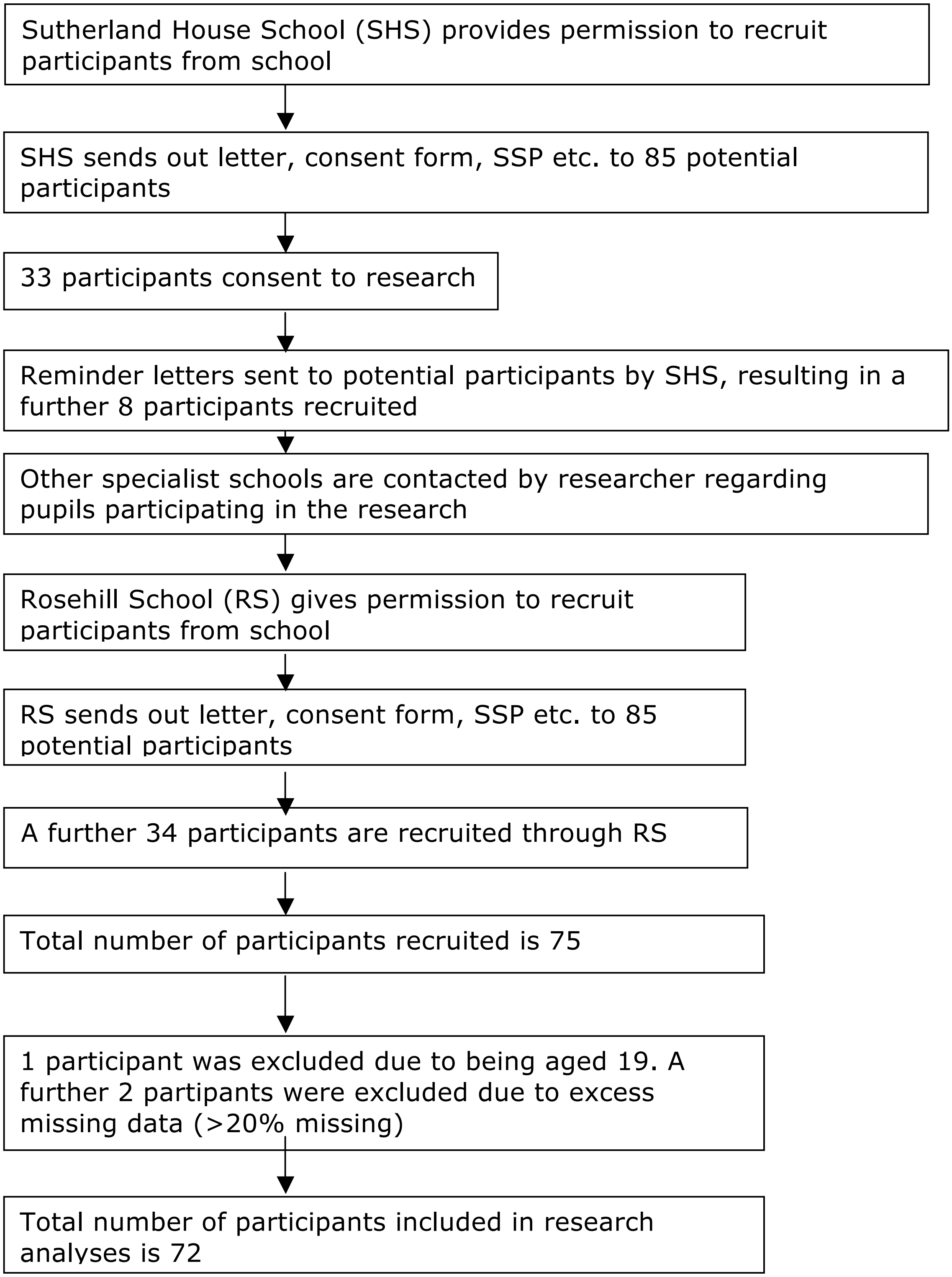
In order to address this, the parents of the participants (children with autism) were asked to give consent on their children's behalf. This consent included the parents consenting to fill in a questionnaire called the Short Sensory Profile (SSP). The parents were asked to complete this questionnaire on behalf of their children. This questionnaire is designed to be filled in by primary caregivers on behalf of their children, so was deemed appropriate within the methodology of the research. In addition, consideration was given to the language used within the letters and questionnaires. However, it was not expected that any of the parents would not be able to speak or read English. This was confirmed through collaboration with the school staff and thus the letters to parents were all printed in English.

APPENDIX C: RECRUITMENT

Participants were initially identified as children with a diagnosis of ASD attending Sutherland House School, a specialist school for children with ASD, located within five different sites in Nottingham. The school educates approximately 85 children (all of whom were invited to participate in the study) from age 3 years up to the age of 18 years. Therefore, when considering the exclusion and inclusion criteria, it was hoped that there would be approximately 60 participants (approximately 70% of participants approached). This is based on the average response rates for postal questionnaires seen in previous studies on this subject (e.g. Adamson et al., 2006). However, the response rates from parents at Sutherland House School resulted in 33 participants (39%) initially and then 40 participants after the reminder letters had been sent (47% of participants approached). Therefore, the researcher decided to approach other schools, within the East Midlands, specialising in the education of children with ASD and Rosehill School agreed to participate. This school also educates approximately 85 children from age 3 years to 18 years and has one site within Nottingham city. All of the children attending Rosehill School met the criteria for the study and were invited to participate in the research. The recruitment of participants from Rosehill School resulted in a further 32 participants being recruited. The response rate, from parents at Rosehill School, was 40% of participants approached.

The process of recruitment, including details on exclusion criteria is summarised in the flow chart overleaf.

Figure I: Recruitment Flowchart



Sutherland House School (SHS) provides permission to recruit participants from school

SHS sends out letter, consent form, SSP etc. to 85 potential participants

33 participants consent to research

Reminder letters sent to potential participants by SHS, resulting in a further 8 participants recruited

Other specialist schools are contacted by researcher regarding pupils participating in the research

Rosehill School (RS) gives permission to recruit participants from school

RS sends out letter, consent form, SSP etc. to 85 potential participants

A further 34 participants are recruited through RS

Total number of participants recruited is 75

1 participant was excluded due to being aged 19. A further 2 partipants were excluded due to excess missing data (>20% missing)

Total number of participants included in research analyses is 72

APPENDIX D: THE STORING OF IDENTIFIABLE MATERIAL

Parents of children at Sutherland House School were asked to return the SSP, questionnaire and consent form to the researcher at the base site (the lower school site of Sutherland House School). Parents of the children at Rosehill School were asked to return the same information to the researcher at a university site. Although this information was received at the university, it was consequently stored at Rosehill School to maintain data protection.

Confidentiality was maintained by storing the questionnaires (with names on them) in cabinets within secure rooms on the school sites. All received and identifiable data was stored securely on school sites to maintain data protection. Questionnaire data was anonymised through the application of identification numbers for each participant rather than using the participants' names. This was done, in order to ensure that any data taken off site was anonymised and thus protected.

APPENDIX E: DESIGN, MEASURES AND QUESTIONNAIRE

Design

This study determined the level of agreement between the ratings of caregivers and school staff on the total raw scores, and the factor raw scores for children using the Short Sensory Profile (SSP). This study therefore used a descriptive, cross sectional design.

Measures

The Sensory Profile (SP)

Some of the suggested pitfalls of previous methodology used to evaluating caregiver questionnaires for sensory sensitivity were addressed in a study by Miller et al. (1999). The researchers focussed on the psychometric properties, such as the external validity, of one of the most frequently used sensory questionnaires, known as the Sensory Profile (SP) (which contains 125 items) (Dunn, 1997). This is a parental/caregiver questionnaire developed for assessing the behaviours associated with abnormal responses to sensory input. This questionnaire was standardised on over 1,000 children with and without learning and physical disabilities in an age range of 3 to 14 years (in the United States of America). Miller et al.

(1999) found that the scores indicative of SS significantly correlated with independent clinical assessment of SS or disorder. In addition, they found that the scores on the profile correlated with abnormal reactions of typically developing children and children with sensory problems, in response to sensory challenging exercises. These findings add support to the external validity of this tool as a measure of SS in children. In addition, researchers have commented that the Sensory Profile is sensitive to discrete sensory responses in individuals, not only in a population of children with ASD or other developmental disorders, but also in a typically developing population of children (where one may not expect the variability in sensory responsiveness to be so apparent) (Dunn & Brown, 1997).

In a large study by Ermer and Dunn (1997), the discriminate validity of the SP was shown, as SP scores discriminated between children with and without developmental disorders, and also discriminated groups of children with different developmental disorders (e.g. ASD and Attention Deficit Hyperactivity Disorder) from each other. This suggests a high level of sensitivity within this tool for profiling the sensory responses of individual children. Furthermore, researchers exploring the link between ASD and SS, have proposed that the SP is a useful tool for conducting further research within this area (Rogers & Ozonoff, 2005; Adamson et al., 2006).

However, Grace Baranek et al. (2006) suggest that the Sensory Profile (and thus the SSP) has limitations, in so much as it does not make the clear distinction between hypersensitivity and hyposensitivity within social and asocial settings. Furthermore, they point out that it is yet to be validated on making the distinction between SS in children with ASD and SS in children with developmental delays. Nevertheless, the use of a shortened version of the SP appeared appropriate as the SP considers the responses of children in their natural environments (Ermer & Dunn, 1998). In addition, its format enabled the researchers to make use of postal questionnaires in order to investigate the level of agreement between caregivers and school staff on the sensory sensitivity of the children with ASD.

The Short Sensory Profile (SSP)

Following the success of the Sensory Profile (SP) (Dunn, 1997), a shortened version, named the Short Sensory Profile (SSP) (Dunn, 1999) was developed. The researchers reduced the number of items from 125 items (in the SP) to 38 items (most relevant to sensory issues) in the SSP. The SSP explores the same areas as the original Sensory Profile (SP), using slightly adjusted factor names: tactile sensitivity; taste/smell sensitivity; movement sensitivity; underresponsive/seeks sensation; auditory filtering; low energy/weak and visual/auditory sensitivity.

The internal consistency, calculated by Cronbach's Alpha, of the SSP total scores and seven factor scores range from 0.70 to 0.90. The internal validity correlations for the SSP range from 0.25 to 0.76, indicating the factor section scores of the SP (hypothesised to represent key sections and factors from the original longer SP) are relatively unique constructs (Dunn, 1999). The SSP has a discriminant validity of more than 95 percent, highlighting the presence or absence of sensory sensitivity, in typically developing children and in children with sensory modulation disorder, (McIntosh, Miller & Shyu, 1999).

