Chapter 3

METHODOLOGY

In this chapter the methodology used to develop and test the occupational performance questionnaire will be described.

3.1 The Process of Outcome Measure Development

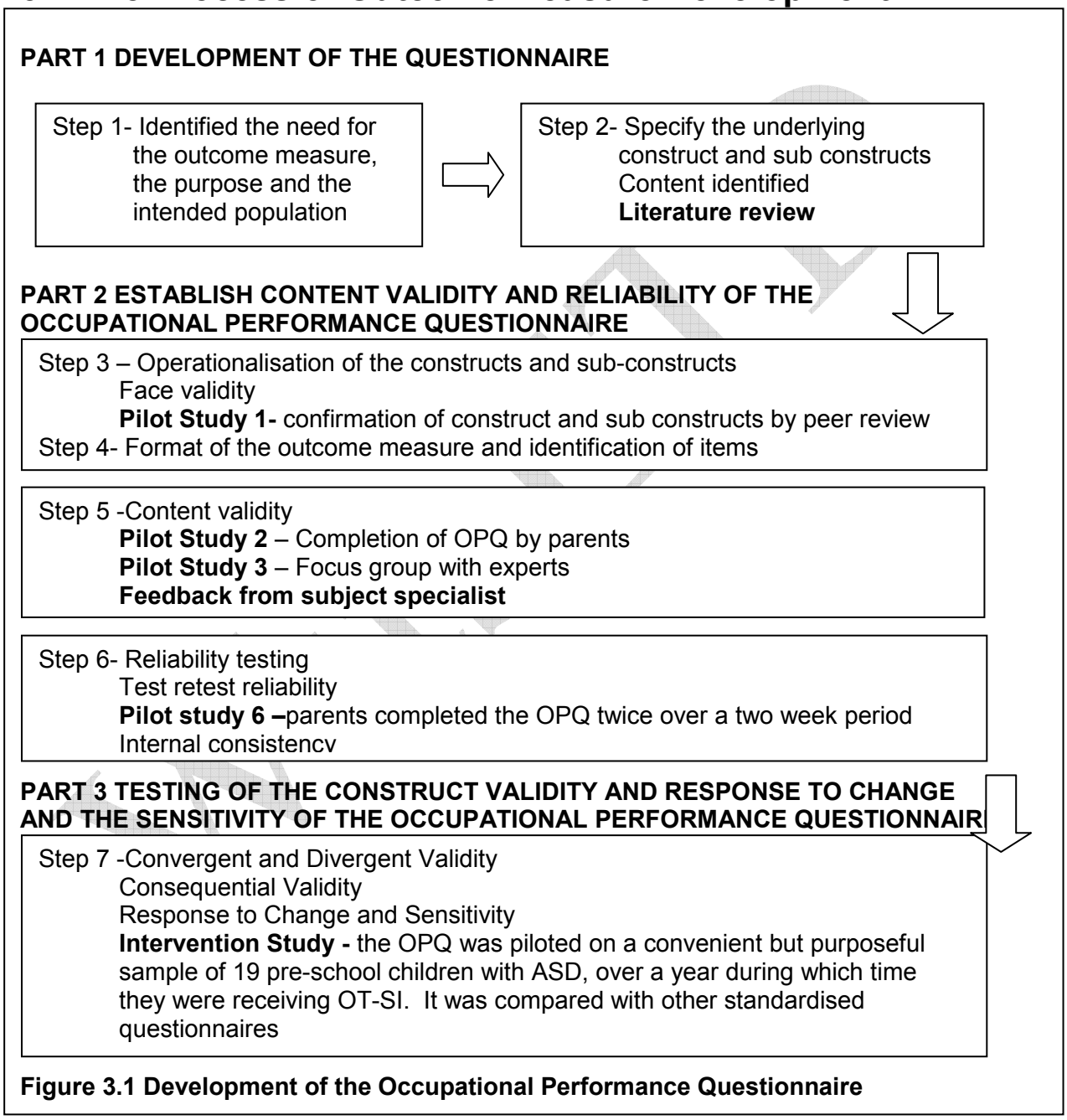

Figure 3.1 Development of the Occupational Performance Questionnaire

The development of this outcome measure was based on a series of steps recommended in the literature (Benson & Hagvtet, 1996). There is no standard process for this and the process outlined in the flow diagram on the previous page was based on the steps recommended by Kielhofner (2006). It should be noted that the steps are not strictly linear but will be presented in a linear model for clarity. Kielhofner describes the ongoing process of instrument development as having no clear endpoint as reliability and validity can never be absolute and development can only achieve acceptable levels of these concepts Usually a level of r= .7 to .9 is acceptable (Kielhofner, 2006).

3.2 PART 1
Development of an Occupational Performance Questionnaire

The introduction to the study defined the need for an "occupation based" assessment for use by occupational therapists to measure occupational performance in a population of four to six year old children with ASD receiving OT-SI.

Step 1
Establishing the Need for the Outcome Measure, the Purpose and Intended Population

In the population of pre-school children with ASD, aspects typically evaluated by OTs have been influenced by the predominance of developmental and medical models, which emphasise underlying internal performance components as the critical determinants of behaviour. The underlying sensory processing, perceptual and motor control deficits are presumed to explain the extent and form of functional difficulties seen in children with clinical disorders such as ASD. The OT-SI approach to intervention emphasises normalising the underlying processes as the best means to achieve greater function (Coster, 1998).

The development of a body of knowledge in occupational science has introduced a new perspective and provided a scientific foundation for occupational therapy practice. This has allowed the significance of occupation as an outcome measure to be justified and to differentiate occupational therapy from other disciplines (Yerxa, Clark, Jackson, Pierce & Zemke 1989).

Although the developmental perspective is one of several perspectives used by occupational therapists to frame their assessment of a child's occupational performance, patterns and/or problems in occupational participation on a developmental scale need to be delineated, in order to guide intervention as well as provide a reliable and valid measure of the outcome of therapy. A sensitive "occupation based" assessment that is able to detect change and reflect occupational performance outcomes for the pre-school (three to six years) age group and the ASD population does not exist. The sensory and associated behavioural characteristics, specifically found in pre-school children with ASD have been assessed, rather than their occupational performance.

In the development of the questionnaire the concept of the interaction between the child, their occupation and environment described by Law, Baptiste, McColl, Polatjko & Pollack (1990), was considered as an appropriate and useful framework for basis of the outcome measure of occupational performance for preschool children with ASD (McColl, Law, Baptiste, & Pollack, 2005). Rodger, et al. (2004) suggested replacing of the productivity/work domain in a measure for preschool children with that of communication/behaviour domain which is more applicable to this age group. Although the productivity/work domain was reflected in schooling the communication/behaviour domain was added as even though this is not a traditional occupational performance area it was considered essential in an outcome measure for children with ASD, where communication is their greatest deficit.

The individualised family service plan (IFSP), is a theoretical model that has been proposed for the ASD population group (Meisels & Fenichel 1996). A measure of both the child's occupational performance skills and the desired family outcomes are recorded at baseline. This is the starting point for intervention planning for the child and the family. Subsequent evaluations include a comparison of the child's performance as well as the family's progress toward family functioning (Stephens & Tauber, 2001). This model informed the development of the questionnaire as it is vital that the outcomes measured are functional, i.e. be of importance to the children, their parents and teachers, and therefore must have social validity (Miller & Kinnealley, 2006) The Occupational History section of an unstandardised "Background Information and Occupational History Profile" designed for use with children from a wide range of diagnostic groups was useful in identifying relevant issues (Schaaf & Smith Roley, 2006). A section measuring the impact of the child's occupational behaviour on family functioning was included (Abidin, 1995)

A valid and reliable questionnaire, suitable for research purposes, was required for this study. The questionnaire needed to measure the subtle increments of change, both in the child's behaviour in occupational performance and in the parents' perception of the effect of the child's occupational performance on family's functioning, on an ongoing basis.

