

Brief Report: Assessment of Sensory Abnormalities in People with Autistic Spectrum Disorders

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Sensory functioning has long been considered crucial in the life of people with autistic spectrum disorders (ASD) (Gillberg, C., & Coleman, M. (1992). *The Biology of Autistic Syndromes* (2nd ed.). London: Mac Keith press.) However, much of the research is methodologically flawed and based on child populations and adults' retrospective accounts (O'Neill, M.C 1995). Sensory-perceptual abnormalities in autism. *Psychological Perspectives in Autism-Conference Proceedings 1995* (pp. 55–61). Autism Research Unit, University of Sunderland). Such sensory dysfunction may contribute to poor person/environment fit and subsequent challenging behaviour. This paper presents an assessment tool developed to explore the sensory functioning of adults with ASD.

KEY WORDS: Sensory function; autism; assessment.

INTRODUCTION

Sensory abnormalities have long been recognised as being associated with autistic spectrum disorder [ASD] (O'Neill, 1995). Such abnormalities are not necessary for the diagnosis of such conditions and are usually subsumed under the rubric of non-triadic features (Happe, 1995). However, this is not to dismiss such features as unimportant, either as regards their impact on the person with ASD or in terms of clues as to underlying neurobiological mechanisms of ASD. In her review of sensory abnormalities in children with ASD, O'Neill (1995) examined both psychological research and personal accounts concerned with this phenomenon. She reported a number of studies (e.g. Ornitz, Guthrie, & Farley,

1977, 1978; Volkmar, Cohen, & Paul, 1986) that provided evidence that sensory abnormalities are present in the majority of children (70–80%). Earlier work by Metz (1967) reported that children with ASD showed preference for much higher levels of sound than children with a learning disability. Frankel, Freeman, Ritvo, Chikamin, and Carr (1976) found that for children with ASD, specific frequencies of flickering light had reinforcement value but did not for non-ASD children, whilst specific visual agnosias have also been associated with people with ASD (Jambaque, Mottron, Ponsot, & Chiron, 1998). Overall, abnormalities have been described in all main five sensory modalities as well as kinaesthetic and proprioceptive sensation. They include:

1. Hyper and hyposensitivity to stimulation, often fluctuating between the two.
2. Distortions, e.g. depth may wrongly perceived or still objects perceived as moving.
3. Sensory tune-outs, e.g. sound or vision may suddenly blank out and return.
4. Sensory overload.
5. Difficulties in processing from more than one channel at a time.

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6. Multi and cross channel perception, e.g. the perception of sound may be accompanied by perceptions of colour or taste akin to synesthesia.
7. Difficulties in identifying source channel of sensory stimulation.

In a recent community study, Bromley, Hare, Davison, and Emerson (2001) found that from a sample of 75 children; 71% were hypersensitive to sound; 52% to touch; 41% to smell and 40% to taste. They also found that 23% of children were hypersensitive to pain and 45% were hyposensitive to pain. Other researchers (e.g. Baranek, 2002) have focussed on evaluating interventions intended to address sensory abnormalities including auditory integration training (Morgan Brown, 1999), postural control (Kohen-Raz, Volkmar, & Cohen 1992) or visual orientation deficits (Wainwright-Sharp and Bryson, 1993).

O'Neill and Jones (1997) conclude that much of the research concerning sensory abnormalities is methodologically flawed and first hand accounts are usually from adults recounting their experiences as children. O'Neill and Jones highlight a number of areas that require further investigation. These are:

1. Range and extent of existing abnormalities
2. Relationship to other impairments
3. Developmental/maturation influences
4. Psychological sequelae
5. Specificity to ASD

To examine this areas further, an assessment measure, the Sensory Behaviour Schedule (SBS) has been developed, based on the sensory domains highlighted by O'Neill (O'Neill, 1995; O'Neill and Jones, 1997).

METHOD

The SBS was constructed based on the sensory domains highlighted by O'Neill (1995), a literature review and discussion with professionals in the field of ASD. The questions were shown to psychologists in the field in order to elicit comments regarding appropriateness and clarity. The questions were considered to possess face validity.

A sample was used comprised of all of the residents of two National Autistic Society [UK] (NAS) residential services N = 25 people with ASD aged 20–50, the male to female ratio being 19:6. The