Individual items on the SSP are scored from 1 to 5 indicating frequency of behaviour (ranging from always responds to never responds). The raw score totals on the SSP can vary from 38 to 190 with lower scores indicative of higher impairment. The SSP provides a classification system for representation of the raw scores. Firstly, ‘typical performance’ is scores at or above the point 1 standard deviation below the mean. Scores within this range represent typical sensory responding. Secondly, ‘probable difference’ is scores at or above the point 2 standard deviations below the mean, but lower than 1 standard deviation below the mean. Scores within this range represent questionable areas of sensory responding. Lastly, ‘definite difference’ is scores below the point 2 standard deviations below the mean. Scores within this range represent difficulties with sensory responses (Dunn, 1999).

Miller et al. (1999) addressed many of the concerns regarding the use of caregiver questionnaires in their study exploring the psychometric qualities of the SSP. They found that abnormal scores on the SSP were associated with independent clinical assessment of difficulties in sensory sensitivity. In addition, Miller et al. (1999) found the abnormal scores on the SSP were associated with atypical psycho-physiological responses to sensory input in typically developing children, and those with sensory processing difficulties.

The above findings provide support for the use of the SSP as a tool for assessing sensory sensitivity in children, with and without ASD.

The Demographic and Clinical Questionnaire

This questionnaire was devised by the researcher and distributed to parents who completed the questionnaire once they had given consent to participate in the study.

APPENDIX F: THE MANAGEMENT, LEVEL AND DISTRIBUTION OF MISSING DATA

There was an expectation that missing data would be present within some of the questionnaires returned. This was anticipated for two reasons. Firstly, when administering questionnaire based research by post, it is not unusual to have missing data within returned questionnaires (e.g. Ben-Sasson et al., 2003). Secondly, the SSP instructs raters that they have the option to cross out items which they either do not feel able to comment on (due to no observation of the behaviour) or if they believe the item does not apply to the child for whom the SSP is being rated. It was expected that raters who were unsure about a particular item would be more likely to cross out an item than give the answer which they thought most likely to apply to that particular item, resulting in missing data. The management of missing data was guided by the management used in previous research looking at sensory modulation issues in toddlers (Ben-Sasson, et al., 2003). This research utilised a version of the sensory profile adapted for use with toddlers, namely the Infant/Toddler Sensory Profile (Dunn, 2002) and was thus subject to the same difficulties with missing data.

APPENDIX G: TESTS OF NORMALITY

Kolmogorov-Smirnov tests were used to assess the normality of distribution of the variables within this study. This test was used, rather than the Shapiro-Wilk tests because the number of participants was greater than 50 for all variables. The results of this analysis are shown in table V below.

Table V: Kolmogorov-Smirnov test for age and SSP scores

	Statistic	Df	P
Age	.112	72	.025*
Parent - Total Score	.057	66	.200
School – Total Score	.070	57	.200
Parent – Tactile Sensitivity	.076	70	.200
School – Tactile Sensitivity	.069	68	.200
Parent - Taste/Smell Sensitivity	.159	70	<.001*
School – Taste/Smell Sensitivity	.125	66	.012*
Parent - Movement Sensitivity	.211	70	<.001*
School – Movement Sensitivity	.267	62	<.001*
Parent – Underresponsive/Seeks Sensation	.089	72	.200
School – Underresponsive/Seeks Sensation	.053	71	.200
Parent – Auditory Filtering	.102	70	.067
School – Auditory Filtering	.114	69	.026*
Parent – Low Energy/Weak	.247	69	<.001*
School – Low Energy/Weak	.168	70	<.001*
Parent – Visual/Auditory Sensitivity	.103	72	.058
School – Visual Auditory Sensitivity	.087	70	.200

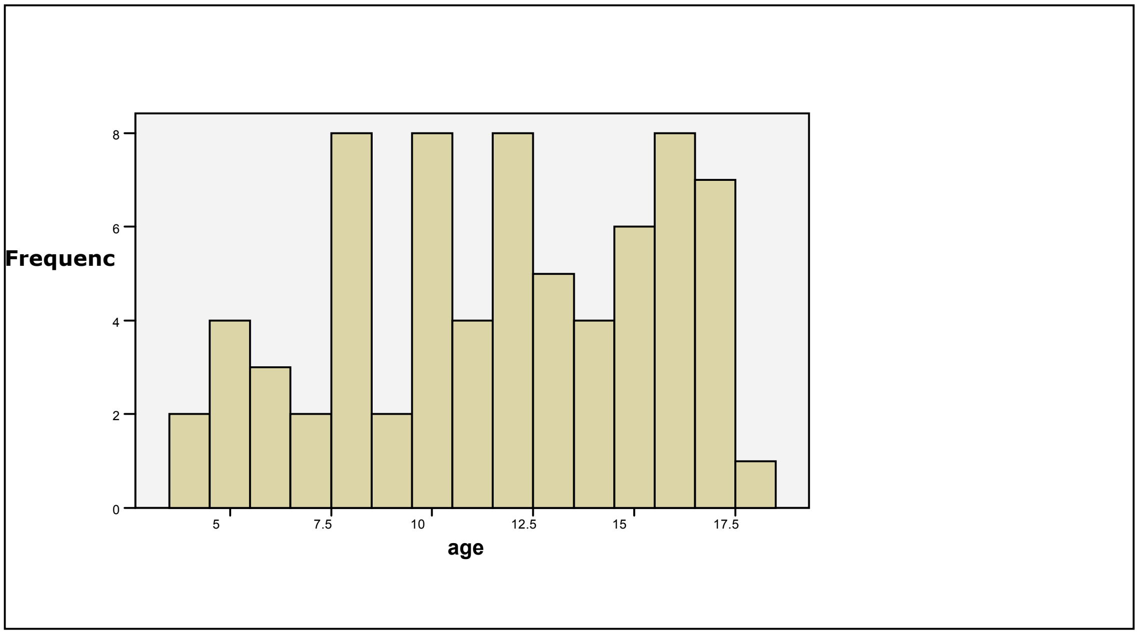
*p<0.05

**p<0.01

***p<0.001

Table V shows that 8 of the 17 variables assessed had distributions which were significantly different from normal. This included the variable for age, which was included in each planned correlation. The distribution patterns of these 8 variables are depicted in the following histograms.

Figure II: Distribution of age of children



The above histogram demonstrates the distribution of ages of the participants recruited, which is significantly different from a normal distribution. The histogram shows the majority of children attending the school to be above the mean age of 12 years old.

Figure III: Distribution of taste/smell sensitivity scores (caregiver)

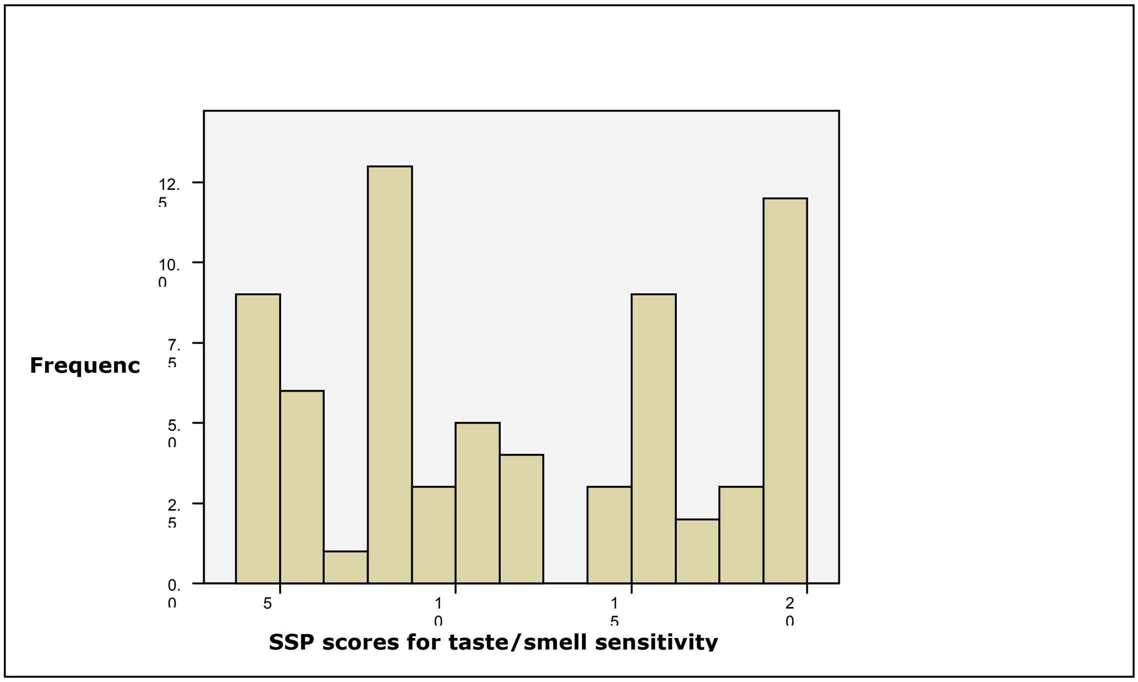


Figure IV: Distribution of taste/smell sensitivity scores (school)

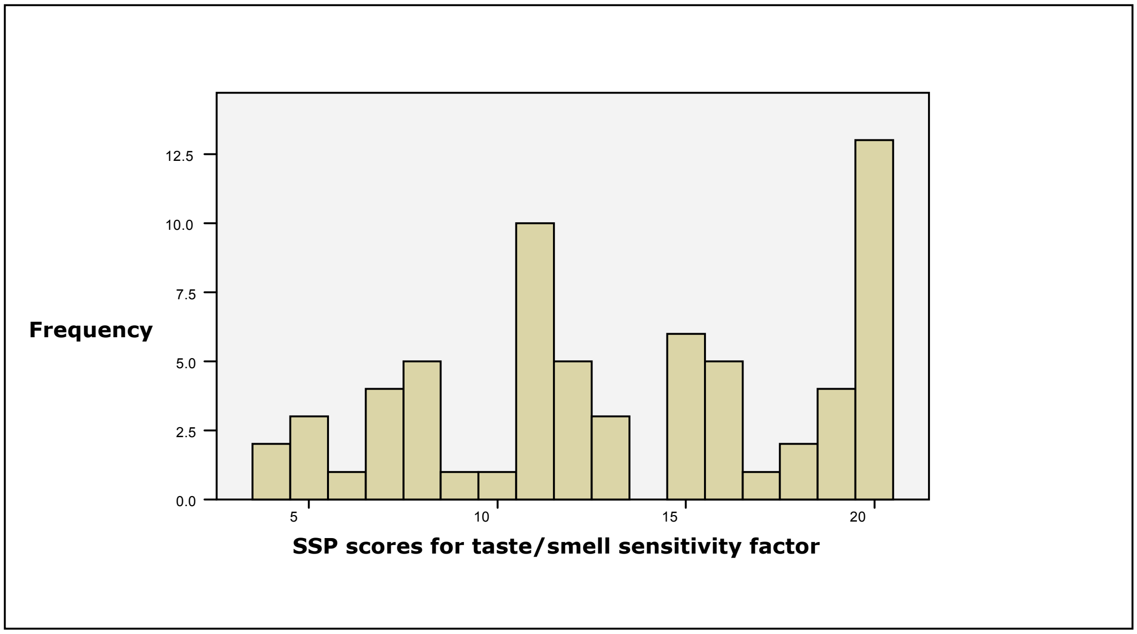


Figure V: Distribution of 'movement sensitivity' scores (caregiver)

