Chapter 14

Using A Sensory Diet To Mediate Behaviours Of Concern And To Increase Children's Participation In Daily Activities

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The behaviour of children with intellectual disability is complex. One possible contribution to the amelioration of problem behaviour that is not well understood is sensory defensiveness. This term that refers to the way that some children process non-noxious sensory input in everyday tasks as threatening. This qualitative study examined the impact of one type of intervention on reducing sensory defensiveness called 'the sensory diet'. Parents reported that positive changes to behaviour and increased participation in daily activity were easily achieved by purposefully scheduling a minimum of eight sensory based activities into the day. This change was most likely to occur when using additional proprioceptive (joint) and vestibular (movement) based activities as part of the child's daily sensory experience.

Introduction

The findings in this chapter describe the use of sensory diets from parent reports that were part of data collected for a pilot study. The study examined the impact of using a sensory intervention within a home context to improve behavioural responses and functional outcomes for children with intellectual disability, behaviour problems and sensory defensiveness. In this chapter, an overview of sensory processing disorder and its impact on behaviour is presented as well as a description of a 'sensory diet', and a rationale and current evidence to support its use. The qualities and components that were common across sensory diets used with seventeen children will be described and a case example will be used to demonstrate the clinical application in a home context.

Background To Study

Children with intellectual disability and behaviour problems are a vulnerable group that is increasing in size within society. Prevalence studies report that 40% of children and young people with intellectual disability experience severe behaviour and emotional problems (Emerson, 2003a). Behavioural intervention for this group of children predominantly focuses on home and school function. The relationship between problem behaviours (self injury and stereotypy) and environmental situations that prompt those behaviours consists of a complex variety of contributing factors (O'Neill, Horner, Albin, Storey, & Sprague, 1990; Willis, LaVigna, & Donnellan, 1993; Sameroff, 2000). One possible contribution to problem behaviour that is not well understood is the inability of some children to process sensory input that is inherent in a task (Ahn, Miller, Milberger, & McIntosh, 2004; Trott, 2002).

While many children with intellectual disability have typical reactions to the sensory inputs of everyday life, some appear to interpret everyday sensations as threatening or noxious, showing signs of SPD (Baranek, Boyd, Poe, & David, 2007; Dunn, 1999; Wilbarger & Wilbarger, 2002). The consequence is an extreme behavioural response to sensory dimensions of everyday tasks such as bathing, eating, and dressing, referred to as 'sensory defensiveness'. Activities people think ought to come naturally to children such as playing, making friends, doing schoolwork, responding to a hug, are a struggle and may contribute to social, emotional, personal, and learning problems. When sensory processing styles are extreme, the ability of children to do their daily routines, tasks, and activities at home and school is compromised. This has been referred to as a 'sensory processing disorder' (SPD) (Miller, Reisman, McIntosh, & Simon, 2001), and the impact of this disorder on children and their families is substantial.

Parenting children who have an intellectual disability as well as sensory processing disorder is difficult, and specific guidance to assist children and families to cope with everyday sensations is required (Cermak & Daunhauer, 1997; Mangeot et al., 2001; Murray-Slutsky & Paris, 2005; Reynolds & Lane, 2008; Schaaf, Miller, Seawell, & O'Keefe, 2003; Schneider et al., 2008; Talay-Ongan & Wood, 2000). There is growing support for the use of a sensory processing approach for such children and adults with intellectual disability (Baranek, Foster, & Berkson, 1997; Bright, Bittick, & Fleeman, 1981; Moore & Henry, 2002; Reisman & Hanschu, 1992; Soper & Thorley, 1996; Stagnitti, Raison, & Ryan, 1999; Wilbarger & Wilbarger, 2002).

Sensory Processing Disorder (SPD)

The ability to process sensory information begins before birth and continues to develop and adapt throughout life. The most rapid development occurs in early childhood. As a child's central nervous system matures, so do the sensory systems. Each of the senses develops at its own rate, but by the time a child enters preschool, children have learned to differentiate types of touch, visual and auditory inputs, and regulate their responses to them. There is a wide range of what could be considered 'typical' responses to inputs. Genetics and environmental influences, as well as health and disability play a huge role in how children respond to different types of sensory input (Williamson & Anzalone, 2001). While everyone experiences the occasional problem with processing sensory information, most people learn how to adjust and manage so that they can complete everyday tasks. Children with SPD are deficient in their ability to *suppress* (filter out) repeated or irrelevant sensory input and fail to selectively *regulate* the sensitivity of cortical responses to additional incoming sensory stimuli (Davies & Gavin, 2007).

