

## **The 'Hidden Sense': Targeting the proprioceptive system to improve behaviours for children with Autism Spectrum Disorder (ASD).**

### **Proprioception and undesirable behaviours**

#### **CONFIDENTIAL**

This document is confidential and the property of Victoria Jarman

No part of it may be transmitted, reproduced, published, or used without prior written authorisation from the institution.

#### **STATEMENT OF COMPLIANCE FOR NON DRUG OR DEVICE CLINICAL TRIALS**

This document is a protocol for a clinical research study. The study will be conducted in compliance with all stipulations of this protocol, the conditions of ethics committee approval, the NHMRC National Statement on Ethical Conduct in Human Research (2007) and the [Handbook for Good Clinical Research Practice \(GCP\)](#)



## Contents

STATEMENT OF COMPLIANCE .....	1
<b>1. GENERAL INFORMATION .....</b>	<b>3</b>
<b>2. SYNOPSIS.....</b>	<b>3</b>
<b>3. RATIONALE / BACKGROUND .....</b>	<b>3</b>
<b>4. AIMS / OBJECTIVES / HYPOTHESES .....</b>	<b>5</b>
<b>5. PARTICIPATING SITES .....</b>	<b>5</b>
<b>6. RESEARCH PLAN / STUDY DESIGN .....</b>	<b>5</b>
<b>7. ETHICAL CONSIDERATIONS .....</b>	<b>9</b>
<b>8. SAFETY CONSIDERATIONS .....</b>	<b>10</b>
<b>9. OUTCOMES AND SIGNIFICANCE.....</b>	<b>10</b>
<b>10. TIMELINES / MILESTONES .....</b>	<b>10</b>
<b>11. FINANCIAL .....</b>	<b>11</b>
<b>12. PUBLICATION POLICY.....</b>	<b>11</b>
<b>13. REFERENCES.....</b>	<b>12</b>
<b>14. APPENDICES .....</b>	<b>15</b>



## 1. GENERAL INFORMATION

Dr Yu-Wei Chen, University of Sydney Lecturer, is the chief investigator. Victoria Jarman, University of Sydney Postgraduate student, is the second researcher. Victoria will be facilitating the clinical trial with the participants under the guidance of Yu-Wei.

### Contact details:

**Yu-Wei:** [Yu-wei.chen@sydney.edu.au](mailto:Yu-wei.chen@sydney.edu.au) (02) 9531 9798

Cumberland Campus, J Block, Room J115

**Victoria:** [Vjar1807@uni.sydney.edu.au](mailto:Vjar1807@uni.sydney.edu.au)

## 2. SYNOPSIS

Sensory-based intervention (SBI) aims to improve undesirable behaviours of children with autism spectrum disorder (ASD). Proprioceptive input is one type of SBI that is hypothesised to organise the central nervous system and aid sensory regulation. Proprioceptive input arises as a result of an individual's own movement, specifically, active muscle contraction against resistance. However the research on SBI is inconclusive as it remains unclear how to effectively use proprioceptive input to improve behaviour of children with ASD. This study aims to understand how undesirable behaviours of children with ASD and co-occurring sensory over-responsiveness change following parent-facilitated proprioceptive input. The research uses an ABA single-case design (SCD) research over a 9 week period. Five children, aged 4-14 years, with ASD and co-occurring sensory over-responsiveness will participate in the study. Following training from the researcher (occupational therapist), their parents will facilitate responsive, proprioceptive input during play and tasks in the home environment. The parents will score their target behaviour prior to intervention (A1), during the proprioceptive intervention (B), and following the intervention period (A2) on a visual analogue scale. Visual analysis of the VAS data for each participant will be used to establish preliminary evidence of a causal relationship between parent-facilitated, responsive proprioceptive input and undesirable behaviours for children with ASD and co-occurring sensory over-responsiveness.

## 3. RATIONALE / BACKGROUND

Children with ASD experience difficulties in sensory processing which impact their day to day lives (Howe & Stagg, 2016; Lane, Young, Baker, & Angley, 2010). A relatively recent inclusion in diagnostic criteria acknowledges "hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment" as possible contributors to restricted and repetitive behaviours (American Psychiatric Association, 2013). When a child experience hyper-reactivity, they are being over-responsive to an incoming sensory input which results in a strong, often negative response; an undesirable behaviour (Bundy, 2002).