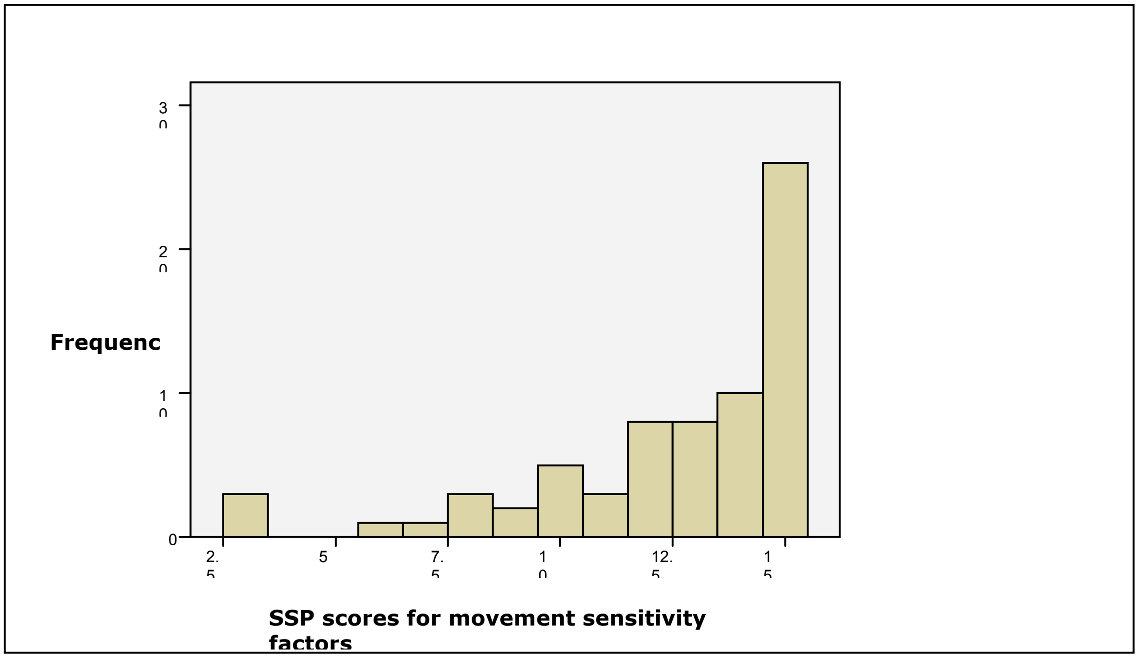


Figure VI: Distribution of 'movement sensitivity' scores (school)

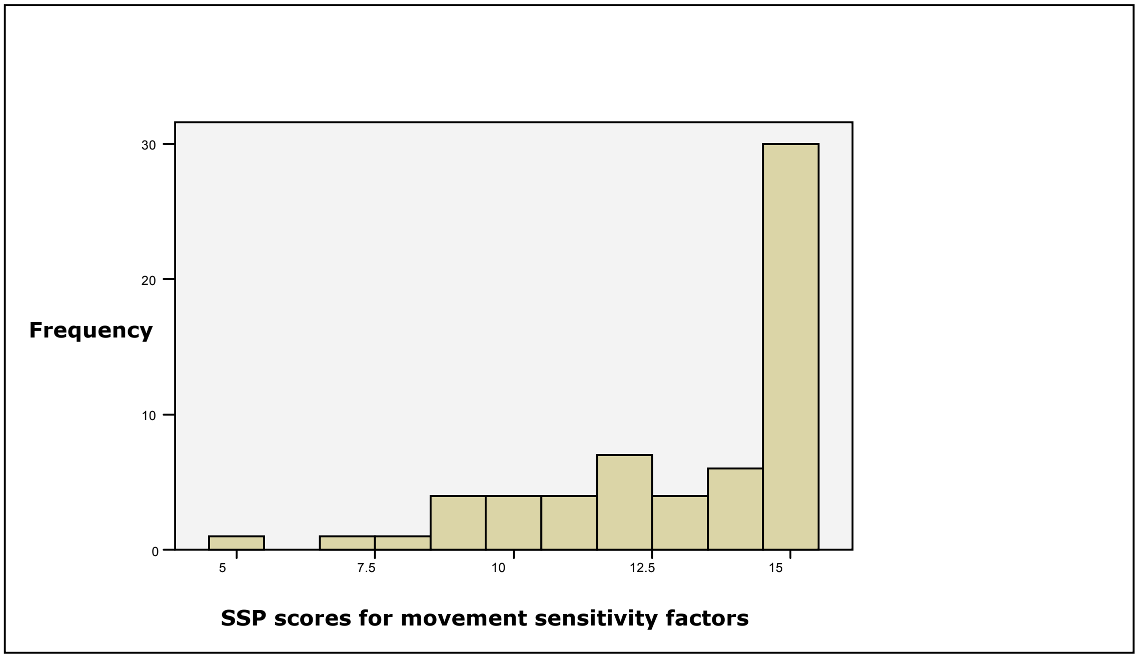


Figure VII: Distribution of 'auditory filtering' scores (school)

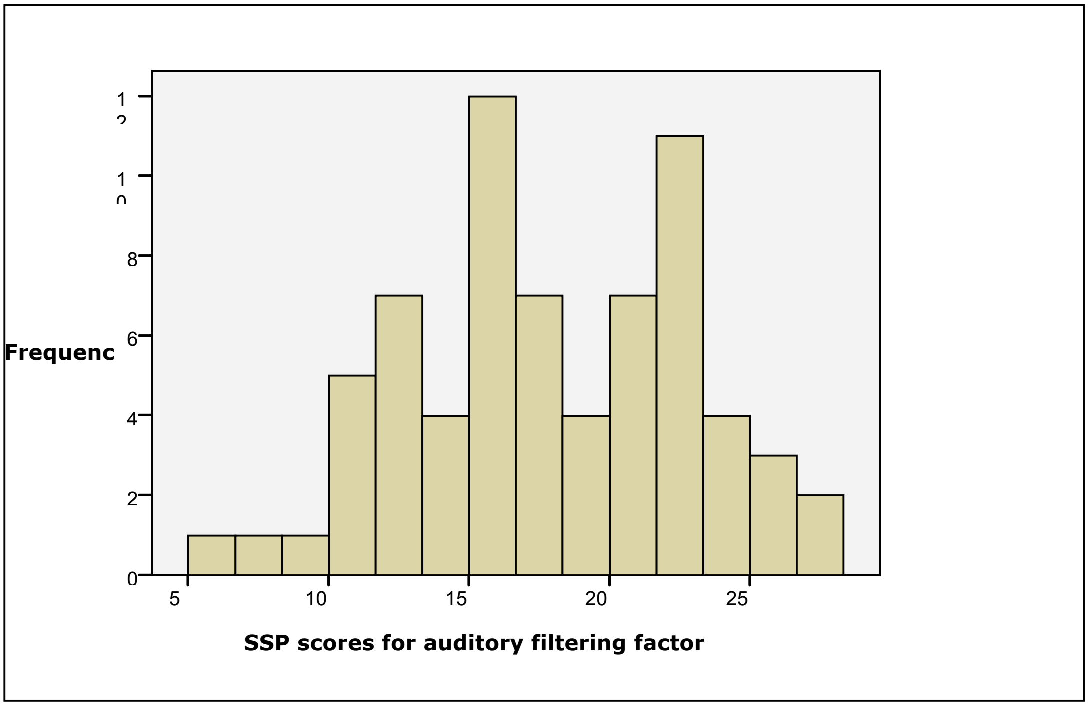


Figure VIII: Distribution of 'low energy/weak' scores (Caregiver)