Children classified as having SPD by therapists are significantly different from their age-matched peers based on family observations. Studies have shown that parents of children with SPD report aberrant behaviors that were prompted by specific everyday sensory events, whereas parents of children who appeared to be processing sensory inputs typically did not. Validity for these behavioural observations has been provided by electroencephalographic measures. These have shown differences between the two groups of children, with children with SPD displaying deficiencies in their ability to suppress repeated or irrelevant sensory input and their ability to selectively regulate the sensitivity of cortical responses to additional incoming sensory stimuli (Davies & Gavin, 2007). The decreased ability of children with SPD to suppress irrelevant stimuli is thought to contribute to behavioural manifestations such as distraction, impulsiveness, abnormal activity level, disorganization, anxiety, and emotional lability (Cohn, Miller, & Tickle-Degnen, 2000; Miller, Reisman, McIntosh, & Simon, 2001).

There is a significant relationship between sensory filtering and age, with researchers inferring that regulation of sensory inputs improves as children mature (Davies & Gavin, 2007; Freedman, Adler, & Waldo, 1987; Marshall, Bar-Haim, & Fox, 2004). Alternatively, the sensitivity of children with SPD does not appear to change as a function of either biologically driven maturity (e.g., physical growth) or the accumulation of experiences across time (e.g., learning), with children appearing to remain either hyper-responsive or hypo-responsive to sensory inputs occurring during everyday activity (Hanft, Miller, & Lane, 2000; McIntosh, Miller, Shyu, & Dunn, 1999).

Although occupational therapy using various sensory based approaches has been trialed with children who have sensory processing disorders, evidence supporting the

effectiveness is controversial and inconclusive (Foss, Swinth, McGruder, & Tomlin, 2003; Mulligan, 2003; Schaaf & Nightlinger, 2007). This has been partly due to the heterogeneity of the populations studied, poor adherence to the principles of the particular sensory approach used, and use of research methodologies and outcome measures that do not assess functions that are most closely linked to regulation of sensation. Few studies have measured the impact of a sensory based approach to behavioural management on aspects of home and family life that are important to individual children and parents. No studies reviewed prior to this pilot study measured outcomes of a sensory based intervention that incorporated therapressure and sensory diet components and had been implemented by parents within the home context.

What Is A Sensory Diet?

A 'sensory diet' is one type of sensory based intervention that has been widely used by occupational therapists to modify the effects of SPD in children. The term 'sensory diet' was coined by Wilbarger (1984) to describe a strategy for developing individualised programs that provided planned and scheduled activities to address a person's sensory needs, so that behaviour remains purposeful. The term 'sensory diet' uses a nutritional diet as a metaphor. That is, just as a nutritional diet involves three main meals a day with snacks in between and involves special knowledge about many complex factors, so does a sensory diet (Wilbarger, 1995). The purpose is to help children function better in a sensory world. All people require a unique amount and type of sensory input in order to maintain an optimal level of arousal, to regulate their mood and to perform their daily activities (Wilbarger & Wilbarger, 1991). Each person's diet will vary according to their goals, preferences, resources, and limitations. A sensory diet is considered an ecological

approach to behavioural management and requires collaboration between children, parents, therapists, and others. It is designed to be used in context and in conjunction with other planned daily activities.

The way a person responds to sensory input is also unique. Some children crave sensory experiences, while others interpret sensory input as threatening (Dunn, 1999; Wilbarger & Wilbarger, 1991). The way children perceive sensory experiences can impact on their ability to engage in activities of daily living. Some may enjoy the sensory experience life offers, while others may be fearful about experiences that most people consider to be everyday, such as brushing one's hair. By understanding the sensory aspects of activities people seek out or avoid, clinicians can begin to understand people's behaviour from the perspective of their unconscious or conscious attempts to meet their sensory needs. Activities can either be reorganised or supplemented to ensure that a person is getting the right amount of sensory input during his/her day in order to be calm, to concentrate, to regulate mood, and to participate in daily life. Central to the qualitative assessment of responses to sensory inputs and the need for a sensory diet are the answers to the following questions.