3.2.2 Step 2
Specification of the Underlying Construct and Sub- Constructs of the Occupational Performance Questionnaire (OPQ)

The development of a sensitive, "occupationally based" outcome measure that was appropriate in terms of milestones and which reflected the occupational performance of preschool children between the ages of three and six years, therefore formed the first part of this study.

A detailed caregiver report instrument designed to evaluate occupational performance as observed in common everyday behaviour in pre-school children with ASD was identified as being the most suitable instrument. Thus the most practical design for the outcome measure was a parent report questionnaire. Although the reliability of parent report measures has been questioned because they are in close contact with their child, (McGibbon, Lammi & Law, 2003), recent studies have found that the accuracy in parental reporting increases with exposure to therapists and therapy as their depth of understanding grows (Reznick, Baranek, Reavis, Watson & Crais, 2007). Parents are regarded as respected, key members of the therapeutic team and the key figures in the lives of their children with ASD and they are best able to report back on their children's functioning in activities of daily living in their home environments (Reznick et al. 2007).

An occupation-centred assessment would ensure that OT services were measured according to the individual's functioning in meaningful activities (Meisels & Fenichel, 1996). The constructs of the Occupational Performance Questionnaire (see Appendix A2) were developed by the researcher based on a literature review. A wide variety of occupation-based behaviours observable in children with ASD, were considered in the development of the questionnaire. The primary caregiver's perception of the effect the child's occupational performance on their family's functioning was considered. Parental perceptions of their child's functioning are relevant occupational performance goals (Rodger et al. 2004). Problems with sleep, feeding, toilet training, play, and social interaction are hypothesised to be related to poor sensory processing (Jasmin et al. 2008). The association between progress in these areas and classical OT-SI intervention will be evaluated in this study.

Internal performance components, which are the underlying building blocks for achieving occupational performance, like sensory responsiveness, attention, self-regulation, adaptive responses, planning and spatial temporal adaptation, affect, self-esteem and

explorative behaviour were excluded from the questionnaire along with specific process skills, such as dressing and independent bathing which have strong motor planning components. These aspects were deemed best evaluated by an expert OT and although these areas may be affected, they were not considered as part of the objective of this parent-rated measure.

Background information from the literature relevant in an occupation based assessment for occupational therapists in terms of developmental milestones (Case-Smith, 2001; Stewart-Lord & Kotkin, 1998; Bayley 1993; Solarsh, et al. 1990), and behaviour of children with ASD (Schaaf & Miller, 2005; Miller-Kuhaneck, 2004; Murray-Slutsky & Paris, 2000; Smith Roley et al. 2001) was considered in the confirmation of the sub constructs of the OPQ. This included: parental report studies (Rodger et al. 2004; Cohn & Cermak, 1998; Kientz & Dunn, 1997), empirical studies (Cohn et al. 2000; Ayres & Tickle, 1980); and conceptual models (Coster, 1998; Meisels & Fenichel, 1996; Law et al. 1990).
From this literature the researcher identified the following sub-constructs that were likely to be impacted by OT-SI intervention for children with ASD and as being most relevant to family quality of life:
This included the parent's perspective on the child's occupational performance in:

- the child's personal care tasks – sleep, feeding and toilet function. Personal management questions in the OPQ were based on this expected behaviour in terms of gauging sleep in children with ASD.
- the child's social interaction – individual, group and peer interaction. A communication section that would give information as to the ASD child's ability to use non-verbal cues such as pointing or signing, the emergence of vocalisations or speech, therefore needed to be included in the occupational performance outcome measure to be developed. South African developmental norms and milestones for verbal and non-verbal communication were researched to construct appropriate items for the OPQ (Solarsh, et al. 1990). Developmental milestones for independence from the mother, taking turns, sharing and co-operating with adult requests were also amongst the aspects considered for items. (Stewart-Lord & Kotkin, 1998).
- the child's play, types of play and play environment. Assumptions for items in the OPQ for this section were made based on theoretical rather than empirical data, due to the paucity of empirical research on play in the OT literature.
- the child's schooling.

- the mother's perception of the effect that dysfunction in the above areas has on family members (Rodger et al. 2004; Hastings et al. 2005).

This first draft of the questionnaire was drawn up for clinical use in the second pilot study by occupational therapist Kerry Wallace. A second therapist Charlene Scheepers was involved and assisted with the establishment of face validity.

3.2.3 Step 3
Operationalisation of the Constructs and Sub-Constructs

3.2.3.1 Face Validity

In establishing face validity, researchers look at the operationalisation of the instrument, to see whether "on its face" it seems like a good translation of the construct (Trochim, 2006). In other words, does the OPQ measure the occupational performance of the pre-school child with ASD and tap into the occupational dilemmas in the family? Are the subheadings appropriate?

3.2.3.2 Pilot Study 1

The sub-constructs identified in the areas of personal management, social interaction, play, schooling and the effect of the child's performance on family functioning were presented and analysed by a colleague Charlene Scheepers, and my supervisor Denise Franzsen, to establish their face validity in terms of the development of an outcomes based measure for children with ASD.

Participants

A peer analysis was conducted by two conveniently selected colleagues:

- one with 12 years experience working with OT-SI and
- the other was one of the supervisors of this project.

Methods and results

The participants were asked to evaluate the details presented under the sub-constructs and identify what they considered to be occupational performance components that would be suitable for a parent self report questionnaire.

The peer analysis of these sub-constructs, resulted in the domains presented being separated into internal performance and occupational performance components. The internal performance components were deemed best evaluated by an experienced professional; whereas parents were deemed to be able to judge behaviours related to occupational performance components.

As a result of this pilot study it was agreed that all the sub- constructs had face validity, so the first draft of the parent questionnaire was formulated using only occupational performance components for the instrument items. Subsections that were included for parental assessment were observations of behaviour in biological rhythms affecting personal management, social interaction, play skills and the effect of the behaviours on family adjustment.

3.2.4 Step 4
Format of the Outcome Measure and Identification of Items. -The Structure of the Occupational Performance Questionnaire (OPQ) (Appendix A)

In this step the details of the instrument including the rating scale and item development was completed (Kielhofner, 2006). The OPQ was drawn up as a self report questionnaire for the parents to complete individually. All items described an occupational performance behaviour that they needed to observe and report on. From the sub constructs identified and defined in Steps 2 and 3 the first draft of the OPQ was constructed and contained the following sections:-

1. Sleeping Patterns
2. Toilet Training
3. Social Functions and Family Gatherings
4. Family Stress
5. Free Time/Playtime

The OPQ was laid out in a grid format with each item under the heading for each of the occupational performance areas and family adjustment. (Appendix A 2)
Scoring was on a dichotomous yes/no scale for each item.

3.3 PART 2
Establishment of Content Validity and Reliability of the Occupational Performance Questionnaire

3.3.1 Step 5
Content Validity Testing of the Occupational Performance Questionnaire

Validity tests how well the interpretation of the questionnaire measures the underlying construct. The importance of carrying out a validity evaluation was to ensure that the questionnaire measures what we were aiming for i.e. determining that the items reflect the aspects of occupational performance of pre-school children with ASD that could possibly be affected by OT-SI.

3.3.1.1 Content validity

Content validity in terms of test content, response process and internal structure were established, as this aspect was essential before reliability tests could be carried out. The first draft of the OPQ was piloted on a sample of the population to identify problems with administration, content difficulty, ambiguity, test instructions and the use of the rating scale (Kielhofner, 2006).