Sensory-based intervention (SBI) is one type of intervention used to target over-responsiveness to sensory input. SBI is characterised by structured, adult-directed sensory strategies that are integrated into the child's daily routine to improve undesirable behaviours (Case-Smith, Weaver, & Fristand, 2015). Two systematic reviews examining research from 2000-2013 (Case-Smith et al., 2015; Watling & Hauer, 2015) propose that there is currently



insufficient evidence for implementing SBI with children with ASD. SBI research varies in how sensory input provided, the frequency and duration of the input and the context which the sensory input is delivered. Studies have used purely proprioceptive input by use of weighted vests (Cox, Gast, Luscre, & Ayres, 2009; Fertel-Daly, Bedell, & Hinojosa, 2001; Hodgetts, Magill-Evans, & Misiaszek, 2011a, 2011b; Leew, Stein, & Gibbard, 2010; Quigley, Peterson, Frieder, & Peterson, 2011; Reichow, Barton, Neely Sewell, Good, & Wolery, 2010); combinations of proprioceptive and tactile input through massage (Escalona, Field, Singer-Strunck, Cullen, & Hartshorn, 2001; Silva, Schalock, Ayres, Bunse, & Budden, 2009) or brushing (Davis, Durand, & Chan, 2011); combinations of proprioceptive and vestibular input using therapy balls (Bagatell, Mirigliani, Patterson, Reyes, & Test, 2010; Schilling & Schwartz, 2004); and combinations of all three forms of input through implementing sensory diets (Bongatt & Hall, 2010; Devlin, Healy, Leader, & Hughes, 2011; Devlin, Leader, & Healy, 2009). There are mixed results within each combination of sensory input provided to children. Likewise, there is not clear what frequency and duration or context results in more efficient improvements in undesirable behaviours for children with ASD.

This study will primarily use proprioceptive input as the form of sensory input provided to children with ASD. This is because proprioception is generally the most organising type of sensation and children are rarely sensitive to proprioceptive input. The primary sensory receptors for proprioceptive input are small parts of muscle. These muscles are activated when a child moves a muscle, specifically, when the muscle moves against resistance. Therefore, activities where a child is actively pushing, pulling, carrying, lifting, chewing, sucking or gaining another form of resistance, are providing proprioceptive input. Proprioceptive input is calming to the child as it provides an inhibitory effect on the central nervous system (Bundy, 2002). Although the input may be gained by different parts of the body, such as arms, legs or mouth, the input travels directly to the brain to provide a generalised calming effect on the child's whole body.

SBI is characterised by sensory strategies that are integrated into the child's daily routine. However, the frequency of SBI in the above studies is not responsive to the unpredictability of a child's daily routine. The majority of SBI studies used pre-determined times for the sensory strategy, rather than being proactive to the child's needs. As SBI is designed to support a child's regulation, it is recommended that they the intervention be implemented as a response to the child's arousal, such as, when they experience over-responsiveness (Case-Smith et al., 2015). Therefore, the proposed study adopts a responsive SBI. Sensory input was generally applied for 10-15 minutes, this duration will be replicated in the current study.

SBI is characterised by adult-directed activities, and despite being arguably the most influential adult in a child's life, parents are featured in a minority of the studies. The majority of studies mentioned above are set in the school, or preschool, environment and rely on interventions being implemented by teachers and teachers' aids. To replicate real-world occupational therapy and enrich family-centeredness, parents will facilitate the SBI in the home environment in the proposed study.

It is clear that children with ASD exhibit behaviours related to over-responsiveness, although it is currently unclear on how to best support them. We know that proprioceptive input has a general calming effect on the body. However, SBI drawing on proprioception has mixed outcomes with the studies drawing upon unconvincing strategies to provide the input; such



as frequency of the input and context where the input is provided. There is an upmost need for further research in how to provide successful proprioceptive input to improve undesirable behaviours of children with ASD and co-occurring sensory over-responsiveness.

#### 4. AIMS / OBJECTIVES / HYPOTHESES

**Research Question:** How do undesirable behaviours of children with ASD and co-occurring sensory-over responsiveness change following parent-facilitated proprioceptive input?

#### 5. PARTICIPATING SITES

The research will be conducted in the home environments of participants in South Eastern Sydney.