- Is there a *sensory contribution* to the child's presenting *anxiety, avoidance or hyperreactivity?*
- Is there a *sensory contribution* to the child's *intolerance to everyday objects* such as clothing, textured food?
- Is there a relationship between *responses to sensation and the family's struggle* to deal with the child within their daily routine (e.g., hypersensitivity)?
- Is there a *pattern of sensory preferences* across sensory modalities?

The Wilbargers (1995; 2007) have found that some sensory based activities act like ‘snacks’ and change a person’s mood or arousal levels quickly and for a short duration, in a similar way to having a small snack between meals. Other activities are thought to have longer lasting effects on mood and daily performance. The time of day that each person does sensory based activities will also have an effect on how well they are able to stay calm and engage in every day life. Thus the timing, duration and intensity of activities throughout the day influences how easily people are able to stay calm, concentrate and regulate their emotional state.

Components Of A Sensory Diet

The Wilbargers (1991) recommended six components to be included in a sensory diet. These components are outlined below.

1. All activities in a sensory diet are prescribed after in-depth assessment of the child’s context, sensory preferences and needs.
2. All activities should occur naturally within the child’s ecology and are sustainable.
3. Specific time oriented activity routines, that is, sensory based activities are prescribed that can be done in a short time and are repeated periodically throughout the day.
4. Changes in routines and interactions, that is, consistent routines are developed to increase predictability for the child, prepare for upcoming events, and help to seek out opportunities for sensory experiences that provide long lasting effects. Clinicians also need to remain aware that interactions with people generate a lot of potentially disruptive sensory input for the child in the form of voice, odours, eye contact, and touch.

5. Environmental adaptation, that is, safe play areas are created that provide spaces that the child can go to if overstimulated and reduce disruptive stimulation.
6. Participation in play and leisure activities that meet the child's sensory needs, that is, clinicians need to determine what the sensory qualities of different activities are in terms of cost and benefit and assist the child to engage in these.

Senses Utilised In Sensory Diet Programs

Sensory diet programs employ the use of a child's senses (i.e., proprioceptive, vestibular, tactile, oral, auditory and visual) based on his/her sensory preferences and needs. In order to have an understanding of the relevance of the different senses in a sensory diet, the function of each sense is outlined below.

- *Proprioception* is the sense that provides information about limb position, limb movement and force (Kandel, Schwartz, & Jessell, 2000). It relies on information from muscle, joint, and skin receptors to provide this input.
- The *sense of movement and gravity* provides information about head movement through receptors in the vestibular labyrinth located in the inner ear. These receptors are activated by movement of the head and by gravity (Kandel, Schwartz, & Jessell, 2000).
- The *tactile sense* provides information about the environment via receptors located in the skin. It alerts a person to danger and provides information about the qualities of objects in the environment (Kandel, Schwartz, & Jessell, 2000).
- *Oral structures* rely on several different senses working together to make sense of information in the mouth. It relies on the *gustatory, olfactory, proprioceptive and tactile systems* to provide information about texture, taste, pressure, vibration,

movement, temperature, and pain. The nose receives olfactory information and interprets whether the odour is a safe or noxious substance (School Therapy Services, 2001).

- *Vision* is the sense that detects visual images and the eyes are the sensory receptors. The eyes take in information from the environment about the contrast between light and dark, colour and movement. It enables individuals to evaluate the environment, recognise similarities and differences between object forms, sizes, and positions (Kandel, Schwartz, & Jessell, 2000; School Therapy Services, 2001).
- *Auditory* information is received through receptors located in the outer and inner ear and is stimulated by noise and sound information. It receives information about volume, pitch, and rhythm. It enables individuals to distinguish between similar sounds, recall what is heard and assists in the development of communication and literacy skills (Kandel, Schwartz, & Jessell, 2000; School Therapy Services, 2001).

Methodology

Study Design

This study used two qualitative methods to address the following research questions,

1. How many and what *activities* were used in each sensory diet?
2. What were the *sensory qualities* of the activities?
3. *Who* implemented the intervention?
4. What *environments* was the intervention used in?
5. What were the therapeutic *goals* for the participants?
6. What *area of life* was the goal targeting?