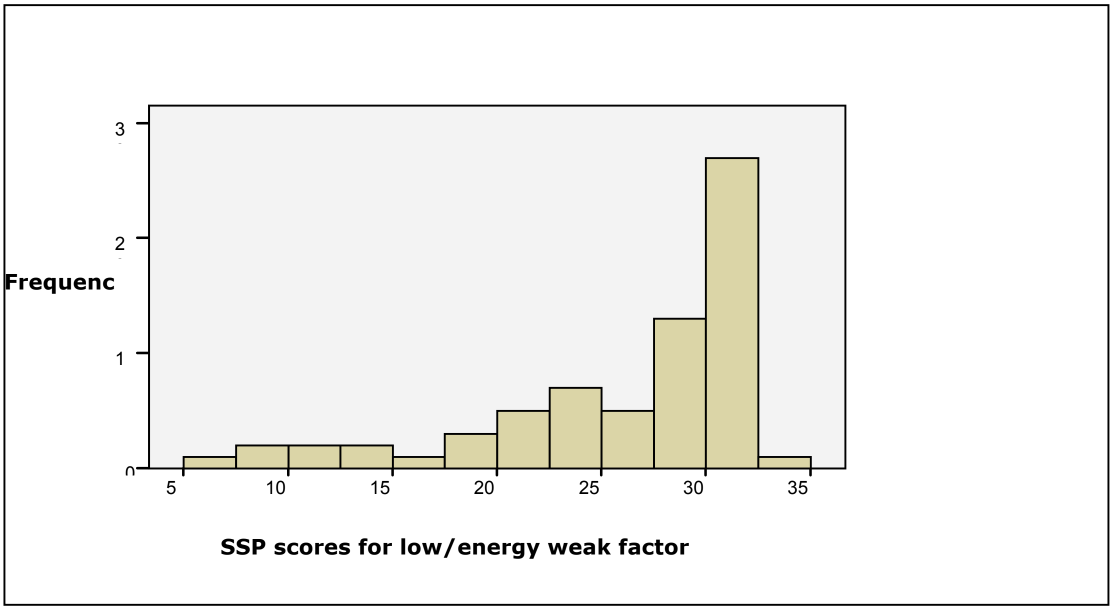
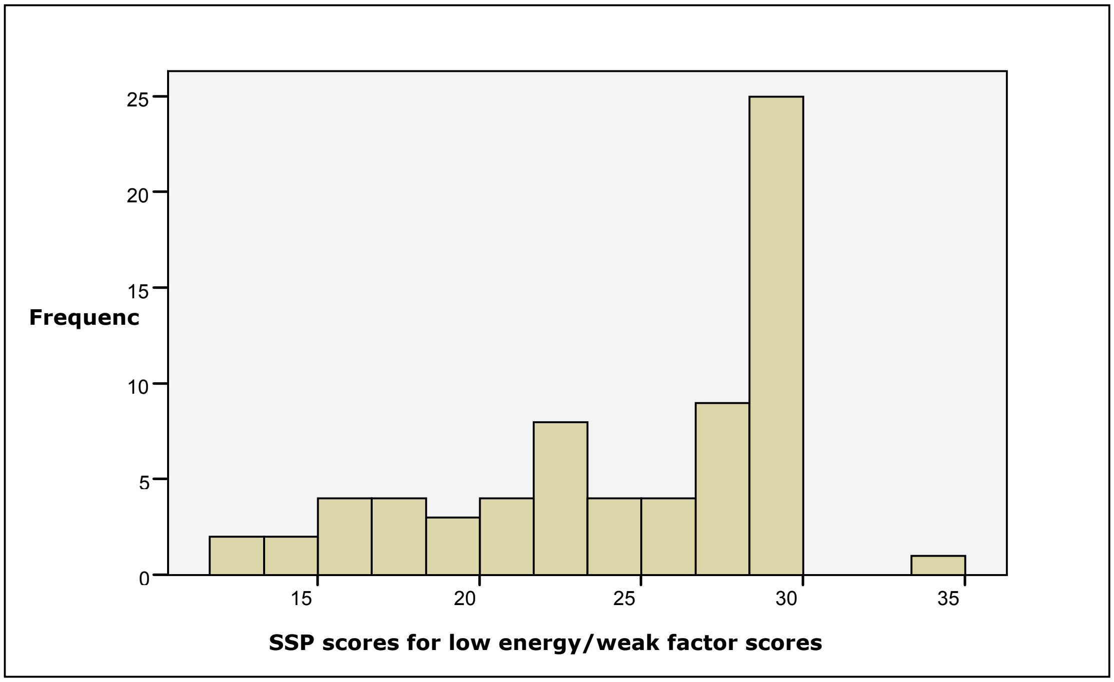


Figure IX: Distribution of low energy/weak scores (school)



The previous histograms depict distributions of scores which are significantly different from a normal distribution (positively skewed), thus supporting the Kolmogorov-Smirnov test results. However it is important to note that the higher scores on the histograms are an indication of more normal levels of SS, as shown in the population with whom the SSP was standardized.

As observed above, several of the variable distributions were significantly different from normal. This included the distribution of the children's age, which was to be analysed in every correlation.

Therefore non-parametric tests (Spearman’s Rank Order Correlations) were used to assess the relationship between SS and age.

APPENDIX H: FURTHER DESCRIPTIVES AND RESULTS

The relationship between level of sensory sensitivity (as rated by caregivers and school staff) and age for children with ASD

Spearman's correlation coefficients assessing the relationship between the SSP total and factor scores, and the child's age (for both the teacher and parent ratings) are displayed in Table VI. As there were 16 correlational analyses planned, it was decided that a Bonferonni correction should be undertaken which gave an adjusted significance level of $p \leq 0.0031$.

Table VI. Spearman rank Order Correlations between children's age and scores on the Short Sensory Profile

Sections/Factors	**Rating**	**Number**	**r**	**p**
Total Score	Caregiver	66	.356	.003**
	School	57	.199	.138
Tactile Sensitivity	Caregiver	70	.248	.038*
	School	68	.027	.828
Taste/Smell Sensitivity	Caregiver	70	.329	.005**
	School	66	.203	.102
Movement Sensitivity	Caregiver	70	-.058	.636
	School	62	-.156	.225
Underresponsive/ Seeks Sensation	Caregiver	72	.386	.001***
	School	71	.120	.321
Auditory Filtering	Caregiver	70	.307	.010**
	School	69	.054	.658
Low energy/Weak	Caregiver	69	.059	.631
	School	70	.192	.112
Visual/Auditory Sensitivity	Caregiver	72	.046	.701
	School	70	.015	.900

*p<0.05

**p<0.01

***p<0.001

From Table VI, five positive correlations between total and factor scores (rated by caregivers) and age were found, with higher ages associated with lower levels of SS on the relevant scores/factors. However, following the Bonferroni adjustment (where $p \leq 0.0031$) only two significant positive correlations of SS and age were observed. There was a medium significant positive correlation between parents' total scoring on the SSP and age ($r=.356$, $p<0.0031$) and a medium significant positive correlation between parents' scoring on the factor underresponsive/seeks sensation and age ($r=.386$, $p<0.0031$). There were no significant correlations found between SSP scores rated by teachers and age.

Missing Data Findings

Of the SSP data, 1.6% of the items' scores was missing or rated as 'no opportunity' in the parents' ratings of their children. 3.98% of the items' scores was missing or rated as 'no opportunity' in the teachers' ratings of the same children. Within the teachers' group, there were occasions when every item for one particular section was missing or rated as 'no opportunity.' For example, one particular teacher (who was considered the person who knew the children best) expressed that she did not feel equipped to answer any of the items contained within the factor on taste/smell sensitivity. She explained that she only observed the children at lunchtime, and did not feel that was adequate enough to rate the items within the section.

Further breakdown of the frequency of missing items found in each factor is shown in the Figure X overleaf for both caregivers and school staff.

Figure X: Frequency of missing data

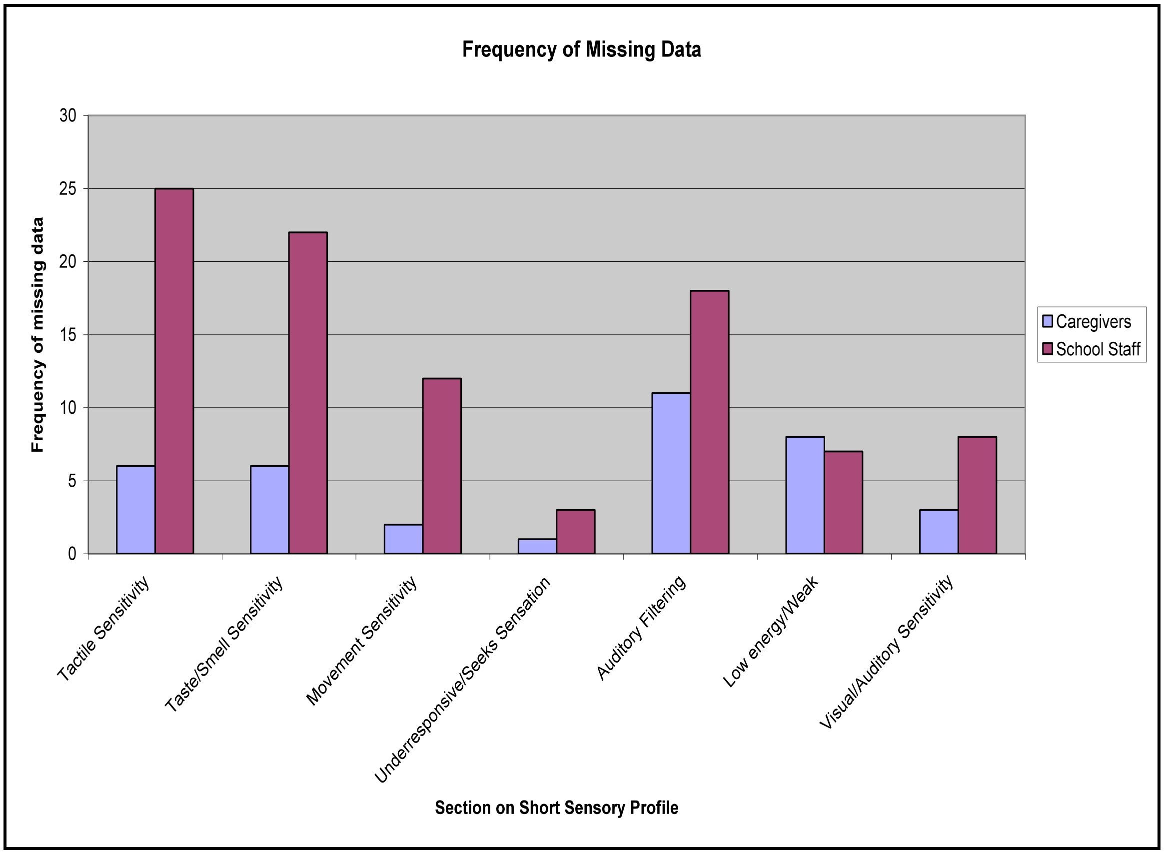


Figure X depicts that the school staff were more likely to have missing data than the caregivers (with the Low energy/weak section being the exception).

There was much variation in the items which were missing. However, there were a couple of items which had higher levels of missing data than others. For example, item 28 in the Auditory Filtering Section was frequently missed in comparison to other items within that section. From the missing data for the school staff on this section, 16 (88.9%) of the 18 missing items were item 25 (has trouble completing tasks when the radio is on). However, from the missing data for the caregivers on the Auditory Filtering Section, 4 (36.4%) of the 11 missing items were item 25. Though it should be noted that a further 5 (45.5%) of the 11 missing items were accounted for by one caregiver who failed to identify any items within that section.

In addition, in the Movement Sensitivity Section, item 14 (dislikes activities where head is upside down, for example, somersaults, roughhousing) was frequently missed in comparison to other items within that section. From the missing data for the school staff on this section, 10 (83.3%) of the 12 missing items were item 14. From the missing data for the parents on the Movement Sensitivity Section 2 (100%) of the 2 items missing were item 14.