#### 6. RESEARCH PLAN / STUDY DESIGN

**Type of study:** This study is a prospective study.

**Study Design:** This research will adopt a quantitative approach, using a single case design (SCD). SCD was chosen over the 'gold standard' of quantitative research, randomised controlled trial (RCT), for a number of reasons. First, SCDs require fewer participants to obtain reputable results. Second, SCD eliminates the need for control groups and thus removal of the ethical dilemma of withholding treatment to a group of children. Third, SCD allows for individualised intervention matched to the family's priorities and needs. Finally, SCD is a less intrusive research design allowing families to continue their regular routine with minimal adjustments (Bulkeley, Bundy, Roberts, & Einfeld, 2013; Mesibov & Shea, 2011; Perdices & Tate, 2009). SCD research establishes the child as his/her own control. The child's target undesirable behaviour is rated with and without intervention, that is, the implementation of parent-facilitated, responsive proprioceptive input. Changes in target behaviour are measured by analysing the behaviour prior to the intervention, during the intervention, and when the intervention is withdrawn (Kazdin, 2011). SCD research can provide a causal relationship between proprioceptive input and undesirable behaviours for children with ASD. However, the ABA design does not allow for three intervention effects to be analysed which Kratochwill et al. (2013) recommends for causation to be established. Instead, the ABA design will allow for identification of preliminary evidence of the casual relationship as proposed by Johnston and Pennypacker (2009).

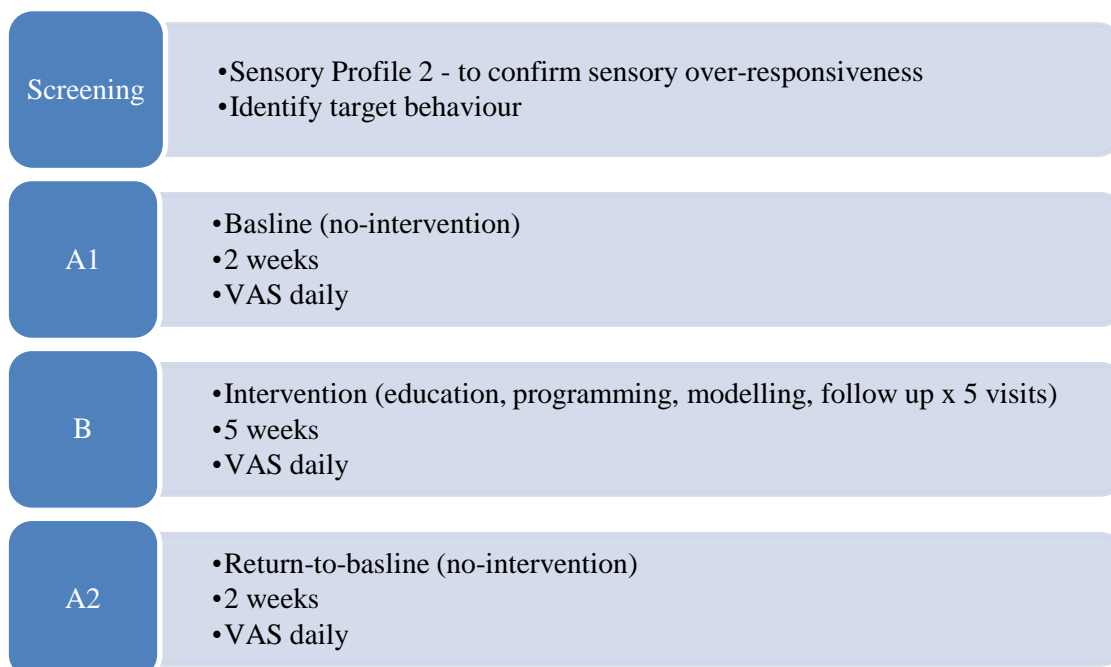
**Population / Sample Size:** This study includes both children and their parents as participants. The study will use parent-report for the children's age and diagnosis. Children are required to be aged 3-14 years of age and have a diagnosis of ASD. Children with co-morbidities (for example, physical disabilities, moderate-profound cognitive impairments, severe mental health disorders) *will not* be eligible for the study. However, ASD is commonly paired with a mild cognitive impairment and/or mental health conditions. Therefore, children with a diagnosis of mild global developmental delay (GDD), mild intellectual disability (ID), mild anxiety and/or ADHD *will* be eligible for the study. Parents and children will be required to reside in South Eastern Sydney. Due to practical reasons, parents will be required to speak fluent English. To increase validity of the results, participants can be receiving other

services but need to agree that the target undesirable behaviour of the study will not be addressed by other therapies during the study period.