First, a directed qualitative content analysis was used (Busch et al., 2005; Carley, 1993; Hsieh & Shannon, 2005; Minichiello, Aroni, Timewell, & Alexander, 1995) to examine themes in the documentation of sensory diets that were implemented by parents of children with intellectual disability and SPD. Content analysis is a way to understand qualitative data in the form of written text by counting the frequency with which words or concepts occur or are implied in texts, and by the interpretive coding of data (Krippendorff, 2004). To conduct a directed content analysis, predefined concepts were developed for this study from research about sensory processing disorder and use of sensory diets, and from terms that appear in italics in the research questions listed above (Hsieh & Shannon, 2005).

Second, a qualitative critical case study was used to further describe the use of sensory diets (Yin, 2003). Case study research designs have been acknowledged to contribute important information to the understanding of parenting issues and the behaviour of children with intellectual disability. In some instances they are the preferred method of determining intervention impact because group methodologies do not yield the type of qualitative information sought from heterogeneous populations (such as children and families) and contexts (such as unique home environments) (Nott & Chapparo, 2008; Swan & Alderman, 2004). Case study is suited to situations where little is known about a new phenomenon (such as SPD and sensory diets), when studying problems in a real-life context (such as homes), and involving a number of complex human factors (such as intellectual disability and sensory defensiveness) (Salimen, Harra, & Lautamo, 2006). Directed content analysis and case study methodology is being used in conjunction with randomised controlled trial methodology as part of a larger study that examines the impact of the sensory protocol in comparison

to behavioural intervention in this group of children and parents (Chapparo & Mora, 2008).

The qualitative methods reported here have afforded the researchers a qualitative analysis of aspects of intervention outcomes and perceived changes in children's behaviour as a consequence of this particular sensory based intervention that was not offered by quantitative approaches alone. Although the qualitative content analysis and case study approaches do not allow generalization of findings, the findings further inform the results of quantitative analysis, the direction of research, and current clinical practice by describing both problems experienced by children with SPD and their parents, and what they perceived as useful solutions.

Participants

Seventeen children participated in the study. All were clients of Ageing, Disability and Home Care (ADHC), Department of Human Services NSW and were receiving occupational therapy services. The age of the children ranged between 4½ to 11 years with a mean age of 6½ years. Fifteen of the children were male and two were female. Three of the children had a mild intellectual disability, ten of the children had a moderate intellectual disability and four had a severe intellectual disability. Twelve out of the seventeen children had a diagnosis of Autism. Several of the children's experiences have been used to illustrate concepts relating to sensory diets. These children, Lachlan, Ted, Emilio, Jeremy, Ian, Milly, and Peter (pseudonyms used), lived at home with their families and were assessed by therapists as experiencing sensory processing disorder, characterised by severe sensory defensiveness.

Sensory Diet Intervention

The sensory diet intervention was designed to be used for a period of 6 to 12 weeks. It was refined in the first week and then monitored fortnightly. Interventions were activity based and were scheduled into the children's daily routines to,

1. Provide additional sensory input e.g., arm wrestle at morning tea time;
2. Prepare a child for the up and coming event or interaction e.g., wearing weighted back pack to enter school;
3. Provide a space that the child could go to when overwhelmed e.g., rolling wheel; and
4. To participate in play activities e.g., climbing frame at the playground.

Table 14.1 outlines the interventions used in the sensory diets categorised according to the primary sense used.

[Insert Table 14.1 here]

Data Collection Methods

Sensory Diets

Data about individualised sensory diets were obtained for the seventeen child participants. Each sensory diet had been generated by an occupational therapist trained in the sensory diet intervention in collaboration with the parent or adult caregiver. The sensory diets were two pages long on average. The first page outlined the daily routine and the second page provided detailed descriptions of the sensory activities. As each sensory diet was developed within the context of a daily routine, this meant that sensory

activities occurred at scheduled times and with key daily events e.g., at breakfast time a child would be given crunchy cereal.

Content Analysis

Codes were generated for the content of the diets according to frequency of appearance of sensory activities and also according to the underpinning theoretical framework of sensory processing. Comparisons between the seventeen sensory diets were made.