It is important to note that the above figures represent the missing data for those who were eligible for inclusion to the study. This did not include the participants (n=2) who had been excluded due to excess missing data.

Categorical Classification Results of the SSP

Tables VII and VIII show the categorical classification (i.e. typical performance, probable difference and definite difference from SSP Manual, Dunn, 1999) result based on caregiver scoring of the SSP. As the SSP has only been standardised on children aged 3 to 10 years, these tables distinguish between the classification categories found for the standardised sample and the very tentative classification categories (to be considered with caution) found for the non-standardised sample.

Table VII shows that the majority of children with ASD (within the standardised age group), when rated by caregivers, had 'definite differences' in tactile sensitivity, taste/smell sensitivity, underresponsive/seeks sensation, auditory filtering and visual auditory sensitivity. From this group, 93.1% had a ‘definite difference’ overall on the SSP.

The same group, when rated by school staff, had definite differences observed in tactile sensitivity, taste/smell sensitivity, underresponsive/seeks sensation, auditory filtering and low energy/weak. From this group, rated by school staff, 72.73% had a ‘definite difference’ overall on the SSP.

Table VIII shows the majority of children with ASD (within the non-standardised age group rated by caregivers) had ‘definite differences’ in tactile sensitivity, underresponsive seeks sensation, auditory filtering and visual/auditory sensitivity. From this group, rated by caregivers, 64.86% had a ‘definite difference’ overall on the SSP.

Table VIII also shows the majority of children with ASD (within the non-standardised age group rated by school staff) had ‘definite differences’ in tactile sensitivity, underresponsive seeks sensation, auditory filtering and visual/auditory sensitivity. From this group, rated by caregivers, 54.29% had a ‘definite difference’ overall on the SSP.

Table VII: Short Sensory Profile (SSP) classifications for the standardised sample

	Tactile Sensitivity Number (%)	Taste/Smell Sensitivity Number (%)	Movement Sensitivity Number (%)	Underresponsive/Seeks Sensation Number (%)	Auditory Filtering Number (%)	Low Energy/Weak Number (%)	Visual /Auditory Sensitivity Number (%)	Total Number (%)
Caregiver scores								
Definite Difference	22 (75.86)	21 (72.41)	6 (20.69)	26 (89.66)	26 (89.65)	9 (31.03)	15 (51.72)	27 (93.10)
Probable Difference	4 (13.79)	2 (6.89)	5 (17.24)	1 (3.44)	2 (6.9)	1 (3.44)	6 (20.69)	1 (3.44)
Typical Performance	3 (10.34)	6 (20.69)	18 (62.07)	2 (6.9)	1 (3.45)	19 (65.52)	8 (27.59)	1 (3.44)
School scores								
Definite Difference	13 (44.83)	13 (50)	0 (0)	21 (72.21)	20 (71.43)	14 (48.27)	10 (34.48)	16 (72.73)
Probable Difference	9 (31.03)	6 (23.08)	5 (21.74)	4 (13.79)	4 (13.79)	2 (6.9)	11 (37.93)	3 (13.64)
Typical Performance	7 (24.14)	7 (26.92)	18 (78.26)	4 (13.79)	4 (13.79)	13 (44.83)	8 (27.59)	3 (13.64)

Table VIII: Short Sensory Profile (SSP) classifications for the non - standardised sample

	Tactile Sensitivity Number (%)	Taste/Smell Sensitivity Number (%)	Movement Sensitivity Number (%)	Underresponsive/Seeks Sensation Number (%)	Auditory Filtering Number (%)	Low Energy/Weak Number (%)	Visual /Auditory Sensitivity Number (%)	Total Number (%)
Caregiver scores								
Definite Difference	22 (53.66)	16 (39.02)	9 (21.95)	35 (81.39)	26 (63.41)	12 (30.77)	19 (44.19)	24 (64.86)
Probable Difference	7 (17.07)	5 (12.19)	6 (14.63)	5 (11.63)	6 (14.63)	1 (2.56)	7 (16.28)	8 (21.62)
Typical Performance	12 (29.27)	20 (48.78)	26 (63.41)	3 (6.98)	9 (21.95)	26 (66.67)	17 (39.53)	5 (13.51)
School scores								
Definite Difference	20 (51.28)	14 (35)	11 (28.2)	21 (50)	22 (56.41)	13 (32.5)	18 (43.9)	19 (54.29)
Probable Difference	10 (34.38)	2 (5)	6 (15.38)	9 (21.43)	4 (10.26)	2 (5)	6 (14.63)	6 (17.14)
Typical Performance	9 (23.08)	24 (60)	22 (56.41)	12 (28.57)	13 (33.33)	25 (62.5)	17 (41.46)	10 (28.57)

Descriptive Data of Caregiver Informants

The following tables outline the descriptive data drawn from the demographic questionnaires distributed to the caregiver informants participating in the study.

Table IX: Level of education of caregivers completing SSP on behalf of their children with ASD

	Frequency	Percentage
Primary school	0	0
Some Secondary School	2	2.8
Secondary School (GCSE, A-level or equivalent)	32	44.4
Some university	9	12.5
University (degree level)	15	20.8
Post Graduate University	8	11.1
Missing data	6	8.3

The above table IX shows that the majority (44.4%) of caregiver/parent informants completing the SSP had been educated to a secondary school level, obtaining qualifications such as GCSE's or A-levels. In addition, a further 20.8% of caregiver/parent informants had been educated to a university degree level.

Table X shows that the majority of caregiver/parent informants were either full time homemakers or employed part time (total of 66.7%).

Table X: Current employment status of caregivers completing SSP on behalf of their children with ASD

	Frequency	Percentage
Full time employed	12	16.7
Part time employed	17	23.6
Full time homemaker	31	43.1
College/university student	1	1.4
Self employed	3	4.2
Retired	0	0
Not employed	3	4.2
Missing data	5	6.9

Table XI shows that the number of children under the age of 16, within the households, varied from 0 to 5. The majority of households had 1 or 2 child(ren) under the age of 16 (76.4%) being cared for.

Table XI: Number of children (under the age of 16) being cared for at home

Number of children at home	Frequency	Percentage
0	1	1.4
1	25	34.7
2	30	41.7
3	9	12.5
4	1	1.4
5	1	1.4
Missing data	5	6.9

Table XII shows that the majority of parent/caregiver informants were married (66.7%).

Table XII: Relationship status of parent/caregiver completing the SSP

Relationship Status	Frequency	Percentage
Married	48	66.7
Divorced	7	9.7
Single	6	8.3
Widowed	2	2.8
Separated	2	2.8
Other	2	2.8
Missing	5	6.9

Intraclass Correlation Significance Levels

The following table XIII details the Intraclass Correlation Coefficients and the corresponding level of significance found within the analyses. This table shows that there were: four statistically significant, medium strength correlations; one statistically significant large strength correlation; and two statistically significant low strength correlations; indicating the levels of agreement between caregivers and school staff scoring the SSP on behalf of the same children.

Table XIII: Agreement between caregiver/parent ratings and school staff ratings on SSP

Sections/Factors	No	ICC	Level of Significance
Total Score	53	0.348**	0.03
Tactile Sensitivity	67	0.250*	0.016
Taste/Smell Sensitivity	64	0.530***	<0.001
Movement Sensitivity	61	0.386***	0.01
Underresponsive/Seeks Sensation	71	0.302***	0.01
Auditory Filtering	67	0.433***	<0.001
Low energy/Weak	67	0.258*	0.017
Visual/Auditory Sensitivity	70	0.189	0.05

ICC-Intraclass Correlation

*p<0.05

**p<0.01

***p<0.001

The analysis of data for which the SP has been standardised

A chi square test for independence was carried out in order to determine whether the total sensory sensitivity classification categories on the short sensory profile (SSP) as rated by the caregivers were related to the total classification categories on the SSP as rated by the school staff for the same children. As the SSP is standardised on children aged 3 to 10 years, there were 29 participants in the study who fell into this age group and thus had categorical classifications indicating their overall level of sensory sensitivity (i.e. typical performance, probable difference and definite difference). However, after exclusion due to excess missing data (i.e. over 20% missing data within one factor/section), there were only 22 participants eligible for inclusion in the chi square analysis. As a consequence of this low number, there was a rule violation within the assumption of chi-square analyses. Frequencies less than 5 were expected within the cells, whereas chi-square analyses assume that the minimum cell frequency should be 5 or greater (or at least 80% of cells should have expected frequencies of 5 or more). Nevertheless, it was considered worthwhile to explore the chi square findings with caution.

The chi square test for independence indicated there was no significant association between the caregivers' classification categories and the school staff's classification categories when rating on the same children $x(2, n=22) =.463$, $p>0.5$.

APPENDIX I: EXTENDED DISCUSSION

Discussion of results

Of the 72 participants, six were female and 66 were male. This ratio of males to females (11:1) within the sample is not unexpected considering the research suggesting that ASD is strongly sex-dependent. For example, children with autism (included in the list of diagnoses within ASD) show a male to female ratio of 4:1 across the full IQ range (Rutter, 1978), and 9:1 among children with Asperger's Syndrome (included in the list of diagnoses within ASD) (Wing, 1981).

The distribution of ages of the participants, recruited within the schools, was significantly different from a normal distribution, with a mean age of 12 years. It may be that the parents of older children were more inclined to fill in the questionnaire or had more time to fill in the questionnaire, as a consequence of learning to manage their time and parental responsibilities more efficiently as their children age. In addition, parents of older children with ASD may have more immediate concerns about the future for their children (once they reach adulthood) and thus more inclined to contribute to research which may improve the future prospects for their loved ones.

However, it may also be the case that there is a higher enrolment of older children in special schools for ASD. Perhaps, as children with ASD grow older, they are considered more difficult to manage in mainstream education and are thus more likely to be considered in need of specialist input in the form of specialist schools for ASD. It is possible that the distribution of ages of children with ASD, within mainstream schools, will be different to that observed within specialist schools.

Seven of the variables (i.e. factor scores) on the SSP had distributions of scores which were significantly different from a normal distribution (positively skewed) (please see the histograms in Appendix G). However, it is important to note that the higher scores on the histograms are an indication of more normal levels of SS, as shown in the population with whom the SSP was standardized. Therefore, when the distribution of the histograms is skewed more towards the higher scores, such as in the histograms for the parent and teacher scoring on the factor for movement sensitivity, this may actually be an indication of more normal sensory functioning within this sensory area for the children with ASD. Other, more varied distributions may be indicative of the abnormal way in which children with ASD have been shown to process sensory input (Adamson et al., 2006). However, as the SSP has not been standardized on children over 10 years old it is not possible to fully explore the distribution in terms of classifications of sensory sensitivity (i.e. typical performance, probable difference and definite difference).