Due to SCD using the child as their own control, they yield robust findings with a small number of participants (Bulkeley et al., 2013). Furthermore, standards for SCD research recommend at least three replications, or three participants, are required to establish a causal relationship between proprioceptive input and improving undesirable behaviour for children with ASD (Kratochwill et al., 2013). Therefore, five families will be recruited for the study.

**Procedure and measures:** The procedure for this research has been based on the recent work by Bulkeley, Bundy, Roberts, and Einfeld (2016). Similarly to Bulkeley et al. (2016), an A-B-A SCD will be used over a 9 week period (see figure 1). The A-B-A design will allow for an initial baseline measurement (A1), the intervention period (B) and a return-to-baseline phase (A2). Following screening of a sensory over-responsiveness, the initial baseline (A1) will occur for 2 weeks, whereby the parent will rate their child's target undesirable behaviour at the conclusion of each day. Next, during the 5-week intervention phase (B), the researcher, who is an experienced and practicing occupational therapist, will visit 5 times to individually provide the participants with education, programming, modelling and follow up. During the 'B' phase the parent will continue to rate the target behaviour daily. Lastly, the return-to-baseline (A2) will involve the parent ceasing proprioceptive activities (intervention) and continuing to score the target behaviour daily. The A-B-A design allows for the functional link between behaviour change and the intervention to be measured (Bulkeley et al., 2013; Kazdin, 2011).

Figure 1: Research Procedure



Prior to beginning the research phase (A-B-A), screening will take place to: 1) ensure the children in the study have sensory over-responsiveness (defined by sensory avoiding and/or



sensitivity behaviours as identified by Sensory Profile 2 Child; SP-2) and 2) to identify a target undesirable behaviour for each child. Screening will involve the researcher completing the SP-2 with each parent. Please see appendix A for copy of SP-2. This assessment is a questionnaire for age 3:0 to 14:11 years in which the caregiver marks how frequently the child engages in behaviours listed on the form. The SP-2 has demonstrated good validity and reliability (internal consistency, test-retest reliability and interrater reliability); with these psychometric properties inclusive of children with ASD (Dunn, 2014b). The norm-referenced results rate the child's responses (low registration, seeking, sensitivity, avoiding) in a range of sensory areas: auditory, visual, touch, movement, body position and oral sensory (Dunn, 2014a). If results from the SP-2 show the child as having "much more than others" response for avoiding and or sensitivity, meaning the child displays over-responsiveness, the child will be eligible for the study.

The researcher and parent will identify a target undesirable behaviour (that is a result of sensory over-responsiveness) from a sensory domain of SP-2 where the child responded 'much more than others'. For example, if the child scores 'much more than others' in the area of touch, the researcher will refer to the 'almost always' and 'frequently' answers for the questions asked about touch. This will show what behaviours, related to sensory touch, are impacting the most on the the child and their family's day to day lives. Using the touch example, a target behaviour deduced from the SP-2 may be 'shows an emotional or aggressive response to being touched'. The impact (e.g. level of aggression from touch) of the target behaviour will be rated by the parent daily during the research period.

SCD research requires ongoing monitoring to effectively track individual outcomes (Mesibov & Shea, 2011). A Visual Analogue Scale (VAS) will be used to track the child's behaviour throughout the research period. Please see appendix B for copy for VAS. The VAS is the chosen instrument because it is individualised, user friendly, inexpensive and has good reliability and construct validity (Chafouleas, Sanetti, Kilgus, & Maggin, 2012; Wewers & Lowe, 1990). The VAS will be individualised for each participant, for example, using the behaviour defined above, the VAS would record parent daily perceptions from 'no aggression to 'high aggression'. To ensure consistency in the recognition of the target behaviour, the same parent will score the behaviour throughout the research period and a clear description of the behaviour will be provided on each VAS. Each night, parents will be required to 1) indicate whether the child presents the undesirable behaviour that day, and 2) mark on a line how they perceived the impact of the target behaviour that day. To make rating accessible and efficient, parents will use the application P.I.E.L. Survey (Jessup, Bian, Chen, & Bundy, 2012) where they will be able to access their individualised VAS each day. The parents will be able to loan an iPod touch from The University of Sydney if they do not have own a compatible iOS device. Using P.I.E.L. Survey allows the researchers to download all the participant's responses. By utilising a VAS, a parent-rated assessment measure, the effects of the researcher also being the interventionalist are minimised.