Behaviours Of Concern

The children's parents identified behaviours of concern and functional activities in which they hoped to see a change after implementation of the sensory intervention. Changes in the children's behaviour were obtained from documents which employed Goal Attainment Scaling (GAS) (Kiresuk & Sherman, 1968) to measure the extent and direction of change. The descriptive content of behavioural change was reviewed in relation to this study and is reported below. Quantitative results from GAS statistical analyses are reported elsewhere (Chapparo & Mora, 2008).

Findings

The findings of the study are presented below. It should be noted, that the sensory diet was only one component of the intervention, therefore any change described can not be solely attributed to use of a sensory diet.

Behavioural Changes

The types of behaviours of concern that parents identified included: anxiety, agitation, crying in distress, tantrums, sleeplessness, hurting others, running away, protest vocalisations, not following rules, and stripping. These behaviours were mediated after the children received the sensory diet.

There were a few children who began to calm themselves down and were able to live their daily lives with a reduced 'heightened affect'. For example, Emilio lashed out at others less, Ian began to decrease the duration for which he made loud protest noises, Milly showed less distress and Peter had fewer tantrums. Jeremy was able to stay asleep six out of seven nights when previously he had woken almost every night during sleep time. Emilio, who previously ran away when out in the community, began to be able to walk beside his parents whilst out. Lachlan began to follow the house rules such as having quiet time which enabled his mother some time to get her daily chores completed.

These results demonstrated that family life became more manageable and community activities were able to occur without parents being concerned about their children's behaviour. These outcomes were all very positive and had an impact on the overall family functioning.

Frequency Of Sensory Diet Activities

Therapists programmed sensory based activities into children's daily routines to enable children to be calm and to participate in daily activities. On average there were twelve occasions of prescribed sensory based activity during the day, however most therapists prescribed eight per day. The number of sensory based activities ranged from five to twenty-eight per day. The duration of the activities varied from 30 seconds to 15

minutes, e.g., firm hug for 30 seconds, bicycle ride for 15 minutes. These results suggest that clinicians may be able to make changes to children's behaviour with a minimum of eight sensory based activities per day.

Frequency Of The Senses Utilised

The proprioceptive, movement, tactile, oral, auditory, and visual senses (discussed previously) were all used in the sensory diets used with the seventeen participants. During analysis of the data, a hierarchy of the most to least used senses emerged. Each activity used in the sensory diet was categorised by the primary sense utilised in the activity, for example, rolling on a ball primarily activates the vestibular receptors whereas an arm wrestle relies more on the proprioceptors.

Proprioception was the most utilised sense in the sensory diets analysed. This was followed by activities that primarily targeted the vestibular system. The tactile system emerged as the third most used sense. The oral sensory system and the visual systems were the forth most utilised. The auditory system was used the least. See Table 14.2 for the number of occasions of use of each sense.

[Insert Table 14.2 here]

In this study, sensory diets using primarily the proprioceptive and vestibular senses were more likely to assist in mediating behaviour and increasing participation in daily life. These interventions will be discussed further as they were the most utilised senses in the sensory diets and are the senses credited for having the most calming

effect on exaggerated responses to perceived noxious sensory stimuli (Wilbarger & Wilbarger, 2007).

Sensory Diet Interventions Relating To Proprioception

Proprioception was the most highly utilised sense in the programs and thirty-one proprioceptive interventions were generated for the participants. The qualities of the actions utilised in these interventions included squashing, pushing, pulling, providing pressure, lifting, vibration, and being contained in equipment that provided pressure. Some of the interventions were able to be implemented by the child independently, some required support from an adult, and others relied on a piece of equipment that the child could utilise independently or with adult assistance.

The outcomes of these interventions enabled extended participation in other daily life activities. Figure 14.1 shows a schematic representation of how proprioceptive interventions promoted participation. Self care activities, such as eating and showering, were performed calmly and with comfort for the first time for Ted, Ian and Milly. For example, Ted's mother provided firm touch to his head prior to having a shower and this enabled Ted to have a shower without distress.

[Insert Figure 14.1 here]

Some of the interventions facilitated play between the child and their parent. Activities such as being squashed by a ball or wrestling with a parent produced a playful social response. This was particularly relevant as many of the parent's goals related to improving the child's opportunity for social experiences.