3.3.1.2 Pilot Study 2

This pilot study involved testing the questionnaire on a sample of the population for whom it was intended. This was done to ensure that there were no difficulties in administration, problems with difficult or irrelevant content e.g. too difficult or irrelevant, ambiguity, or difficulty with test instructions and in using the rating scale (Kielhofner, 2006).

Participants

A convenience sample of four mothers of pre-school children with ASD currently in OT-SI were asked to complete the questionnaire (A:2) and give feedback.

Methods

The parents were asked to complete the OPQ while critically evaluating the items in terms of whether the behaviours described were observable and to comment on the relevance and any problems with the items or in completing the scale.

3.3.1.3 Pilot Study 3

A second panel of experts on the items was asked for feedback on draft A:1 of the questionnaire to ensure the content was applicable to the initial construct and sub constructs. This was done in a focus group and the experts were asked to comment on the clarity, importance and the relevance of the items, whether they were applicable to the circumstance of the respondent, and they reflected what they considered important about occupational performance in view of the purpose of the OPQ (Kielhofner, 2006).

Participants

Three independent conveniently selected expert occupational therapists rated the questionnaire.

The three independent raters were selected in terms of their experience and training:

- Qualification with South African Institute of Sensory Integration (SAISI).
- At least ten years of experience in sensory integration practice.
- Experience working in the field of ASD.

Methods and results

They were asked to verify that each question was appropriate to the population being studied. A focus group was conducted to discuss differences of opinion on the items in the OPQ. All items were presented to the raters and discussion ensued and agreement was reached among the three raters on the following:-

- The questions were appropriate to the population being studied.
- That a positive change in scoring on the OPQ could be associated with effective treatment.
- That items were divided into those reflecting an improvement in the child's occupational performance, and those which reflected family priorities.
- That all changes reflected on the questionnaire would result in improvement in the family quality of life.
- That mean for typically developing children on the OPQ would approach 100% and as children with ASD approach the mean, they approach age appropriate norms in their occupational performance.

The results of this Pilot study 2 and 3 are summarised in Table 3.3.1.3 below and were used to draft the second version of the questionnaire (A:2)

Table 3.3.1.3 Changes made to the Occupational Performance Questionnaire

	Problem	Action		Revision
	Part 1			
	No demographics	Added	1 – 15	**General Information**
	Part 2			
1 2 3 4 5	Sleeping patterns Toilet training Social functions and family gatherings Family stress Free time/Play time	Divided into sections	1 – 3 4 – 6 7 – 8 9.	Biological rhythms Family adjustment Play skills/Peer Interaction Summary of progress in Post therapy questionnaire
1.1 – 1.4 1.4	Sleeping Patterns Night waking	Renamed Detailed scoring Expanded	1.1 – 1.5 1.2 1.3	Sleeping Number of times per night child wakes Strategies parents use to get child back to sleep
2 – 2.5	Toilet training	Expanded	2.1 – 2.3 2.3.1	Toilet training Record of frequency of bedwetting
	No feeding section	Added	3 – 3.3	12 items on feeding
		Section renamed		**Family adjustment**
3.1 – 3.6	Social functions and family gatherings	Questions condensed	4.1 - 4.5	Social functions and family gatherings
4.1	Family stress	Section renamed Expanded Detailed	5. 5.1 5.2 – 5.4	**Impact on individual family members** Distress in family members Added career, interests, and direct consequences for parents
4.3 – 4.9	Child's behaviour as a source of family stress	Section renamed Expanded Detailed	 6.1 – 6.7 6.1.3 and 6.3.2 6.5 -6.6	**Social Interaction** Added detail Details of maladaptive behaviour Detailed effects on parents
		Section added	6.7.1	**Communication**
	No Communication section	Added	6.7 -6.7.1	Communication questions
5.	Free Time/Play Time	Section renamed Expanded	 7.1 – 7.7	**Play skills/peer interaction**
5.6	Schooling	Expanded	8	Schooling
		Section added	9.	Summary Open ended and closed questioning of the reason for change in the previous three sections

3.3.1.4 Changes made to the Occupational Performance questionnaire as a result of Pilot Study 2 and 3 (A:1 to A:2)

On the basis of the analysis of the comments from the two pilot studies described above the following items were changed (Table 3.3.1.3):

- A separate pre and post therapy questionnaire was drawn up with a view to conducting a retrospective study.
- The questionnaire was increased in length from two to five pages.
- More space was provided for descriptive comments and details.
- A General Information page was added to provide basic demographic information, to ensure the child met inclusion criteria, including the child's diagnosis, and details regarding Occupational Therapy. In order to determine other factors that may have affected the outcomes, questions related to medication, and parallel interventions such as physiotherapy, speech therapy and Applied Behaviour Analysis (ABA), and occupational performance milestones were included.
- The Social functions and Family gatherings, and Family stress section was put under a subsection named "Family adjustment", including Impact on individual family members and Social interaction.
- A section of three questions on Feeding was added
- The section on the child's behaviour was expanded and reframed as Social Interaction. Details of maladaptive behaviour were included 6.3.2.
- Questions relating to communication were added 6.7.
- A section on schooling was added 8.1.
- Questions considered irrelevant to occupational performance were excluded e.g. 2.4 Can your child inform you if he needs to use the toilet?
- Questions were modified in order to make them more sensitive to subtle changes e.g. 1.2 How many times per night did he/she awake? Almost never, 1 – 2, 3-4, 5-6, more.

3.3.1.5. Review by Subject Specialist

The OPQ (A:2) was reviewed to evaluate the layout and the scoring suggested in terms of design and capturing data from the items by a subject specialist in terms of questionnaire design and statistical analysis. The questionnaire was modified by the researcher, based on feedback.

General Information

The first page of the questionnaire needed to provide more detailed demographic information, which would ensure that the subjects met the inclusion criteria, and enable the researcher to obtain information about the children according to age, gender, socio-economic status and family structure. Information on the child's schooling was moved to this section. The name of the doctor who made the diagnosis and more specific diagnostic information was included.

Occupational Performance Areas

The questions were based on the deficits identified from the literature, with the emphasis on social interaction, as this is a major area of concern. The OPQ included the following sections.

- Personal Management, which included 25 questions about sleeping, toilet training and feeding.
- Social interaction was explored in 50 questions and
- Play explored in 25 questions

The OPQ outcomes measure needed to differentiate between the performance of older and younger children. The item scores were related to the age appropriate ability of typically developing children of six years of age, so that typically developing children would achieve close to maximum scores. Scores were scaled so that the younger the child or the more delayed the child's ability the lower the scores. The scale therefore allowed for higher functioning children with ASD to achieve higher scores than lower functioning children. Therefore an improvement in scores reflected an increase in occupational functioning (Case-Smith, 2005).

- Impact on individual family members

  This section of the questionnaire included 14 questions on stress and conflict within the family and burden of care. A further 14 questions on the resolution of these problems was included for the post-therapy evaluation.

3.3.2 Layout and Scoring

Supporting materials in terms of instructions were developed to explain how to fill in the OPQ and to explain the rating scale in terms of percentages. No manual was needed as this is a self report questionnaire.

A continuous summative five point Likert scale instead of a dichotomous binary scale with "Yes/No" responses was advised by the subject specialist so the instrument would be sensitive enough to measure small increments of change in behaviour. The OPQ was set up with a scale which was scored from 5 to 1 according to the items in column one of table 3.1 for each section described above. This 5 point format was then used for test-retest reliability purposes.