The design of this SCD research study mimics real life therapy strategies whereby parents implement intervention throughout the day with their child. However, to analyse a causal relationship between the intervention and the undesirable behaviours, evaluation at the end of each day which encompasses the parent's perceptions of their child's behaviour throughout the day is included.



**Intervention:** In line SCD research, the intervention has been developed to reflect real world occupational therapy with an aim of being easily embedded into regular routines, with minimal additional demands for participants. Furthermore, each participant is able to work towards an outcome meaningful to them. Each child has their own target behaviour which is measured using the VAS and their own set of proprioceptive activities that work for their family. However, important to the research design is the consistency of proprioceptive input being received by the child in the set activities (Mesibov, 2011). Therefore, to ensure each child is correctly receiving proprioceptive input, the intervention phase includes: education, programming, modelling and follow up.

Education will involve the researcher (occupational therapist) explaining the fundamentals of sensory over-responsiveness to parents and how to be responsive through understanding the signs of over-responsiveness and triggers for the child's target behaviour. The researcher will work with the parent to develop a program of activities that primarily provide proprioceptive input to the body. These activities will be those that can easily be implemented in the home environment and in the child's established routine, typically embedded within play or jobs around the house. The recommended activities do not involve expensive equipment or specialised training to administer. The parent will facilitate the proprioceptive activities when triggers of the target behaviour are present or when they observe the child showing signs of over-responsiveness. Please see appendix C for parent handout. The researcher will model how to engage the child in these activities and how to perform the activities correctly in order to provide proprioceptive input. The parent will facilitate the activities for 10-15 minutes, or until they see a positive change in the child's face and body language. This time frame was chosen as it is a commonly used time frame for implementing sensory based intervention (e.g. Bagatell et al., 2010; Escalona et al., 2001; Reichow et al., 2010; Schilling & Schwartz, 2004; Silva et al., 2009). The researcher will visit the home weekly during the intervention 'B' phase, ideally when the target behaviour is expected to occur, to follow up and provide further guidance to the parents.

Due to the target behaviour being a behaviour scored as 'always' or 'frequently' on the SP-2, it is anticipated the behaviour will occur almost, if not, daily and may even occur numerous times a day. It is not anticipated that the intervention will remove the behaviour altogether, but rather, from being responsive to the child's signs of entering high arousal and becoming over-responsive to certain sensory stimuli, the perceived impact of undesirable behaviour will be minimised.

**Expected duration of study:** The research period for each participant is 9 weeks. The total length of the study will be from July 2017 to July 2018.

**Data analysis:** Data analysis will involve visual analysis of the VAS results for each participant. As with SCD research, each child is his/her own control, and therefore, each child's data will be analysed individually. The visual analysis will aim to find a causal relationship between the intervention and the child's undesirable behaviour, and the strength of this relationships, then generate a hypothesis about the relationship (Kazdin, 2011; Kratochwill et al., 2013)

The first step in the visual analysis will be establishing a projected level of baseline (A1) data, that is, determining whether the target undesirable behaviour is steady, increasing, decreasing or adopting another pattern over the 2 weeks prior to intervention. Next, the data





within each child's B and A2 phase will be examined to establish the within-phase patterns. The data from each phase will then be compared visually to the data in the adjacent phase (A1 to B and B to A2). This will be done for each child and will determine if the addition of the proprioceptive intervention has an effect on undesirable behaviour. The final step will include integrating the information from each phase (A1, B and A2) to establish preliminary evidence of a causal relationship (Kratochwill et al., 2013).

Throughout the analysis phase, six outcome-measure features will be used to examine the within- and between-phase data patterns (Kratochwill et al., 2013): level (mean of the data points); trend (best-fitting straight line); variability (scatter of points); immediacy of the effect (immediate change in level of data points in adjacent phases); overlap (same data level in adjacent phases) and; consistency of data patterns across similar phases (similarity of data level, trend and variability in A1 and A2). Analysis of these six outcome measures across and within the phases, will support the argument for preliminary evidence of a causal relationship between parent-facilitated, responsive proprioceptive input and undesirable behaviours for children with ASD and co-occurring sensory over-responsiveness.

## 7. ETHICAL CONSIDERATIONS

**Recruitment and Selection of Participants:** Recruitment will commence following ethical approval from the University of Sydney Human Research Ethics Committee. A recruitment flyer (appendix D) targeting parents of children with ASD that have behaviours related to sensory processing will be distributed to ASD support groups, including Autism Community Network, and Sutherland Autism Support Group.