There was a large level of variability seen within the range of SSP scores of children, as rated by caregivers and school staff (e.g. total scores as rated by caregivers ranged from 71 to 174 and total scores as rated by school staff ranged from 80 to 181.6). This may be related to the wide heterogeneity seen within a diagnosis of ASD (Szatmari, 2003). Moreover, there was great variability in the informants completing the questionnaires. For example, the school staff varied from teachers to keyworkers and in the caregiver sample there was a range of levels of education and employment status. This may have introduced further variability to the research and may be impacting upon the variation in SSP scores found. However, this is likely to occur in a real world context, such as when professionals are using informants who know the children well, when screening for sensory sensitivity. Therefore, the findings merit consideration in terms of the application of the SSP in clinical and educational, real life contexts.

The classification categories

Table VII showed children with ASD (within the standardised age group), as rated by caregivers, had a majority of ‘definite differences’ in tactile sensitivity, taste/smell sensitivity, underresponsive/seeks sensation, auditory filtering and visual auditory sensitivity. The same group, when rated by school staff, had definite differences observed in tactile sensitivity, taste/smell sensitivity, underresponsive/seeks sensation, auditory filtering and low energy/weak.

The above is in line with: previous findings suggesting higher levels of visual symptoms of children with ASD, in comparison to typically developing children (Leekam et al., 2007); research suggesting the auditory sense is abnormally affected in individuals with ASD (Adamson et al., 2006); and researchers findings that the taste and tactile domains are affected in children with ASD (Leekam et al., 2007; Cascio et al., 2008). For example, definite differences in the taste domains may be reflective of the findings of Keintz and Dunn (1997), who reported observations of children with ASD displaying strong responses (preferential or aversive) to smelling food. The above findings are also in support of Baker, Lane, Angley and Young (2008), who, using the SSP with caregivers in their study, found ‘definite differences’ in underresponsive/seeks sensation and auditory filtering factors in 68% (n=15) of their participants.

However, an area which has mixed findings within previous research is the factor of low energy/weak. For example, Baker et al. (2008) found that an equal number of children with ASD scored ‘definite difference’ and ‘typical performance’ for the low energy/weak factor. However the study by Baker et al. only included children under the age of 8. In this study (which included children under the age of 10), the caregiver scores identified a majority (65.52%) of children with ASD as having a ‘typical performance’ in this factor. While the school staff scored a small majority (48.27%) of the children with ASD to have a ‘definite difference’ in this factor. These differences may be related to the level of demand placed upon the children in different contexts (e.g. more demands at school) resulting in different behaviour displayed by the children in terms of energy and weakness. Consequently, informants from different settings may develop different perceptions of the children’s sensory within the low energy/weak factor with caregivers less likely to observe the children displaying low energy or weakness within the context of home life. These findings suggest the importance of contextual considerations when assessing the sensory processing of children with ASD, in relation to their observed behaviour in different settings.

Furthermore, from the ratings given by the caregivers group, 93.1% of the children with ASD had a 'definite difference' overall on the SSP. From the ratings provided by the school staff group, 72.73% of the children with ASD had a 'definite difference' overall on the SSP. This is accordance with previous research findings of a prevalence of sensory difficulties in children with ASD, ranging between 70% and 94% (Adamson et al., 2006; Baker et al., 2008; Leekam et al., 2007). ASD is acknowledged as highly prevalent among developmental disorders (e.g. Harrison, O'Hare, Campbell, Adamson, & McNeilage, 2006). Thus in light of the high prevalence of sensory processing difficulties within this group, continued investigation of the sensory processing in individuals with ASD is advisable.

Table VIII displays very tentative categorical classifications results, based on the SSP cut off points for the standardised group being applied to the scores for the non-standardised group. Table VIII showed the majority of children with ASD (within the non-standardised age group rated by caregivers) had 'definite differences' in tactile sensitivity, underresponsive seeks sensation, auditory filtering and visual/auditory sensitivity. The majority of children with ASD (within the non-standardised age group rated by school staff) had ‘definite differences’ in tactile sensitivity, underresponsive seeks sensation, auditory filtering and visual/auditory sensitivity. This suggests a fair level of agreement between caregivers and school staff for this group. However, these findings must be considered with caution as the SSP has yet to be standardised on children over 10 years of age (as was this sample). These findings do however provide further information which may contribute to devising classification cut off points for scoring older children on the SSP.

From this non-standardised group, as rated by caregivers, 64.86% had a ‘definite difference’ overall on the SSP and, when rated by school staff, 54.29% had a ‘definite difference’ overall on the SSP. These percentages are lower than those found for the standardised group. This may be indicative of the need for altered cut off points for classification in older children on the SSP. Conversely, these lower scores may be indicative of reduced levels of sensory sensitivity in this older age group (11 to 18 year olds). This suggestion is made in consideration of research findings showing the prevalence of sensory difficulties to decrease as children with ASD age (Kern et al., 2008). A longitudinal study of the impact of age on levels of sensory sensitivity is likely to further knowledge with regard to this possibility.

From both tables VII and VIII (standardised and non-standardised samples), the factor section most often scored as ‘typical performance’ as rated by both caregivers and school staff, was movement sensitivity. This is in agreement with previous research where movement sensitivity was the only factor on the SSP which affected less than half of the ASD population in the study (Adamson et al., 2006). The responses of children with ASD to movement may have reduced susceptibility to sensory processing difficulties. Future research may wish to seek confirmation of this, with the use of assessments such as the TSI (Berk & Degangi, 1983) which explores aspects of movement, such as bilateral motor integration.

Level of Agreement

Significant Intraclass Correlations Coefficients (of medium strength) were found between caregiver and school staff ratings for total scores on the SSP and for the factors: movement sensitivity, underresponsive/seeks sensation and auditory filtering. A significant Intraclass Correlation Coefficient (of large strength) was found for the factor, taste/smell sensitivity. The medium strength correlations between caregiver and school staff ratings on the movement sensitivity factor suggests that the children with ASD are likely to show similar levels of anxiety and dislike in relation to large movements (such as feet leaving the ground).

The medium correlations between caregiver and school staff ratings on underresponsive/seeks sensation factor, also suggest that the children with ASD are likely to display similar levels of responsiveness to sensory input (such as noises and movements), and the same levels of sensory seeking behaviour (such as touching others and objects), across contexts. The medium correlations between caregiver and school staff ratings on the auditory filtering factor also suggest that the children with ASD are likely to display similar levels of distraction and attention, in response to auditory input within different environments.

The large correlation between caregiver and school staff scores for the taste/smell sensitivity factor also suggests that children with ASD respond in the same ways across contexts with regard to eating and scents. However, one teacher within the study did not complete the items contained within this factor section, suggesting that observation of lunchtime was not adequate to inform her of the child's SS in this area. If this is true, then the large correlation observed may be in part related to communication between caregivers and staff regarding the children's likes or dislikes with regard to food, which often occurs when a child enrols (as happens in both specialist schools taking part in the study). This is a logical process as children with ASD often have very narrow preferences for food, thought to be related to taste and smell (Kientz & Dunn, 1997).

Consideration must be given to the strength of the correlations. The majority of correlations were only of medium strength (r= 0.3-0.5). As these correlations were not perfect, there is an implication that across contexts there may still be a degree of difference. In addition, the chi-square analysis for the SSP categorical data drawn from the children for whom the SSP has been standardised (ages 3-10) suggested that there was no significant association between caregiver's classification categories and the school staff's classification categories for the same children (although these results must be considered with caution due to the rule violation within the assumption of chi square analysis). Consequently, the hypotheses: 'that parents/caregivers will have a strong level of agreement with teachers/keyworkers on overall ratings of the sensory sensitivity of their children' and 'that parents/caregivers will have a strong level of agreement with teachers/keyworkers on ratings of discrete aspects (factors) of the childrens' sensory sensitivity', were not supported.

What is not clear is whether the behaviours of the children are different; or whether both the perception of the observers and the behaviour of the children are different across settings. Future research could perhaps explore this further by assessing the level of agreement between observers, observing the child within each context and comparing these with objective measures of sensory sensitivity using physiological measurements.

Sensory sensitivity and age

This study examined the association between age and SS. Following Bonferonni corrections, there were significant medium positive correlations found between parents total scores and age, and between parents' underresponsive/seeks sensation factor scores and age. These results suggest that children with ASD become less sensitive to sensory input as they age, particularly in terms of responsiveness and sensation seeking. In addition, three other positive correlations between caregivers' factor scores and age were found to be significant prior to Bonferroni corrections, which may be suggestive of more normal levels of SS as age increases. This is in line with previous research suggesting that overall levels of SS decrease with age (Baranek et al*.,* 2006). However, it is also possible that caregivers adapt the home environment gradually to suit their children's sensory needs, and thus become less likely to observe their children's abnormal responses to sensory input (Case-Smith & Bryon, 1999). Moreover, the majority of correlations were non-significant, suggesting that levels of SS stay the same as the child develops (in accordance with the findings of Rogers et al*.,* 2003).

SS, as reported by caregivers and teachers, varied widely from low levels to high levels of SS. Within a group displaying such variability, the cross sectional design used may not have adequately highlighted patterns of change as children age. In addition, the age range within this study was skewed towards the higher ages (>11 years). Future research in this area may benefit from adopting a longitudinal design, assessing the changes in the SS of the same individuals over development.

This study found significant medium positive correlations between parents' total scores and age and parents' underresponsive/seeks sensation factor scores and age. This would suggest that children with ASD are less sensitive to sensory input as they age, particularly in terms of responsiveness and sensation seeking. Three other positive correlations between caregivers' factor scores and age were found to be significant (prior to Bonferroni corrections). This may be suggestive of more normal levels of SS as age increases. This is in line with previous research suggesting that overall levels of SS decrease with age (Baranek et al., 2006).

However, the majority of correlations (including all those related to school staff scores) were non-significant, suggesting that levels of SS stay the same, or fluctuate, as the child develops in accordance with previous research findings (Rogers, et al., 2003; Adamson et al., 2006). Thus the hypotheses that: overall levels of sensory sensitivity (as measured by the SSP total scores, with teachers and parents as raters) will decrease as the age of children with ASD increases; and factor levels of sensory sensitivity (as measured by the SSP factor scores, with teachers and parents as raters) will decrease as the age of children with ASD inceases, were not fully supported by the study. However, as alluded to in the paper, the real world nature of this study may have resulted in a highly variable sample of children with ASD, with variable levels of sensory sensitvity. It is difficult to draw conclusions from the findings regarding the association between age and sensory sensitivity and propose hypotheses as to what the findings indicate. In future research, a longitudinal study may better explore the relationship between age and levels of sensory sensitivity within children with ASD.