Table 3.3.2.1 Scoring guide for the Occupational Performance Questionnaire

Almost always	The response to the question is true 90% or more of the time
Frequently	The response to the question is true about 75% of the time
Occasionally	The response to the question is true about 50% of the time
Seldom	The response to the question is true about 25% of the time
Almost Never	The response to the question is true 10% or less of the time

It was found however that this scale was not suitable for all items on the OPQ and some scales had to be changed and inserted next to the items so the correct response could be obtained. In item 1.2 of sleeping the number of times waking at night was changed to a scale > 6 to 0 and this was inserted in the blocks alongside the item for easy of answering by the parent.

Table 3.3,2.2 Scoring Guide for item 2.1

1.2	How many times per night does he/she wake?	>6	5-6	3-4	1-2	0

Other items had scoring based on time in minutes from >30 to ,<1 on a 1-5 point scale in terms of the length of time a behaviour could be sustained. A structure for analysis was finalised with a template for data entry being drawn up on an Excel spreadsheet.

3.3.3 Response Process

Bias related to how respondents answer questions can be influenced by the formulation of the questions as well as the respondents desire to please. This aspect was addressed by having some scoring where 5 was positive and other items having a score of 1 being positive and other items were changed to reflect either a negative and positive phrasing. An ascending (1-5) or descending (5–1) rating scale was applied to each item depending on how it was phrased.

Table 3.3.3 Changes made to Occupational Performance Questionnaire based on feedback from a supervisor and subject specialist (draft A:2 – A: 3)

	Problem	Action		Revision
Part 1	General information	Addition	2 3.4 5,6 7,8 10 16 – 18	Mother's marital status, Child's gender, age Parents occupations, Family income, ethnic group Name of doctor, Schooling section
		Relocation		
1 - 3	**Biological Rhythms**	Section renamed	**A.**	**Personal management**
		Added	3.11	10 - 15 mins
3.1 – 3.3		Changed numbering	3.1 – 3.12	
4 – 6 4. 6.	**Family Adjustment** Social functions and family gatherings Social Interaction	**Reorganised** Moved Renamed Moved	**B.** 6. 4. 5.	**Social Interaction** Group Interaction Social – Interaction: Individual Peer Interaction
7 – 8 7. 8.	**Play skills / Peer Interaction** Free time /Play Time Schooling	**Expanded** Moved section	**C.** 8. 9. 10. Part 1	**Play** Level of Play Individual Group General Information
5.	**Impact on Individual Family Members**	**Moved section**	**D.**	**Impact on Individual Family Members**

Once the changes had been made according to the content validity pilot studies an item analysis of the four sections: Personal management, Social interaction, Play and Impact on the family, as well as the subsections was completed. As the study focussed on the ASD child's behavioural functioning the items were analysed to determine whether they represented:

- A change in occupational performance (positive or negative)
- A family quality of life question
- Reflection of effective treatment
- A shift towards age appropriate developmental levels

3.3.3.1 Pilot study 4

Participants

Three independent expert occupational therapists that had not previously been part of a pilot study were conveniently selected in terms of their experience:

- Qualification with South African Institute of Sensory Integration (SAISI).
- At least ten years of experience in sensory integration practice.
- Experience working in the field of ASD.

Method and results

Experts were asked to rate items by marking a x in the appropriate column on an Excel spreadsheet according to the following criteria:

- Whether the question was phrased positively e.g. 5.5 Does your child smile in response to others? Almost always (Score 5). Almost never (Score 1).
- Whether the question was phrased negatively e.g. 4.1 Does your child exhibit aggressive behaviour? Almost always (Score 1) Almost never (Score 5)They were asked to allocate questions on the OPQ according to the following criteria:
- Whether change could be associated with effective SI-OT treatment, e.g. 4.4 Does your child use self-stimulatory behaviour to deal with anxiety or sensory overload? and/or accelerated normal development e.g. 2.1 Is your child in a nappy in the day?
- Whether positive change indicated a shift towards normal age appropriate development.
- Whether the items reflected the expected age appropriate occupational performance.
- Whether items under family adjustment reflected a family quality of life question.
- Whether change would indicate improved family quality of life e.g. 6.1 Are you able to attend family gatherings with your child?

The results of the ratings were assimilated by the researcher on an excel spreadsheet and discrepancies in ratings were summarised. A focus group comprising the two experts, and the researcher was held, where consensus was

achieved. This was the final step in the construct validity study, before the OPQ was to be used for Part III. According to their comments the marking schedule was finalised.

3.3.4 Step 6
Reliability Testing on the Occupational Performance Questionnaire

Once the changes had been made according to the validity tests, reliability tests were conducted. As it is not possible to calculate reliability exactly, - instead, reliability could only be estimated, which is always an imperfect endeavour (Trochim, 2006). Test-retest reliability and internal consistency of the OPQ were investigated to establish whether sources of external error existed (Kielhofner, 2006). Rater bias was minimised by phrasing some questions positively and others negatively in an attempt to optimise parental objectivity and the two week interval between parental reassessment, eliminates the memory component.

3.3.4.1 Test-Retest reliability

Test-retest reliability was used to assess the consistency of the measure from one time to another. The period between the administrations needed to be carefully considered by the researcher, in order to avoid changes that may occur in the underlying trait, but not so soon that memory inflates agreement. Taking these considerations into account, two weeks was considered to be a reasonable time lapse between administrations. Pearson's Product Moment was used by the researcher to calculate test-retest reliability (Kielhofner, 2006).

3.3.4.2 Pilot Study 5

The test–retest reliability of the OPQ was tested by repeated measurements by the same parents over a time period of two weeks.

Participants

A convenience sample of five mothers with pre-school children with ASD receiving OT-SI was selected. The children had been in therapy for a number of months and excluded as subjects for the intervention aspect of the study.

Method and results

Mothers were asked to fill out the OPQ and record the occupational performance of their child by observing their behaviour and the effect on the family according to

a key to completing the Occupational Performance Questionnaire on the cover sheet. The result on OPQ was recorded as percentages of the total possible score.

The same mothers filled out the OPQ again after two weeks to evaluate test-retest reliability of the outcome measure. Questionnaires were coded to ensure anonymity (Table 3.3.4.2).

The results for each item were correlated to establish whether mothers obtained similar scores on both occasions. Significance was set at 95% in establishing a significant correlation, indicating test-retest reliability.

From Table 3.3.4.2 it can be seen that although the mean correlation was statistically significant; in the case of Subject 1, the reliability was not statistically significant on retest after a two-week period. Reasons for this could have been associated with parenting stress, possibly a lack of understanding of the questions, or an extraneous factor that may have influenced the child's occupational performance. The mean correlation of (r= 0.9) is very high which indicates that the test retest reliability is acceptable at a .05 level.

Table 3.3.4.2 Correlations for test-retest reliability

	Total Score Time 1	**Total Score Time 2**	**Correlation r value**	**p value**
Subject 1	305	337	0.66	NS
Subject 2	202	184	0.94	0.05*
Subject 3	261	244	0.95	0.05*
Subject 4	265	263	0.97	0.01**
Subject 5	318	331	0.97	0.01**
Mean	270.20	**271.80**	**0.90**	**0.05***

* significant p≤0.05

** significant p≤ 0.01

3.3.4.3 Internal Consistency

Internal consistency is used to assess the consistency/reliability of results across items within a subtest. It enables the researcher to determine whether the items in a particular section are measuring a similar phenomenon. Cronbach α was used as it assessed the reliability of a summative rating Likert scale composed of the variables specified. Alpha computes the interim correlations or co-variances for all pairs of variables. If Cronbach α is .80 or more in a correlation of two data sets, then the questions are measuring

phenomena that can be grouped together (Sun, Chou, Stacy, Unger & Gallagher, 2007) (See Table 3.3.4.3), and this means that they are testing similar constructs.