Potential participants will be required to contact the researchers by email if they are interested to participate. When contacted, the researchers will send the participants a parent and child Participant Information Statement (PIS; appendix E) to explain the purpose of the study. The researchers will ask the participants to read child and parent PIS and email back their contact details if they are interested in participating. The researchers will phone interested participants to ensure they are eligible for the study and organise a home visit.

**Informed Consent:** During the first home visit, the researcher will explain the consent process to the participants. The parent and child will sign the consent form (appendix F) if they are willing to participate.

**Confidentiality and Privacy:** Pseudonyms will be used for all participants in all documents to protect identity.

**Data storage and Record Retention:** All electronic materials will be stored in password protected file in Research Data Store (RDS) available through the University of Sydney. Any hard copy materials will be scanned in RDS and shredded. Only researchers will know the passwords for RDS. All materials will be kept in RDS for 20 years or until participants (children) are 25 years old.



## 8. SAFETY CONSIDERATIONS

Parents may experience negative reactions when discussing their child’s undesirable behaviours. If this occurs, the researchers will ensure the parents have access to a support person (family member, friend, psychologist) they can talk with. There is a low risk that the proprioceptive activities could cause injury to parents or children. To minimise risk the activities will be individually tailored to the child and parent capacities and will be similar to activities they already participate in at home (but with an added proprioceptive element).

## 9. OUTCOMES AND SIGNIFICANCE

The study hopes to support occupational therapists with how to use sensory-based intervention with families. Specifically, the research aims to provide preliminary evidence for using proprioceptive activities to improve undesirable behaviours of children with ASD and co-occurring sensory over-responsiveness. Furthermore, by adopting a real-world, parent-friendly intervention, the study has the potential to be easily replicated within households of families with children with ASD.

## 10. TIMELINES / MILESTONES

**Timeline** (July 2017 – July 2018)

Date	Phase	Participant Tasks	Researcher Tasks
July 18 <sup>th</sup>	Ethics approval	<ul style="list-style-type: none"> <li>○ N/a</li> </ul>	<ul style="list-style-type: none"> <li>○ Submit ethics</li> </ul>
< August 13 <sup>th</sup>	Preparation - find potential participants	<ul style="list-style-type: none"> <li>○ Email interest</li> </ul>	<ul style="list-style-type: none"> <li>○ Distribute flyer</li> <li>○ Phone potential participants to ensure they meet eligibility criteria</li> </ul>
< August 13 <sup>th</sup>	Preparation – screen potential participants	<ul style="list-style-type: none"> <li>○ Read PIS and consent form – ask questions</li> <li>○ Complete Sensory Profile 2 online</li> </ul>	<ul style="list-style-type: none"> <li>○ Email PIS and consent form – answer questions</li> <li>○ Email Sensory Profile 2 Online</li> </ul>
< August 13 <sup>th</sup>	Preparation – recruit eligible participants	<ul style="list-style-type: none"> <li>○ Parent and child sign consent form</li> </ul>	<ul style="list-style-type: none"> <li>○ Formulate target behaviour and outcome measure (see below)</li> <li>○ Set up PIEL Survey (specific to each family)</li> </ul>



August 14 <sup>th</sup> - August 27 <sup>th</sup>	Phase A1 (2 weeks)	<ul style="list-style-type: none"> <li>○ Parent scores behaviour daily</li> </ul>	<ul style="list-style-type: none"> <li>○ No home visits (unless need support to use PIEL Survey)</li> </ul>
August 28 <sup>th</sup> – October 1 <sup>st</sup>	Phase B (5 weeks)	<ul style="list-style-type: none"> <li>○ Parent implements proprioceptive activities as per individual family plan (see below)</li> <li>○ Parent scores behaviour daily</li> </ul>	<ul style="list-style-type: none"> <li>○ Provide education to family (see handout below)</li> <li>○ Create individual family plan (see below)</li> <li>○ Home visits 1/week</li> </ul>
October 2 <sup>nd</sup> – October 15 <sup>th</sup>	Phase A2 (2 weeks)	<ul style="list-style-type: none"> <li>○ Parent scores behaviour daily</li> </ul>	<ul style="list-style-type: none"> <li>○ Reminder to participant to stop all proprioceptive intervention</li> <li>○ No home visits</li> </ul>
October 15 <sup>th</sup> – November 19 <sup>th</sup>	Conclusion	<ul style="list-style-type: none"> <li>○ Parents email all data</li> </ul>	<ul style="list-style-type: none"> <li>○ Follow up / thank you phone call</li> <li>○ Visual analysis</li> <li>○ Send lay summary to participants</li> </ul>
January – July 2018	Research article	<ul style="list-style-type: none"> <li>○ n/a</li> </ul>	<ul style="list-style-type: none"> <li>○ Prepare and publish research article</li> </ul>

## 11. FINANCIAL

This study has no funding or grants.