Strengths of the study

This study benefited from having a reasonable response rate and good number of participants with both primary caregivers and school staff prepared to complete questionnaires. This allowed the allocation of informant dyads who were scoring questionnaires for children whom they knew well. This enabled direct exploration of the level of agreement between the two informants who observe the children in different settings and taking on different roles. This sample included a wide distribution in relation to the age of children, the roles of staff members completing the SSP and the education and employment status of caregivers completing the questionnaire. This wide distribution is reflective of the wider population and thus promotes confidence in the relevance of the study findings for children with ASD.

In addition, the study utilised the Short Sensory Profile (SSP) as the measure of choice. As mentioned earlier this measure is based upon the Sensory Profile (SP), a well established questionnaire found to have good psychometric properties such as external validity (Miller et al., 1999). In addition, the SSP itself has been shown to have a reliability of 0.90 and discriminate validity greater than 95% in the identification of children with and without sensory processing difficulties (McIntosh, Miller & Shyu, 1999). Consequently, the results of the SSP scoring can be confidently considered in terms of the identification of sensory difficulties within the sample.

Limitations of the study

One of the areas which limited the application of the study was the high level of missing data (see Appendix F and Appendix H). Although the study had a standard protocol for managing missing data, there was still a high level of missing data which impacted upon the research. For example, there were different numbers of participants included within each analysis. This is because in each analyses a certain number of participants had to be excluded due to excess levels of missing data (e.g. within a factor or overall total scores). Analyses tended to contain between 50 and 65 subjects, and thus the study analyses were not always able to benefit from the full number of participants (n=72) in the sample. One way of addressing the risk of missing data could have been to support parents and school staff, in person, when completing the SSP. However this was not feasible considering the number of people invited to participate in the study.

In addition, the researchers chose to take advantage of the full age range of participants available recruited within the two specialist schools. This meant that the SSP was not standardised for a significant number of the participants (n=43, 59.7%). Consequently, the study was not able to produce reliable analyses on the categorical data (i.e. typical performance, probable difference and definite difference) which would have been utilised had all participants been within the standardised age range of 3 years to 10 years. The researchers did carry out analysis on the total categorical classification data for those participants who were within the age group. However, the numbers were limited, following exclusion of some participants due to missing data (n=22) and thus the analyses were not statistically sound. The SSP is not standardised for older children. However, the SSP did appear an acceptable measure for older children, as reported by school staff. In addition, there appeared to be a wide distribution of scores on the SSP when administered with this group. This study contributed further information which could contribute to the process of increasing the standardisation age range for the SSP.

The schools participating in the research chose the SSP as being the most useful sensory screening tool available, which they could implement as part of the standard education planning for the individual children. They identified its user friendly qualities and the brief nature of completing the questionnaire as important factors in this choice of assessment as a screening tool. These schools educate children up to, and including, the age of eighteen and thus standardisation of the SSP for wider age groups would be beneficial for broadening its real world application (e.g. as a screening tool across the age range for carers, education and health clinicians).

The sample used within the study was not random, as the researchers attempted to gain the consent of as many participants as possible within two locations (schools). This guaranteed the diagnosis of ASD for the participants and helped the researchers gain a respectable number of participants. However, it is likely that the children enrolled in specialist schools for ASD attend them because they are more likely to be severely or profoundly affected by their ASD. Therefore, it is also likely that the sample within this study is not a true representative sample of the spectrum of ability and impairment that can be observed within ASD, and this may also apply to the levels of sensory sensitivity experienced by these children. Therefore, it may be interesting to evaluate the sensory sensitivity (using the SSP) in children with ASD attending mainstream schools.

As outlined earlier, the SSP supports informants’ choice not to score any items which they do not feel equipped to answer, or items which they do not feel apply to the child in question. Consequently, there was a fairly high level of missing data in the SSP questionnaires returned by caregivers and, in particular, school staff. The SSP may, therefore, not be as suited to research as originally recommended by Dunn (1999). In addition, the SSP is not designed to elicit information relating to sensory responses in different contexts. More recently Dunn (2006) has developed a version of the Sensory Profile, adapted for use with school staff (Sensory Profile School Companion). Future research could administer this measure alongside the original sensory profile to further explore the contextual differences and similarities between children’s sensory sensitivity at home and at school. Furthermore, as these longer measures are context specific, they may be subject to lower levels of missing data. However, these questionnaires take longer to complete, which may mean that potential participants will be less inclined to participate.

The position taken for this study

This study adopted quantitative methods, within a hypothetical, positivist, approach, rather than qualitative methods. This was done for several reasons. Firstly, both school recruited wished to use short screening questionnaires for assessing the sensory sensitivity of children on enrolment, and one of the schools had already expressed an interest in Short Sensory Profile (SSP). For this reason, it appeared appropriate to utilise this standardised questionnaire, containing linear rating scales. The SSP produces categorical and numerical data, conducive to quantitative research methods. Secondly, when planning the research, the researchers expected a high number of participants to be recruited, and thus planned to use quantitative methods to take advantage of the good sample size.

The researcher planned to cover basic information regarding sensory sensitivity as observed by informants, rather than exploring the detailed experiences of sensory sensitivity (which could possibly have been done in qualitative research). For this reason quantitative research appeared to be the most appropriate method. By doing so, testable hypotheses were defined and the results of these could possibly provide a foundation from which sensory sensitivity could be further explored. This may take the form of investigating the area in more detail/richness through qualitative studies in future research (for example, exploring the themes regarding the impact of a child's sensory needs on those around them). Thus, the positivistic approach adopted in this study, was not conceptualised as a barrier to qualitative research, as advised by Michell (2003).

As identified in the literature review, there is limited research on sensory sensitivity and ASD and some may argue that by adopting a positivistic approach, there would a narrowing of the area of study (e.g. Martin, 2003). However, by designing a study which was easily replicated (i.e. quantitative), it was hoped that the initial, perhaps narrow, findings could prompt future researchers to replicate or expand upon the study in their own work.

Conclusion

This study has provided further confirmation of the high levels of sensory sensitivity observed in children with ASD. Research findings suggest that difficulties in sensory processing may account for a variety of unusual behaviours in children with ASD. For example, Baker et al. (2008) and Baranek, Foster & Berkson (1997) suggest that behaviours (which are considered challenging) thought to be related to sensation seeking, such as inappropriate smelling and rubbing, may explain the diagnostic criteria of repetitive stereotyped movements highlighted in ASD. Furthermore, higher levels of difficulty with sensory processing have been associated with poorer levels of adaptive behaviour (daily living skills) (Schaaf & Miller, 2005). In addition, an association between sensory sensitivity and behavioural difficulties has been proposed (Miller et al., 2005; Rogers et al., 2003). Pfeiffer et al. (2005) and Baker et al. (2008) and have added to this, finding that both behavioural difficulties and emotional problems were associated with difficulties in sensory processing.

Therefore, when children with ASD are referred to Child and Adolescent Mental Health Services (CAMHS) for difficulties, such as challenging behaviour or emotional problems, it is important that clinical psychologists consider and assess, the potential contribution of sensory sensitivity to these problems, and incorporate this into the formulation. This will best inform any planned intervention and also may encourage collaboration with other health professionals (e.g. occupational therapists) in providing the most appropriate input for each child.

This study has also provided information regarding the level of agreement between caregivers and school staff. This information is suggestive of context specific aspects of sensory processing which merit further investigation. In consideration of these findings, it is recommended that in practice, clinical psychologists assess children's behaviour in response to sensory input, across settings and with more than one informant. This will assist the psychologist in gaining a detailed profile of children's experiences of sensory sensitivity across settings (and possible time frames) and facilitate exploration of the possible links between sensory sensitivity and the problems for which the children have been referred.

Clinical psychologists, working with children with ASD, are likely to regularly receive referrals regarding behavioural and emotional problems of clients. Therefore, a full understanding of the contribution of sensory processing to these problems, the contextual nature of sensory processing, and the changes in sensory sensitivity during development is recommended. Further research exploring these areas is advised for continued improvement of clinical practice with this client group.

APPENDIX J: REFERENCES FOR APPENDICES

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APPENDIX K: ADDITIONAL MATERIAL

Letter from School to Potential Participants (Sutherland House School template)

Dear Parents,

Michelle McVey, a former assistant psychologist at the Elizabeth Newson Centre, is conducting some research as part of her doctoral training in Clinical Psychology (based at Nottingham University and Lincoln University). She is hoping to carry out this research at Sutherland House School school regarding the sensory sensitivity of pupils with an Autistic Spectrum Disorder. Most of you will be aware that this is an area that is being given increasing priority in the school

As part of her research she is asking parents and caregivers to complete a short questionnaire on behalf of their children. This information will be combined and compared with the views of staff as part of their ongoing assessments of children in the area of sensory sensitivities.

The details of this study are contained in the information sheet enclosed with this letter. It will be greatly appreciated if you could take the time to read this information sheet. If, after reading the information provided, you are willing to participate on behalf of you child could you please complete the enclosed questionnaires, sign and date the consent form and return them in the prepaid, addressed envelope.

Your participation will be greatly appreciated. If you have any questions about any aspect of this research please don't hestiate to give either of us a ring.

Yours sincerely

Maria Allen
Principal
Sutherland House School

Mr Phil Christie
Director of Children's Services
Elizabeth Newson Centre

Participant information sheet

UNIVERSITY OF LINCOLN
Trent Doctorate in Clinical Psychology
The University of Nottingham

Parents’ and educational staff agreement on the SSP, for children with ASD

You are being invited to take part in a research study titled ‘Parents’ and educational staff agreement on the SSP, for children with ASD.’ Before deciding whether you wish to take part please read the following paragraphs. These explain why the study is being done and what is involved in participating in the study. Please take your time to read the information provided and feel free to discuss the research with others.

What is the study about?

This is an invitation for you to participate in this piece of research on behalf of your son(s)/daughter(s). Michelle McVey is conducting some research as part of her doctoral training in Clinical Psychology (based at Nottingham University and Lincoln University). She is hoping to carry out this research at Rosehill School school regarding the sensory sensitivity of the pupils with a diagnosis of Autistic Spectrum Disorder (ASD).