In order to determine whether an individual question correlates with the other questions in the subgroup, the Cronbach α must be greater than 0.75. In the "Personal management" subgroups, "Sleeping", and "Toilet training" and "Feeding" were at acceptable levels as were "Social interaction :Individual", "Social Interaction: Peer Interaction" and "Family impact". However in the "Social Interaction: Group Interaction", "Communication", and the "Play" subgroups were below the 0.75 level.

In order to increase the reliability of the questionnaire, these sections will need to be subjected to more rigorous examination but the adjustments could not be made in this study as the final aspect of this analysis needed to be completed at the end of Part 3. The applicability of a Rasch analysis of the "Communication " and "Play" sub-constructs may be useful (Andrich, 1988).

Table 3.3.4.3 Occupational Performance Questionnaire: Internal reliability

Occupational Performance Components	**Cronbach α**	
Personal Management		
Sleeping	0.82	Level acceptable
Toilet Training	0.92	Level acceptable
Feeding	0.78	Level acceptable
Social Interaction		
Individual	0.88	Level acceptable
Peer Interaction	0.76	Level acceptable
Group Interaction	0.65	No
Communication	0.56	No
Play		
Level of Play	0.62	No
Individual	0.63	No
Group Play	0.58	No
Family Impact	0.91	Level acceptable

3.3.4.4 Inter-Rater or Inter-Observer Reliability

This is used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon. In this case the parent was the same rater who completed the OPQ before the child started OT-SI, at six months and 12 months, so inter-rater reliability was not applicable.

The final version of the OPQ (Appendix A:3) was accepted as a valid and reliable outcome measure. This version used to measure the outcomes of occupational performance of children with ASD and the impact it has on their families in Part 3 of this study.

3.4 PART 3
Testing of the Construct Validity and Response to Change and the Sensitivity of the Occupational Performance Questionnaire

3.4.1 Step 7
Construct Validity and Response to Change and Sensitivity of the Occupational Performance Questionnaire

Once the items in the OPQ had been tested for validity and had been shown to have an acceptable level of reliability, the outcome measure needed to be tested for other psychometric properties which included construct validity as well as its ability to detect change in occupational performance behaviour or sensitivity (Furr & Bacharach, 2008). A longitudinal intervention study was carried out to determine these aspects.

3.4.1.1 Construct Validity

Convergent Validity

Construct validity includes the association of the OPQ with other variables in determining convergent validity (Kielhofner, 2006). Measures of constructs that are theoretically related to each other are convergent and constructs that theoretically that should are be related to each other are divergent (Furr & Bacharach, 2008; Trochim, 2006). The convergent validity of the OPQ was established by determining the association between the change in the occupational performance of preschool children with ASD using the OPQ and the mother's perception of how this change affected the family and theoretically related constructs of the SSP and PSI -SF

An internal performance component which influences behaviour in occupational performance, sensory processing (The Short Sensory Profile (SSP) (Dunn 1999), as well as an external performance component, the parents' stress levels (Parenting Stress Index (PSI-SF) (Abidin, 1995) had been identified as constructs that were theoretically associated with the ASD child's occupational performance. A large number of the problem behaviours in occupational performance seen in children with ASD have been related to sensory processing problems (2.2.1.1–2.2.1.5) and these same problems are related to an increase in stress in the parents (2.2.2.1–2.2.2.3) of these children. Therefore the occupational

performance aspect of the OPQ was compared to the SSP and items in the impact on the family section ,was compared to the PSI-SF to establish the amount of association between these measures.

Uni-dimensionality and Consequential Validity

When designing an outcome measure it is commonly assumed that only one ability or construct is necessary to explain or account for the performance on the test and this is referred to as uni-dimensional. All the items on a test should measure this single construct and violation of this assumption could lead to misleading results (Hulin, Drasgow & Parson, 1983). The consequences of the use of the OPQ in its clinical application made sure that outcome measure did not allow for differences in groups in terms of other associated variables like gender or socioeconomic status to be reflected when it was applied clinically. Due to logistical reasons two groups of subjects from different backgrounds (3.4.2.2) were recruited to establish that the OPQ did not differentiate between the groups on differences in other variables like socioeconomic status, parents' marital status and school attendance. By having two diverse groups, both of which reflected statistically similar baseline scores on the OPQ, it is clear that no person was adversely or unfairly affected when the OPQ was used to assess their responses to parenting a child with ASD (Furr & Bacharach, 2008).

3.4.1 2 Response to Change and Sensitivity

A detailed caregiver report instrument designed to evaluate occupational performance as observed in common everyday behaviour in pre-school children with ASD was identified as being the most suitable instrument for this study. This would enable the researcher to obtain occupationally relevant data, for the research. The OPQ was designed as an outcome measure to be used to assess the effects of intervention. The psychometric property of sensitivity, which refers to the ability of an instrument to detect a problem or condition when it is present, had to be assessed. (Kielhofner,2006). Response to changes in scores on the OPQ over a 9-12 month period while the child was receiving OT-SI, as well as the sensitivity of the OPQ in for measuring the constructs of occupational performance and family adjustment needed to be established (Furr & Bacharach, 2008). By comparing change in the OPQ with changes in the SSP and PSI-SF; both of which are sensitive reliable measures that had previously been standardised and used in research with this population, sensitivity of the OPQ could be established.

3.4.2 Research Design

A prospective, longitudinal, quantitative, single group, pre-experimental, pre-test/post-test research design was used. The researcher was aware that randomised blind assignment to a treatment group, and blind assessments before and after intervention is the gold standard in treatment efficacy research (Kasari, 2002). However this study was concerned with the development of an outcome measure and its validity thus the relationships between factors identified as being affected by the implementation of OT-SI (Boruch, 1997) were considered. Although the use of a control group in determining the strength of the relationships would have been ideal and added rigour to the study the researcher considered the ethical issues around withholding treatment from vulnerable children at a critical stage of their development. Thus having a treatment control group was not considered to be a viable alternative, due to the critical windows of time during which certain developmental tasks are achieved in the pre-school population.

In view of the fact that this intervention study was therefore a single group study the following steps were taken to control for extraneous variables. The four key standards identified as important and that were applied in the study were: sensitive and relevant hypothesis driven outcome measures, replicable intervention, a homogeneous sample, and rigorous methodology (Miller et al, 2007; Boruch, 1997).

These standards were applied in this study by using:

- Replicable intervention was included in this study by using the “Sensory Integration Fidelity Measure” (Parham et al. 2007) to evaluate the treatment used by different therapists on a sample of homogeneous subjects from the same diagnostic group.
- Sample selection ensured a homogeneous sample by imposing exclusion criteria.
- Although rigour was attempted in the methodology, as stated, this was a single group study, which has limitations particularly in regard to the internal validity of the study. This affected the strength of the study in defining the causal relationship between OT-SI and op, but a control group could not be used.
- In an attempt to control for the various diagnoses under ASD including (Autistic disorder (AD), Asperger syndrome (AS), and Pervasive Developmental Disorder – not otherwise specified (PDD-NOS); diagnostic information was obtained. However previous studies indicate that groups

of children diagnosed with PDD-NOS, AS and AD all had similar scores on the Sensory Profile (Walker, Thompson, Zwaigenbaum, Goldberg, Bryson, Mahoney, Strawbridge & Szatmari, 2004), with functional impairment being associated with low registration and sensory avoidance. The factors that will influence change over an intervention period cannot be controlled. By narrowing down the extraneous variables, and asking parents opinion on what influences the child's occupational performance over the period of a year; clarity could be achieved. Parents will be provided with the opportunity to comment on what effect OT-SI may have had on their child's occupational performance and family's life in the OPQ in keeping with the family-centred approach. . Thus although the diagnosis of autism (AD) has a bearing on language, cognition, motor performance and some bearing on functional skills, the correlation of the SSP as a convergent test allows the OPQ to be judged across the different sub-diagnoses (Walker et al. 2004).