Proprioceptive interventions promoted the child's capacity to attend and participate in school based activities, such as sitting down at a table to do lessons. In a classroom some of these interventions were woven into the typical routine and included activities such as handing out weighted activities to other students. Other interventions relied on the use of equipment such as a weighted lap bag to assist with regulating arousal and promoting concentration.

Finally Lachlan, Ted and Emilio were assisted to get to sleep by parents giving them a 'back rub' at the end of the day, as well as using weighted blankets on their beds to assist them to settle down for sleep time. Therefore, the results this study showed that the qualities of proprioceptive activities to consider in therapeutic programming include squashing, pushing, pulling, providing pressure, lifting, vibration, and being contained in equipment.

Sensory Diet Activities Relating To Movement And Gravity

The vestibular system was the second most used sense used in the study to facilitate the children to be calm and to enable participation in daily activities. Figure 14.2 provides a schematic representation of how vestibular interventions assist children to participate in daily life. The specific qualities of the vestibular interventions included rolling, bouncing, jumping, sliding and gliding, and stepping. Similar to the proprioceptive interventions, the vestibular activities were able to be implemented by the child, with assistance from an adult, or required a specific piece of equipment to facilitate the activity (see Table 14.1 for details of the interventions).

[Insert Figure 14.2 here]

Engaging in the vestibular activities enabled play, self care, and school related performance. However play was the predominant performance area enabled by the vestibular activities. Eleven out of the thirteen prescribed interventions related to play. Ian participated in one self care activity whilst receiving a vestibular intervention. He was able to eat his meal while sitting on a moveable cushion. He usually found eating a noxious experience. Similarly Emilio participated in a school task whilst sitting on a moveable cushion. This intervention facilitated calmness and concentration. Therefore, this study showed that when planning a sensory diet, the qualities of vestibular based activities to consider include rolling, bouncing, jumping, sliding and gliding, and stepping.

Summary

The implementation of these sensory based activities appeared to mediate children's behaviour problems, facilitated a calm state and promoted participation in daily activities. On average each child made two standard deviations of change relating to behavioural goals (e.g., 'Jim will reduce the amount of times he lashes out at people') and also functional goals (e.g. 'Jim will wash his hair in the shower') using Goal Attainment Scaling (Kiresuk & Sherman, 1968). The study provides promising preliminary results that sensory based intervention is effective for children with intellectual disability, behaviour problems and sensory defensiveness.

Clinical Application – Case Study

Peter was a 10 year old boy with a moderate intellectual disability and Autism. He lived with his parents and a younger sister and brother. Peter presented with tantrums every day whereby he screamed, cried, and occasionally pulled hair and pushed and kicked others. Peter was assessed to be sensitive to touch. He didn't like others being close to him, would get upset when lightly touched on his arm by family members, and removed his clothes 5 to 10 times per day because he disliked the feel of clothes on his body.

He was picky with the foods he ate and would become distracted and upset with sounds in the background. He also required a lot of verbal prompting to play by himself for about 2 minutes. He interacted and played with his siblings once a month. His parent's goals during the sensory intervention were to decrease the frequency of his tantrums and how much he removed his clothes. His parents also wanted to increase how much time Peter spent playing by himself and with his siblings.

Peter's therapist prescribed eight occasions of scheduled sensory based activities into his day (see Table 14.3 for an example of his daily schedule). The majority of these activities were proprioceptive and vestibular based. The therapist suggested that Peter's parents show photos of these activities to let him know what was happening. In addition, his therapist recommended that a quiet place be set up where Peter could go that was dark and quiet and also that Peter wear his most comfortable clothes.

[Insert Table 14.3 here]

After 6 weeks of intervention, Peter had a tantrum less than twice a week, he only removed his clothes once or twice a day, he played by himself for 5 minutes and played with his siblings once a week. His parents were very happy with these changes

and reported that ‘the tantrums are not happening this week at home, school or respite’. They also noted that it was easy to implement the sensory activities at home and that they were very helpful. These were very positive changes in the life of Peter and his family. This approach warrants careful consideration by practitioners working in this field.