questionnaires were completed by 25 key workers and 25 other care workers who supported the same people with ASD but were not their key workers. Each key worker completed the SBS in relation to their key client on two occasions at a 4 week interval. The other care workers completed the SBS for the client at the first occasion that the key worker completed it. Three Kappa (Cohen, 1960) values were calculated for each questionnaire item, to determine (1) agreement between the key workers' questionnaire and the retest questionnaires, (2) agreement between the key-workers' first questionnaires and the care workers questionnaires and (3) measured agreement between the key-workers' retest questionnaires and the care workers questionnaires. A kappa value of 0.6 was taken as inferring a "substantial" level of agreement, with a kappa value of 0.4 inferring "moderate" level of agreement (Breakwell, Hammond, & Fife-Schaw, 2000). Therefore, for the purposes of the study, a kappa value above 0.5 was taken as a criterion for reliability. The statistical analysis revealed that 12 items of the original questionnaire had "substantial" intra rater reliability. This meant that the kappa value for the first and retest questionnaires was greater than or equal to 0.6. A further 5 items had first/retest values of between 0.53 and 0.59. The test-retest value for the "twirling around" item was substantial (i.e. over 0.6), but the inter-rater/retest kappa value was in the negative range. This meant there was less agreement than would be expected by chance. However, it was decided to keep the item in the revised SBS and to examine its intra-rater reliability in detail in subsequent studies.

In total, 14 of the original SBS items were discarded and the questions relating to temperature were combined into a single question to produce a revised schedule of 17 individual items, which maintained the domain structure of the questionnaire (Appendix 1). This indicated that these domains, drawn from retrospective accounts and child studies have applicability in an adult population. Table I shows the reported occurrence of sensory behaviour based on the revised SBS, which ranged from 4.76% of the sample displaying "twirling around" to 38.1% who produced "unusual vocalisations".

The percentages associated with the questionnaire items were lower than the reported prevalence of sensory abnormalities in studies of children with ASD e.g. Bromley *et al.* 2004. This probably reflects the different criteria used in the latter study, which asked parents about their children's sensory

Table I. Reported Sensory Behaviours

| Behaviour | Percentage of sample |
|--|----------------------|
| Watching bright lights | 14.29% |
| Twirling fingers in front of eyes | 28.57% |
| Unusual vocalizations | 38.1% |
| Smelling parts of own body | 23.81% |
| Smelling others | 14.29% |
| Putting objects in mouth | 15% |
| Playing with saliva | 10% |
| Unusual tastes | 20% |
| Manipulation of small objects | 28.57% |
| Preference for tight clothes/bedding | 9.52% |
| Wrist flapping | 25% |
| Jumping on the spot | 19.05% |
| Twirling around | 4.76% |
| Difficulty in dressing and feeding | 19.05% |
| Hypo/hypersensitivity to temperature | 44% |
| Noticeable gait | 33.33% |
| Using touch/taste/smell more than vision and hearing | 9.52% |

functioning. As has been noted in the present study, a large number of sensory abnormalities are readily reported in a reliable manner. Also, it is possible that maturational factors may influence sensory functioning (O'Neill and Jones, 1997; Grandin, 1992).

With regard to the use of the SBS in clinical practice, it should be noted that the SBS has not been developed to examine the nature of the neurological processes underpinning unusual sensory experience in ASD nor to act as a diagnostic instrument, but to guide intervention and service development. Therefore, the presence of a particular sensory dysfunction should not be assumed on the basis of the endorsement of a particular SBS item. Similarly, it should be noted that the items were chosen specifically to reflect inappropriate and/or markedly dysfunctional behaviours associated with sensory difference in people with ASD. It therefore remains the case that such differences may also be expressed in more appropriate ways, such as exercise, massage, listening to particular music, etc.

With this in mind, the revised SBS is offered as a tool for routine screening and individual assessment in both generic and autism-specific services. Its use should facilitate the developing of more appropriate environments for people with ASD and also inform functional analyses of cases of challenging behaviour where sensory dysfunction is suspected of being a causal and/or maintaining factor.

Appendix 1. Sensory Behaviour Schedule

| | Ongoing | In past | No | Don't know or N/A |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Visual | | | | |
| a. Does the person watch bright lights? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Does the person twirl their fingers in front of their eyes? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Auditory | | | | |
| a. Does the person make unusual vocalisations? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Olfactory | | | | |
| a. Does the person smell other people? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Does the person smell parts of his or her own body? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Taste | | | | |
| a. Does the person put objects in their mouth? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Does the person engage in play with saliva or other bodily substances? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Does the person like any unusual foods/tastes? (Please give details) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Tactile | | | | |
| a. Does the person hold and manipulate small objects? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Does the person like to be tightly wrapped up in clothes and/or bedding? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Kinaesthetic. | | | | |
| a. Does the person flap their wrists? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Does the person jump up and down on the spot? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Does the person twirl themselves round and round? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Appendix 1. Continued

| | Ongoing | In past | No | Don't know or N/A |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 7. Proprioception | | | | |
| a. Does the person have difficulty in dressing and feeding himself or herself? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Vestibular | | | | |
| a. Does the person walk with a noticeable gait? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Temperature | | | | |
| a. Does the person seem to be unaware/tolerant of temperature extremes (e.g. drinking boiling drinks, getting in very hot baths, going out in snow and rain partially dressed) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Sensory preferences | | | | |
| a. Does the person tend to use touch/taste/smell to examine objects and situations more than vision and hearing? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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