3.4.3 Participants - Parents and their Children with Autistic Spectrum Disorder

3.4.3.1 Parents

Since the subjects of the OT-SI intervention were to be children with ASD, it was important to recruit their parents, as they needed to agree to their children being part of the study for one year and they had to agree to fill out the self report outcome measures three times during the intervention period. Practices from which subjects could be sourced were identified using the South African Institute of Sensory Integration (SAISI) database. The research project was advertised in SAISI news in 2006. Occupational therapists were requested to approach parents of pre-school children diagnosed with an ASD that had been referred to private OT practices in South Africa, and recruit suitable children into the research project.

3.4.3.2 Children with Autistic Spectrum Disorder

Pre-school children with ASD who had been newly referred for OT-SI (within the first month of being referred) were identified as the most suitable subjects for this study.

Inclusion criteria

- Pre-schoolers (three to six years) at the outset of study:

- diagnosed by a medical doctor using DSM IV:TR, who met the diagnostic criteria for ASD,
- presenting with occupational performance deficits,
- and presenting with sensory processing problems.
- Parents of the child willing to continue with OT-SI for one year and complete three assessments (OPQ, SSP and PSI-SF).

Exclusion criteria

- Children who had had more than one month of OT-SI
- The presence of severe sensory disability (blindness or deafness)
- The presence of motor impairments (cerebral palsy)
- Identified genetic disorders
- Transient developmental regression, which is a feature that occurs in some one-fifth to one-third of children with ASD (Rutter, 2005), which is called a childhood disintegrative disorder (Volkmar & Rutter, 1995)
- Co-morbid moderate or severe mental retardation.

The general information section of the OPQ provided information, which ensured that the subjects met the inclusion criteria.

3.4.4 Sample Size

The study was carried out over a 12-month period, which made it difficult to obtain suitable subjects who were willing and able to participate. Convenience sampling was used according to the inclusion criteria. Subjects were selected because of these characteristics which made a purposeful homogeneous sample with reduced variation. Random sampling was not used as there were insufficient subjects and as stated above a control group was not recruited.

The sample size was determined by research on the PSI-SF as this is a standardised measure with norms and standard deviations. PSI-SF subscales A, B and C require a sample size of (40; 39; 45) which would have a 90% power to detect a difference in means of 4.8 points (10%) on each of these three subscales, assuming a standard deviation of differences of (9.1; 8.9; 9.7). This would apply when using a student paired t-test with a 0.05 two sided significance level (Abidin, 1995). Based on the PSI-SF, the aim was to have a sample of 45 subjects. For logistical reasons this was not possible to recruit this number of subjects within the time frame. A large group of children from a special

needs school were excluded at the outset as one of the therapists who had committed to carry out the research protocol was no longer able to participate.

After a three month period only 11 subjects had been recruited. On the recommendation of a supervisor, the principal of the Children's Disability Centre (CDC) pre-school was approached to investigate the possibility of there being suitable subjects that met the inclusion criteria within the school. Thirteen suitable subjects were identified by a team consisting of the Principal of the school, the consultant paediatrician and the researcher. The parents of the children at CDC were then contacted by the researcher, and invited to participate in the study.

Participation was therefore determined by the parents' willingness to complete the three research instruments, and continue with occupational therapy (OT-SI) for their child for at least one year. Twenty four families agreed to participate in the research.
Due to the unavailability of subjects, the sample number was recalculated by the biostatistician. The difference to be detected was increased to15%, which resulted in a sample size of 20 being needed to detect significant treatment effect on the smaller sample and still to achieve a p value equal to or less than 0.05.

A cohort of 11 pre-school children diagnosed with ASD, referred to occupational therapy private practices across South Africa from November 2006 – May 2007, and 13 pre-school children who met the inclusion criteria at the CDC pre-school in Braamfontein, Johannesburg formed the study group. Thus the subjects formed two distinct groups in terms of socioeconomic status as CDC caters for children from lower socioeconomic backgrounds.

3.4.5 Recruitment of Occupational Therapists

Recruitment of children into the study also depended on there being a suitably qualified occupational therapist to carry out the OT-SI intervention on the child for one year. Therapists recruited into the study not only had to agree to carry out the intervention but also to have their practice validated so that the interventions carried out by the therapists could be considered equitable. The concept of the "Fidelity to Treatment" as a way of measuring treatment as being SI based was introduced to the therapists.

These therapists also agreed to have their practice subjected to the "Fidelity Measure" to ensure standardisation of the SI treatment across different therapists and sessions.

3.4.3 Standardisation of the Occupational Therapy using a Sensory Integration Frame of Reference (OT-SI) Intervention

The researcher needed to ensure that the treatment the subjects in the study received was in fact based on the OT-SI clinical frame of reference. It was important to exclude any therapists whose OT was fundamentally behavioural, sensory stimulating in principle neuro-developmental or perceptual-motor. Ten critical criteria that differentiate OT-SI from other clinical frames of reference have been identified by researchers and are stipulated in the "Fidelity Measure" for the application of SI-OT intervention. The practice of the therapists in the study was assessed using the criteria in the "Sensory Integration Fidelity Measure" (Parham et al. 2007; Smith Roley, 2008a). These included:

- Using a written manual to define the intervention. This ensured that the standard of OT-SI carried out by different occupational therapists, met the criteria so that it could be defined as OT-SI (Ottenbacher, 1991).
- Using the "Sensory Integration Fidelity Measure". This has been developed as a reliable and valid instrument, which has been used in other clinical trials and outcomes studies, incorporating Ayres' sensory integration intervention, to standardise treatment across different therapists and sessions. The scale evaluates constructs related to:
  - the intervention provided,
  - the training the therapists have received,
  - administration of intervention,
  - specifying the environment in which the treatment is conducted (Parham et al. 2007).

The evaluation of these constructs determines the degree to which the therapy can be equated as OT-SI across different therapists, patients and treatment settings (Tickle-Degnen, 1988).

The following aspects were considered in evaluating the therapist's practices using the "Sensory Integration Fidelity Measure".

3.4.3.1 Evaluation of Sensory Integration Intervention

Treatment was evaluated for standardisation according to the "Sensory Integration Fidelity Measure" (Parham et al. 2007), to establish whether the therapy administered by the therapists participating in this study was true to the principles established in the literature for SI treatment. The purpose of this evaluation was to determine whether therapists followed a set of principles based on sensory integration theory to guide the therapists' clinical reasoning skills. Astute observation of the child's ability to process and utilise incoming sensory information during intervention activities was also evaluated as this is the key skill of therapists trained in the sensory integration approach, and the feature that distinguishes this approach from others. Guidelines for therapy sessions were stipulated at between 45 minutes and one hour per week of individual therapy conducted by an occupational therapist who has received training in sensory integration.

Therapists were therefore requested to provide a 30 minute video of one treatment session with a participant in the study from which their intervention could be evaluated. Four participating therapists provided the researcher with video material, and three participating therapists did not have access to a video camera, thus the researcher volunteered to film the video so that the therapist's practice could be validated against the fidelity criteria.

The video clips showed the beginning and end of the session and needed to illustrate the child's change in state of self-regulation. The core elements of the OT-SI approach i.e. availability of sensory opportunities; (vestibular, proprioceptive and tactile sensation), and attention to OT-SI principles of addressing postural control and praxis were important. The relationship between the child and the therapist needed to be illustrated demonstrating that there was a therapeutic alliance, opportunities for play, and collaboration in activity choice. The half hour videotapes were edited by the researcher and into five-minute clips, which illustrated the intervention and safety criteria set out in the Fidelity Measure stipulated by the Sensory Integration Research Collaborative (Parham et al. 2007a). The therapist's skill in providing "just right challenge" to ensure success was another important factor to take into consideration in editing the video clips.