Discussion

Findings of this study are consistent with others that have studied the effectiveness of sensory processing interventions over the past few years. For example, single-subject research has shown some similar positive effects that resulted from efforts to decrease the child's hyper-responsiveness to sensory input (Case-Smith & Bryan, 1999; Linderman, & Stewart, 1999) and deep pressure techniques (Edelson, Edelson, Kerr, & Grandin, 1999). The use of weighted vests (a technique to provide deep pressure sensation) has been evaluated, using single-subject designs, in children with pervasive developmental disorders, with results showing similar improvements in on-task behaviour and a decrease in self-stimulatory behaviours (Fertel-Daly, Bedell, & Hinojsa, 2001; Smith, Press, Koenig, & Kinnealey, 2005; VandenBerg, 2001).

Descriptive articles (Olson & Moulton, 2004), research reviews (Mulligan, 2003; Schaaf & Miller, 2005), case reports (Kinnealey, 1998), and anecdotal parent reports, support the views of parents in this study that behavioural changes can result from the use of sensory processing interventions. Changes such as those found in this study, that included increased engagement, more goal-directed play, improved sleep patterns, reduced anxiety, and increased tolerance for change, have also been reported by others (e.g., Candler, 2003; Cohn, 2001; Paul et al., 2003; Stonefelt & Stein, 1998).

The finding in this study that parents found the use of the sensory diet easy to manage is novel and should be followed up with further research.

On one hand, these cumulative research findings offer hope to parents of children with behavioural problems that may be linked to sensory processing disorder. On the other hand, the findings are of concern to those therapists and parents who believe that they see positive changes in the children treated using a sensory diet approach, and want to base their practices on strong evidence. There are clear limitations in the research, with sample sizes of this and most other studies being quite small. As stated previously, individual gains may be masked by lack of distinction between the use of the sensory diet and other sensory processing approaches in this study. Nonetheless, the findings of this study suggest that the decision to provide parents with a sensory diet to assist with management of behavioural problems that are linked to sensory defensiveness should be considered as part of an overall behavioural strategy to enhance children's occupational performance. Further research is required to produce solid evidence that use of a sensory diet is effective.

Conclusion

Sensory diets are used by occupational therapists to influence behavioural change and to improve participation in daily life activities (Candler, 2003; Cohn, 2001; Paul et al., 2003; Stonefelt & Stein, 1998). This study found that behaviour problems (e.g., anxiety, agitation) relating to sensory defensiveness were mediated after children received a sensory diet, which improved the overall quality of family and community life. Therapists using this treatment will need to program a minimum of eight sensory based activities throughout the day in order to create behavioural change and to increase

participation in school, play, self care, and sleep/rest. The therapeutic program will need to primarily include proprioceptive (joint) and vestibular (movement) based activities.

As previously mentioned, these findings are consistent with other research (Edelson et al., 1999; Fertel-Daly et al., 2001; Smith et al., 2005). Of note, is the parental perception that sensory diets are easy to implement. Further research is required to explore intervention utility and implementation. In summary, the sensory diet is an effective and easy to use treatment for children experiencing behaviour problems related to sensory defensiveness.

Table 14.1

Sensory Diet Interventions

Proprioception	
Being squashed by ball	Stomp feet
Squashing with pillow	Firm hugs
Wrap up and squeeze in blanket	Hand and foot massage
Pulling and pushing	Electric massager on hands and face
Swimming	Wipes table down with warm water
Arm wrestle	Spray from squeeze bottle
Climbing frame at playground	Sit on vibrating cushion to eat or travel
To bed with weighted blanket	Rough and tumble play
Sit to eat with weighted vest on	Popping bubble wrap
Carry weighted backpack to school	Firm rub down with towel after wash
Sit with weighted lap bag	Sit amongst large, firm cushions
Animal walks to table	Running
Firm touch on head/shoulders	Jumping
Carries heavy objects	Walk the dog
Lift heavy objects	Crash on cushions
Action songs	
Vestibular	
Rolling on ball	Sit on moveable cushion to eat/do tasks
Bouncing on ball	Trolley ride at shops
Go in rolling wheel	Ride on scooter board
Going down slide	Dancing

Swinging	Riding scooter
Trampoline/mini-trampoline	Bike riding & tricycle
Rocking chair	
Tactile	
Messy play with shaving cream, dough	Play with hand fidget toys
Stand at back of line and get space	Push open newspaper door at school
Foot spa	Light touch on arm
Oral	
Eating chewy and crunchy food	Drink using straw
Use electric toothbrush	Blow toys
Chew toys	
Visual	
Increase light	Decrease light
Auditory	
Listen to music	