## 12. PUBLICATION POLICY / DISSEMINATION OF RESULTS

Participants will receive a lay summary of the results. The results will be published in a journal article by Yu-Wei Chen and Victoria Jarman.



### 13. REFERENCES

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing
- Bagatell, N., Mirigliani, G., Patterson, C., Reyes, Y., & Test, L. (2010). Effectiveness of therapy ball chairs on classroom participation in children with autism spectrum disorders. *American Journal of Occupational Therapy, 64*, 895-903. doi: 10.5014/ajot.2010.09149
- Bongatt, P., W, & Hall, L. J. (2010). Evaluation of the effects of sensory-based intervention by a preschool special education teacher. *Education and Training in Autism and Developmental Disabilities, 45*(2), 292-302.
- Bulkeley, K., Bundy, A., Roberts, J., & Einfeld, S. (2013). ASD intervention research in real world contexts: Refining single case designs. *Research in Autism Spectrum Disorders, 7*, 1257-1264. doi: 10.1016/j.rasd.2013.07.014
- Bulkeley, K., Bundy, A., Roberts, J., & Einfeld, S. (2016). Family-centered management of sensory challenges of children with Autism: Single-case experimental design. *American Journal of Occupational Therapy, 70*(5), 7005220040p7005220041-7005220048. doi: 10.5014/ajot.2016.017822
- Bundy, A. (Ed.). (2002). *Sensory integration: Theory and practice*. Philadelphia: F.A. Davis.
- Case-Smith, J., Weaver, L. L., & Fristand, M. A. (2015). A systematic review of sensory processing interventions for children with autism spectrum disorders. *Autism, 19*(2), 133-148. doi: 10.1177/136236131517762
- Chafouleas, S. M., Sanetti, L. M. H., Kilgus, S. P., & Maggin, D. M. (2012). Evaluating sensitivity to behavioural change using direct behaviour rating single-item scales *Journal of School Psychology, 48*, 219-246.
- Cox, A. L., Gast, D. L., Luscre, D., & Ayres, K. M. (2009). The effects of weighted vests on appropriate in-seat behaviors of elementary-age students with autism and severe to profound intellectual disabilities *Focus on Autism and Other Developmental Disabilities, 24*(1), 17-26. doi: 10.1177/1088357608330753
- Davis, T., N, Durand, S., & Chan, J. M. (2011). The effects of a brushing procedure on stereotypical behavior. *Research in Autism Spectrum Disorders, 5*, 1053-1058. doi: 10.1016/j.rasd.2010.11.011
- Devlin, S., Healy, O., Leader, G., & Hughes, B. M. (2011). Comparison of behavioral intervention and sensory-integration therapy in the treatment of challenging behavior. *Journal of Autism and Developmental Disorders, 41*, 1303-1320. doi: 10.1007/s10803-010-1149-x