The 5 minute video clips were evaluated by a team from the Sensory Integration Research Collaborative composed of occupational therapy researchers and clinicians

from across the United States who were authors of the Fidelity Measure for "Ayres Sensory Integration" and were considered experts in sensory integration. These individuals gave an objective rating of the interventions of the seven participating therapists.

The following is an excerpt from their report:-
"Using the Fidelity Measure based on Ayres' Sensory Integration; I rated seven different therapists providing intervention to a seven different children. One therapist provided a short clip of two sessions. The rest had only one session. The ratings are based on DVD excerpts lasting approximately five minutes each. Prior to scoring, a panel of four world-renowned experts in sensory integration and occupational therapy reviewed the tapes of intervention for general impression. "Unanimously they felt that the sessions reflected sensory integration, as the method of intervention employed" (Smith Roley, 2008a).

Detailed results indicated that six of the seven therapists met the suggested criteria of 80% or above to ensure fidelity to intervention. Only one therapist received a score 71%, scoring low on collaborating in activity choice and addressing praxis items. It is therefore assumed that the interventions provided by the therapists for the duration of the study adhered to principles of occupational therapy using a sensory integration approach (Smith Roley, 2008a). (Appendix D)

3.4.3.2 Therapists' Training

Seven occupational therapists responded to the advertisement. Five had completed training in SI and the SIPT through SAISI, up to Course 4 (SI Intervention). Two of the therapists had completed SI and the SIPT training up to Course 3 (SI Treatment)
(Appendix D).

Four of the five therapists who had completed the training in OT-SI are considered experts, with at least five years of experience in the field. Three of these are part of SAISI's core lecturing team in South Africa. The two therapists, who had completed the process of SI certification up to Course 3, received one hour per week of supervision from an expert therapist when providing OT-SI intervention during the course of the study until they had completed the final module (Course 4 – SI Intervention), which they did during the study period. Supervision of therapist's who have not fully completed their SI training is stipulated by the Sensory Integration Fidelity Measure.

The researcher who is an OT-SI Treatment lecturer, and has been an external examiner for postgraduate students studying the Advanced Diploma in Perception at the University of the Witwatersrand, was responsible for the treatment of 13 of the subjects at the CDC pre- school.

3.4.3.3 Treatment administration

In order to complete the Sensory Integration-Fidelity Measure, the researcher visited each site, interviewed each therapist and reviewed records. This evaluation included assessment of initial assessment records, goal setting, progress reports. Part of the interview was a discussion with the therapist to ensure that there was consultation and collaboration with each child's parents and teachers.

Assessment rand progress reports were reviewed by the researcher. These needed to include the child's history; medical, educational and developmental information as well as therapeutic and occupational profiles, the reason for referral for OT, and sensory preferences. The OTA–Watertown Clinical Assessment worksheet (Smith Roley et al. 2001) was the instrument used by the majority of the therapists in this study to formulate their assessment with the Miller Assessment for Pre-schoolers (MAP) being used in two cases and the Test of Sensory Integration (TSI) in addition to the MAP being used by one therapist. Unstructured evaluations that were reviewed included clinical observations, school reports and parent reports.

As a result of the assessment each therapist defined goals and objectives to improve engagement and participation in multiple contexts for both the child and their family. Each therapist was interviewed by the researcher to ensure that goals and objectives of therapy were defined by a team including family and teachers.

Progress was recorded as the observable changes in the child's ability to participate in sensory-based activities, regulate arousal level, display an improvement in sensorimotor skills, and showed an improvement in the child's ability to participate independently in daily life activities (Schaaf & Miller, 2005).

An interview was conducted with each therapist to establish the manner in which they involved parents and teachers in their child's therapy. Parents and teachers were viewed by all the participating therapists as valued members of the therapeutic team. Parents

were encouraged to observe sessions, and to carry out home programmes as an adjunct to their child's OT-SI sessions. The teachers of the children who attended other nursery schools were contacted once a term by the therapists. Some therapists did school visits or made telephonic contact with teachers while others who ran school-based practices were not in regular face to face contact with the child's teacher. Assessment and progress reports were sent to the parents and teachers. The CDC preschool teachers had weekly in-service training by the researcher/therapist. During these sessions, the basic principles of SI, recognising SI difficulties in the children, and classroom strategies to assist the children to self-regulate were discussed.

3.4.3.4 The therapeutic environment

The therapeutic environment is designed to tap into the child's inner drive to play, and the therapist uses keen observation skills to observe and interpret the child's behaviour and interests, and creates an environment in which the child actively pursues achievable challenges.

The video clips provided by the therapists' (1/2 hr) showed the therapeutic environment, ensuring that safety measures were in place. The researcher visited all seven sites and confirmed that the physical environments met the six criteria and the five safety criteria stipulated in the "Sensory Integration Fidelity Measure" for the application of OT-SI intervention (Parham, et al. 2007a). In the treatment facilities, 92% of the equipment stipulated by the "Sensory Integration Fidelity Measure" was available with the lowest availability of equipment being 83% (see Appendix E). Two therapists withdrew from the study as they did not meet the criteria stipulated in the "Sensory Integration Fidelity Measure" (Parham & Koomar, 2006).

3.4.4 Ethical Considerations

Parents of children referred to OT-SI and parents of children from a special needs pre-school who had been diagnosed with ASD and met the inclusion/exclusion criteria were invited to take part in the research project. Those who agreed were asked to sign informed consent, and were given assurance that withdrawal from the study would not jeopardise their child's therapy. Permission to videotape the children's OT-SI sessions and to take photographs for the research project was given by parents on a separate consent form. They were assured of confidentiality in that all names and contact details supplied in order to receive feedback would be kept separately from the data in another

file by the researcher. These contact details were kept separately from other data collection forms, which were coded with a number by the researcher.

Participating therapists were asked to sign a consent form at the outset, whereby they agreed to provide OT-SI on a weekly basis for a year, and to give the researcher information regarding their qualifications, details pertaining to the environment, including equipment, access to assessment and progress reports, and to supply a 30-minute video clip of the child undergoing OT-SI. Ethical clearance was obtained from the University of the Witwatersrand Human Research Ethics Committee (Medical) R14/49 Wallace Protocol No. M060817(Appendix G).

3.4.5 Measurement Techniques

In order to establish convergent validity the association between the OPQ and two standardised outcome measures were chosen which assessed related variables, one internal and one external to the child was evaluated.

- a component external to the child – the parents' stress levels over a 9-12 month period using the Parenting Stress Index-Short Form (Abidin, 1995) and
- a component internal to the child – the child's sensory processing as measured by the Sensory Profile : Short Form (Dunn, 1999) were correlated with scores recorded in the child's OPQ to determine convergent validity of the OPQ (3.4.1.1).

3.4.5.1 Parenting Stress Index – Short Form (PSI-SF)

Convergent reliability was measured by correlating of change in the OPQ: Family Impact section of the OPQ, with the PSI-SF as both subjectively measure similar constructs. At the time of publication the PSI-SF (1995) did not possess a body of independent research to support its validity. However, because it is a direct derivative of the full-length PSI, the likelihood that it would share in the validity of the full-length PSI has been reported (Abidin, 1995). A correlation (r = .94) between the PSI-SF and the full length PSI was found in a large sample (N=530). The Difficult Child (DC) subscale score correlated highly with the Child Domain on the PSI (r = .87). The Parental Distress (PD) domain correlated highly with the Parental Domain on the full length PSI (r = .92). The P-CDI (Parent-Child Dysfunctional Interaction) subscale contains items from both the Child Domain (r = .73) and the Parent Domain (r = .50) on the PSI, and so lower correlations were expected (Abidin, 1995).