This study aims to look at the level of agreement between the ratings of parents/caregivers on the Short Sensory Profile (SSP) (Dunn, 1999) and the ratings of teachers/keyworkers on this profile, completed with the same children. These ratings will be looked at in order to determine whether there are inconsistencies in the ratings by adults who have regular contact with the children, but within different settings and taking on different roles.

Why have I been contacted?

This study aims to look at the sensory sensitivity of children with Autistic Spectrum Disorder. Therefore, all parents of those children attending Rosehill School will be given the opportunity to participate in this research (approximately 85 children attend Rosehill School).

The details of the study are described below. If, after reading the details you are still willing to participate in the study then please fill in the consent form and questionnaires and return them in the prepaid envelope.

What do I have to do if I participate?

This research will ask you to complete a short questionnaire (delivered with this information sheet) on behalf of your child(ren), called the Short Sensory Profile designed by Winnie Dunn and to return the questionnaire to the researcher in a prepaid envelope. This questionnaire looks at the responses of children to sensations such as auditory (noise) input or tactile (touch) input. This questionnaire will take approximately ten minutes to complete. Also, you will be asked to give consent for the same questionnaire (completed by teachers and keyworkers on behalf of your children), to be passed on to the researcher (Michelle McVey) for use in the project.

In addition you will be asked to fill in a brief questionnaire giving clinical information regarding your child(ren) such as diagnoses and demographic information such as the number of people living in the house and your highest level of education.

Is it confidential?

The clinical and demographic information given in the brief questionnaire will be anonymised so that you and your child(ren) are not able to be identified. All information will be handled in confidence and will be stored at the school. The Short Sensory Profile questionnaires filled in for your child(ren) will be kept confidential. These questionnaires will only be made available to those directly involved in your child(ren)'s care and education.

Any information which leaves the school site will have no names or addresses and will therefore be anonymised. This anonymised information/data will be retained for seven years in line with university policy before being destroyed.

What will happen to the findings of the research study?

The results of the study will be written up by Michelle McVey (the researcher) as part of a Doctorate in Clinical Psychology. No identifying information will be used within the Doctorate. If you would like a copy of the final report on the srudy then please let Michelle McVey know. The information we get from this study may help improve the planning of care and education for children with Autistic Spectrum Disorder in the future.

Who has monitored this research?

This study has been approved by Lincoln University Ethics Committee. It is being funded by Lincoln University.

Do I have to take part?

The participation in this study is voluntary, therefore it is up to you to decide whether to participate on your child(ren)'s behalf. Also if you do choose to take part, you are free to withdraw from the study at any time, by contacting Michelle McVey.

What do I do now?

If you are willing to participate in this research could you **please complete the enclosed questionnaires and consent form and return it in the prepaid envelope as soon as possible**. Your participation in the research will be greatly appreciated. The consent form asks for your name and signature and shows that you are giving consent for the teachers and keyworkers involved in your child's education to fill in the same questionnaire (Short Sensory Profile, SSP) and to pass these completed questionnaires on to the researcher.

Contacts for queries and further information

If you have any questions or concerns regarding the study please feel free to contact Michelle McVey, trainee clinical pschologist, at

E-mail: 06060034@lincoln.ac.uk

Or her supervisor, Dr Nadina Lincoln, at

Address: University of Lincoln, Health, Life and Social Sciences, Court 11, Satellite Building 8, Brayford Pool, Lincoln, LN6 7TS

Thank you very much for taking the time to read this information sheet and for considering taking part in this research study.

Consent form

UNIVERSITY OF LINCOLN

Trent Doctorate in Clinical Psychology

The University of Nottingham

Parents' and educational staff agreement on the SSP, for children with ASD

I ______________________________________ declare that I have read the information sheet regarding the research titled : 'Parents' and educational staff agreement on the SSP, for children with ASD' and have had the opportunity to ask questions.

I understand the information provided and give consent for our participation in this project. I also give consent for the the same questionnaire. filled in on behalf of my child(ren), by the educational staff at Rosehill school to be passed on to the researcher (Michelle McVey) for use in this project.

Signature: _______________________ Date:

Research questionnaire

UNIVERSITY OF LINCOLN　　Trent Doctorate in Clinical Psychology　　The University of Nottingham

Part One-Clinical Information (please circle where appropriate)

1) What is your relationship to the child for whom you are completing the questionnaire?

Mother

Father

Aunt

Uncle

Grandmother

Grandfather

Foster Mother

Foster Father

Other (please specify) ______________________________

2) Does your child have a diagnosis of Autistic Spectrum Disorder (commonly referred to as autism)

Yes No

3) Does your child have a diagnosis of any other developmental disorders?

Yes No

If yes, please specify the names of any other diagnoses

____
_

Part two-Demographic Information (please tick where appropriate)

4) How many children under 16 years old live in your household?

1
2
3
4
5
More than 5

5) What is the highest level of education you have completed?

Primary school

Some secondary school

Secondary school (GCSE, A-level or equivalent)

Some university

University (degree level)

Post-graduate university

6) What is your current marital status?

Single, never married

Married

Separated

Divorced

Widowed

Other

7) Which of the following best describes your current employment status?

Full time employed
Part time employed
Full time home maker
College/university student
Self-employed
Retired
Not employed

Short Sensory Profile

SENSORY PROFILE
Winnie Dunn,
Ph.D., OTR, FAOTA

Child's Name: ____________________ Birth Date: __________ Date: __________
Completed by: ____________________ Relationship to Child: __________
Service Provider's Name: ____________________ Discipline: __________

INSTRUCTIONS

Please check the box that **best** describes the frequency with which your child does the following behaviors. Please answer all of the statements. If you are unable to comment because you have not observed the behavior or believe that it does not apply to your child, please draw an X through the number for that item. Please do not write in the Section Raw Score Total row.

Use the following key to mark your responses:

ALWAYS	When presented with the opportunity, your child always responds in this manner, 100% of the time.
FREQUENTLY	When presented with the opportunity, your child frequently responds in this manner, about 75% of the time.
OCCASIONALLY	When presented with the opportunity, your child occasionally responds in this manner, about 50% of the time.
SELDOM	When presented with the opportunity, your child seldom responds in this manner, about 25% of the time.
NEVER	When presented with the opportunity, your child never responds in this manner, 0% of the time.

Item	Tactile Sensitivity	ALWAYS	FREQUENTLY	OCCASIONALLY	SELDOM	NEVER
1	Expresses distress during grooming (for example, fights or cries during haircutting, face washing, fingernail cutting)					
2	Prefers long-sleeved clothing when it is warm or short sleeves when it is cold					
3	Avoids going barefoot, especially in sand or grass					
4	Reacts emotionally or aggressively to touch					
5	Withdraws from splashing water					
6	Has difficulty standing in line or close to other people					
7	Rubs or scratches out a spot that has been touched					
	Section Raw Score Total					
Item	**Taste/Smell Sensitivity**					
8	Avoids certain tastes or food smells that are typically part of children's diets					
9	Will only eat certain tastes (list: ______________________)					
10	Limits self to particular food textures/temperatures (list: ______________________)					
11	Picky eater, especially regarding food textures					
	Section Raw Score Total					
Item	**Movement Sensitivity**					
12	Becomes anxious or distressed when feet leave the ground					
13	Fears falling or heights					
14	Dislikes activities where head is upside down (for example, somersaults, roughhousing)					
	Section Raw Score Total					
Item	**Underresponsive/Seeks Sensation**					
15	Enjoys strange noises/seeks to make noise for noise's sake					
16	Seeks all kinds of movement and this interferes with daily routines (for example, can't sit still, fidgets)					
17	Becomes overly excitable during movement activity					
18	Touches people and objects					
19	Doesn't seem to notice when face or hands are messy					
20	Jumps from one activity to another so that it interferes with play					
21	Leaves clothing twisted on body					
	Section Raw Score Total					

0761638199

Item	Auditory Filtering	ALWAYS	FREQUENTLY	OCCASIONALLY	SELDOM	NEVER
22	Is distracted or has trouble functioning if there is a lot of noise around					
23	Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)					
24	Can't work with background noise (for example, fan, refrigerator)					
25	Has trouble completing tasks when the radio is on					
26	Doesn't respond when name is called but you know the child's hearing is OK					
27	Has difficulty paying attention					
	Section Raw Score Total					

Item	Low Energy/Weak	ALWAYS	FREQUENTLY	OCCASIONALLY	SELDOM	NEVER
28	Seems to have weak muscles					
29	Tires easily, especially when standing or holding particular body position					
30	Has a weak grasp					
31	Can't lift heavy objects (for example, weak in comparison to same age children)					
32	Props to support self (even during activity)					
33	Poor endurance/tires easily					
	Section Raw Score Total					

Item	Visual/Auditory Sensitivity	ALWAYS	FREQUENTLY	OCCASIONALLY	SELDOM	NEVER
34	Responds negatively to unexpected or loud noises (for example, cries or hides at noise from vacuum cleaner, dog barking, hair dryer)					
35	Holds hands over ears to protect ears from sound					
36	Is bothered by bright lights after others have adapted to the light					
37	Watches everyone when they move around the room					
38	Covers eyes or squints to protect eyes from light					
	Section Raw Score Total					

FOR OFFICE USE ONLY

Summary

Instructions: Transfer the score for each section to the Section Raw Score Total column. Plot these totals by marking an X in the appropriate classification column (Typical Performance, Probable Difference, Definite Difference).*

SCORE KEY

1 = Always
2 = Frequently
3 = Occasionally
4 = Seldom
5 = Never

Section	Section Raw Score Total	Typical Performance	Probable Difference	Definite Difference
Tactile Sensitivity	/35	35 -------- 30	29 -------- 27	26 ---------- 7
Taste/Smell Sensitivity	/20	20 -------- 15	14 -------- 12	11 ---------- 4
Movement Sensitivity	/15	15 -------- 13	12 -------- 11	10 ---------- 3
Underresponsive/Seeks Sensation	/35	35 -------- 27	26 -------- 24	23 ---------- 7
Auditory Filtering	/30	30 -------- 23	22 -------- 20	19 ---------- 6
Low Energy/Weak	/30	30 -------- 26	25 -------- 24	23 ---------- 6
Visual/Auditory Sensitivity	/25	25 -------- 19	18 -------- 16	15 ---------- 5
Total	**/190**	**190-------155**	**154-------142**	**141---------38**

*Classifications are based on the performance of children without disabilities (*n* = 1,037).

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