Table 14.2

Hierarchy Of Most Utilized Senses In The Sensory Diets

Sense	Occasions of use
Proprioception	31
Vestibular	13
Tactile	6
Oral	5
Visual	2
Auditory	1

Table 14.3

Example Of Peter's Sensory Diet

Time	**Key event in the day**	**Sensory activity**	
6.30am	Breakfast	Drink using a straw	
7am	Waiting for taxi	Jump on trampoline	
7.45am	Getting in taxi	Tight hug goodbye	
9.30am	School tasks	Making shapes with doh	
12.30pm	Lunch	Run round yard	
3.30pm	Home from school	Jump on trampoline	
7pm	Bath time	Firm dry with towel after bath	
9pm	Bed time	Listen to quiet music	

Source: Photos/pictures from Google Images.

Figure 14.1

Proprioceptive Interventions Promoting Participation in Daily Life

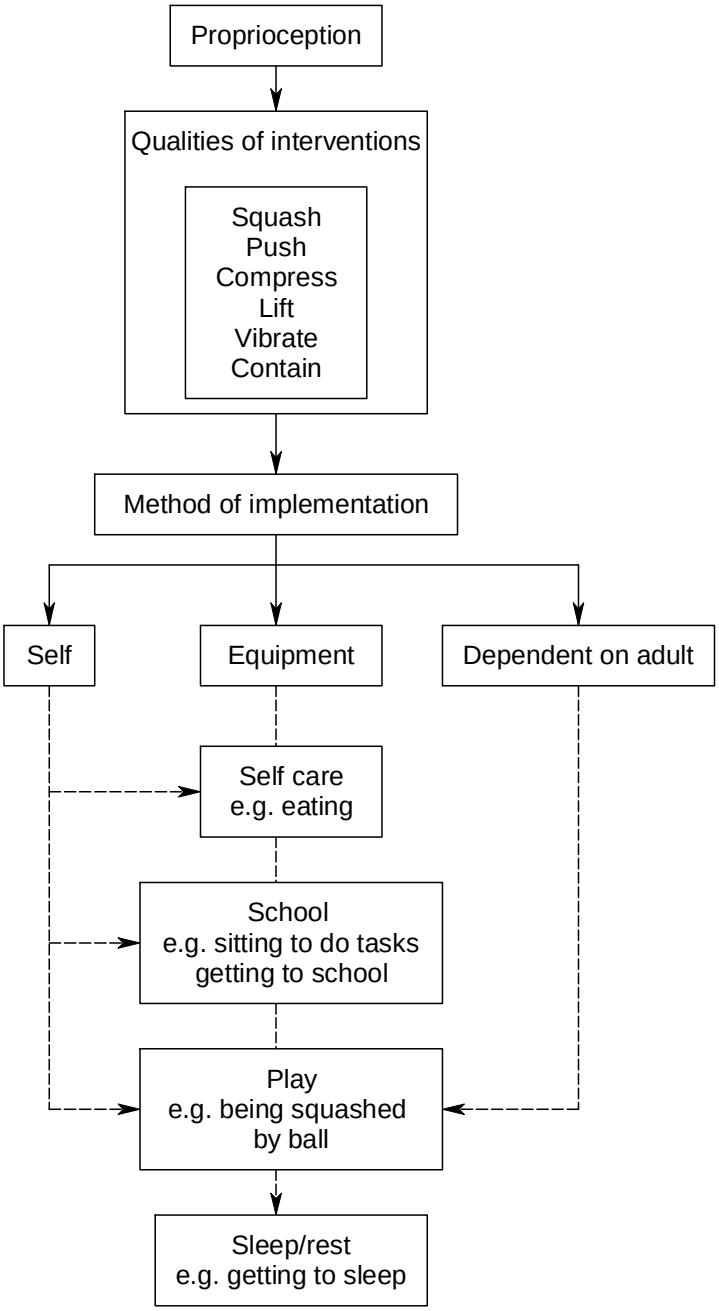

Figure 14.2

Vestibular Interventions Promoting Participation in Daily Life