Test–retest reliability on a normative sample of 800 subjects over a six-month interval was high: 0.84 for Total stress; 0.85 for PD; 0.68 for P-CDI; and 0.78 for DC. Internal consistency reliability was 0.91 for Total stress; 0.87 for PD; 0.80 for P-CDI; and 0.85 for DC (Abidin, 1995).The PSI-SF data at baseline was recorded as percentiles, illustrating the severity of the parenting stress experienced by parents of children with ASD. The graphs provided on the scoring sheet were used to record the percentile scores for subscales of the PSI-SF.

3.4.5.2 Short Sensory Profile (SSP)

The SSP is a derivative of the full Sensory Profile which contains sections corresponding to each sensory system, sections which indicate the modulation of sensory input across sensory systems and sections which indicate behavioural and emotional responses that are associated with sensory processing (Dunn, 1999). In designing the SSP a smaller set of items that would be more discriminating for children with and without disabilities and met specific psychometric criteria were identified from the full Sensory Profile. In order that the SSP specifically measured sensory processing; social/emotional and behavioural products of sensory modulation were excluded.

In order to ensure construct validity i.e. that the SSP measures sensory processing, the instrument was correlated with a physiological measure. "The Sensory Challenge Protocol" cited by Miller is a well-established research protocol establishing that individuals with certain medical or behavioural diagnoses exhibit atypical electrodermal reactivity (EDR) (Miller, Reisman , McKintosh & Simon, 2001). Internal reliability of the SSP test total and sections ranged between 0.70 and 0.90 which is within the high range and acceptable for all tests (Table 3.7.4.3) (Kielhofner, 2006). Internal validity of the sections of the SSP, to examine inter-correlations of the SSP total and section scores, was carried out. Low to moderate correlations (0.25 to 0.76) (Table 3.7.4.3) suggest that the sections tap relatively unusual constructs which differ at times from the overall sensory processing measured.

3.4.6 Research Procedure

Once an appropriate participant was identified, and had consented to participate; a data collection battery of three questionnaires , comprising: The Parent Stress Index – Short Form (PSI-SF), The Short Sensory Profile (SSP) and an Occupational Performance Questionnaire (OPQ), were sent to the therapist for each participant. The therapist

handed the forms to the parent of the child during the first month of the child's therapy. The parent was asked to complete the forms and return them to her child's therapist. The forms were returned to the researcher by registered post.

After six months, the researcher contacted each participating therapist and confirmed that the participant was still attending OT. A second data collection battery, with the same three questionnaires was sent to each therapist, who once again handed them to the parent concerned. The therapists collected all the questionnaires and returned them to the researcher.

Final data collection followed exactly the same procedure at between nine-and-a-half and twelve months after baseline measurements were recorded, In the case of the subjects at the CDC; the researcher was the therapist treating the children. The questionnaires were completed by the parents at the six monthly meetings without any guidance, or sent home with the children in cases where parents were unable to attend the meetings due to work and family commitments. As the school group at CDC started occupational therapy in February and finished at the end of November, the research period that represented a school year and not a full calendar year.

3.4.7 Data Analysis

3.4.7.1 Demographic data

The general information section of the OPQ provided information, which enabled the researcher to separate groups of children according to gender, age, diagnosis, socio-economic status and family structure for comparison. Descriptive analysis was used to present a profile of the subjects in terms of demographic factors. Means and percentages were used to summarise the data.

The demographic data of the two groups; the children who attended private therapy and the second group who were treated by the researcher at school; were compared using a two sample t test with unequal variance in order to establish if there were significant differences between these groups.

3.4.7.2 Comparison of the Outcome Measures Scores for the two Groups

On all three instruments the change from baseline to 6 months and to 12 months in each area was measured by subtracting the baseline score from the final measurement on each scale; the difference representing the change in on the OPQ and SSP in children with ASD receiving OT-SI and the change in the parents' stress levels on the SPSI-SF. z scores on the questionnaires were compared to establish differences.

The scores on all the questionnaires for each group were compared using a Student t test to establish whether the differences between them on the constructs measured by the OPQ, SSP and PSI-SF were significant or not.
This also allowed for the consequential validity of the OPQ to be established.
Raw data at baseline, 6 and 12 months for the study was recorded onto excel spreadsheets from the questionnaires completed by the parents of the subjects by the researcher for each participant.

Using statistical formulae, the baseline raw score for each participant and the "z" scores at baseline, 6 months and 12 months were calculated and recorded (Dunn, W. 1999) for the SSP. Means and standard deviations were used to calculate the "z" scores.

Table 3.4.7.2 Example of conversion of SSP Raw scores to "z" scores

Participant no. 2	SSP Baseline	SSP 6 months	SSP 12 months	Change in SSP 0 mo-6 mo	Change in SSP 0 mo-12 mo
Mean	108	125	147	17	39
SD	13.49	13.49	13.49		
z score	-4.45	-3.18	-1.55	1.26	2.89

"z" scores were calculated for the PSI-SF and with the "z" scores from the SSP, used to establish the level of functioning of subjects at baseline and to ensure that the tests were uni-dimensional. The scores for the OPQ were analysed in the same way to establish the consequential validity and the uni-dimensionality of the measure.

It was also important to establish the relationship between the two constructs that the OPQ was compared to, so the change in the children's sensory processing SSP and 'their parents' stress levels PSI-SF was analysed. The interpretation of the correlations is based on the strength of the relationships between variables (Kielhofner, 2006).

3.4.7.3 Relationship between questionnaires results over time

Pearson's coefficients were used to establish correlations between the variables in the three questionnaires over the research period. Convergent validity depended on demonstrating whether a relationship existed between constructs or not and correlation was the method used to analyse these relationships.
The scores on all three instruments were correlated at baseline , 6 months and ,12 months in each area to establish the convergent validity of the OPQ.

In order to determine whether the impact of a child with ASD on the family contributed to parenting stress, the Family Impact section (OPQ:FI) and the Parenting Stress Index (PSI-SF) were correlated. Furthermore, in order to determine whether it was resolution of the parent's internalised distress, the difficult relationship with their child or the child behaviours per se, the Occupational Performance Questionnaire (OPQ) was correlated with the PSI-SF Parent-Child Dysfunctional Interaction (P-CDI) and the PSI-SF: Difficult Child (DC) subscales.

When dealing with correlations statistical significance should not be interpreted as reflecting the strength of the relationship between constructs as correlations are very sensitive to sample size (Kielhofner, 2006). A high correlation indicates the association between variables did not occur by chance. Correlations were interpreted according to the following levels. (Kielhofner, 2006)

Table 3.7.4.3 Strength of correlation between variables

r values	rating
.0 to .2	negligible
.2 to .4	low
.4 to .6	moderate
.6 to .8	high
.8	very high

3.4.7.4 Change over time

The results of the OPQ, SSP and the PSI-SF were analysed at baseline, at six months and at 12 months. The mean change in the raw scores for the OPQ, SSP and PSI-SF and the various subtests for the 19 subjects who completed the year study was analysed

calculated using a Student t-test. This analysis was to establish the response to change and the sensitivity of the test overall.

The size of the effect of the change in each measure after six months and one year of OT-SI, was calculated using confidence intervals at a 95% level.

Predictive validity which measures the questionnaire against an outcome criterion needs large participant numbers and was not done at this stage (Kielhofner