- Devlin, S., Leader, G., & Healy, O. (2009). Comparison of behavioral intervention and sensory-integration therapy in the treatment of self-injurious behavior. *Research in Autism Spectrum Disorders, 3*, 223-231. doi: 10.1016/j.rasd.2008.06.004
- Dunn, W. (2014a). *Sensory Profile 2*. San Antonio: Pearson.
- Dunn, W. (2014b). *Sensory Profile 2 users manual*. Bloomington, IN: Pearson.
- Escalona, A., Field, T., Singer-Strunck, R., Cullen, C., & Hartshorn, K. (2001). Brief report: Improvements in the behavior of children with autism following massage therapy. *Journal of Autism and Developmental Disorders, 31*(5), 513-516. doi: 0162-3257/01/1000-0513
- Fertel-Daly, D., Bedell, G., & Hinojosa, J. (2001). Effects of a weighted vest on attention to task and self-stimulatory behaviors in preschoolers with pervasive developmental disorders. *The American Journal of Occupational Therapy, 55*, 620-640.
- Hodgetts, S., Magill-Evans, J., & Misiaszek, J. (2011a). Effects of weighted vests on classroom behavior for children with autism and cognitive impairments. *Research in Autism Spectrum Disorders, 5*, 495-505. doi: 10.1016/j.rasd.2010.06.015
- Hodgetts, S., Magill-Evans, J., & Misiaszek, J. (2011b). Weighted vests, stereotyped behaviors and arousal in children with autism. *Journal of Autism and Developmental Disorders, 41*, 805-814. doi: 10.1007/s10803-010-1104-x
- Howe, F. E. J., & Stagg, S. D. (2016). How sensory experiences affect adolescents with an autistic spectrum condition within the classroom. *Journal of Autism and Developmental Disorders, 46*, 1656-1668. doi: 10.1007/s10803-015-2693-1
- Jessup, G., Bian, S., Chen, Y. W., & Bundy, A. (2012). *Manual of P.I.E.L Survey Application [iPhone/iPod Touch/iPad/iPad Mini Application]*. Sydney, Australia: The University of Sydney.
- Johnston, J. M., & Pennypacker, H. S. (Eds.). (2009). *Strategies and tactics of behavioural research* (3rd ed.). New York, NY: Routledge.
- Kazdin, A. (2011). *Single-Case Research Designs - Methods for clinical and applied settings*. New York: Oxford University Press.
- Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2013). Single-case intervention research design standards. *Remedial and Special Education, 34*(1), 26-38. doi: 10.1177/0741932512452794
- Lane, A. E., Young, R. L., Baker, A. E. Z., & Angley, M. T. (2010). Sensory processing subtypes in autism: Association with adaptive behaviour.



- Journal of Autism and Developmental Disorders*, 40, 112-122. doi: 10.1007/s10803-009-0840-2
- Leew, S. L., Stein, N. G., & Gibbard, B. (2010). Weighted vests' effect on social attention for toddlers with autism spectrum disorders. *Canadian Journal of Occupational Therapy*, 77(2), 113-124. doi: 10.2182/cjot.2010.77.2.7
- Mesibov, G. B., & Shea, V. (2011). Evidence-based practices and autism. *Autism*, 15(1), 114-133. doi: 10.1177/1362361309348070
- Perdices, M., & Tate, R. L. (2009). Single-subject designs as a tool for evidence-based clinical practice: Are they unrecognised and undervalued? *Neuropsychological Rehabilitation*, 19(6), 904-927. doi: 10.1080/09602010903040691
- Quigley, S. P., Peterson, L., Frieder, J. E., & Peterson, S. (2011). Effects of a weighted vest on problem behaviors during functional analyses in children with pervasive developmental disorders. *Research in Autism Spectrum Disorders*, 5, 529-538. doi: 10.1016/j.rasd.2010.06.019
- Reichow, B., Barton, E. E., Neely Sewell, J., Good, L., & Wolery, M. (2010). Effects of weighted vests on the engagement of children with developmental delays and autism. *Focus on Autism and Other Developmental Disabilities*, 25(1), 3-11. doi: 10.1177/1088357609353751
- Schilling, D. L., & Schwartz, I. S. (2004). Alternative seating for young children with autism spectrum disorder: Effects on classroom behavior. *Journal of Autism and Developmental Disabilities*, 34(4), 423-432. doi: 0162-3257/04/0800-0423/0
- Silva, L. M. T., Schalock, M., Ayres, R., Bunse, C., & Budden, S. (2009). Qigong massage treatment for sensory and self-regulation problems in young children with autism: A randomized controlled trial. *The American Journal of Occupational Therapy*, 63, 423-432.
- Watling, R., & Hauer, S. (2015). Effectiveness of Ayres Sensory Integration and sensory-based interventions for people with autism spectrum disorder: A systematic review. *The American Journal of Occupational Therapy*, 69(5), 1-12. doi: 6905180030
- Wewers, M. E., & Lowe, N. K. (1990). A critical review of visual analogue scales in the measurement of clinical phenomena. *Research in Nursing and Health*, 13, 227-236.

## 14. APPENDICES

## Appendix A

### Sensory Profile 2 Child (online administration)

**Instructions:** The screens that follow contain statements that describe how children may act. Please read each phrase and select the option that best describes how often your child shows these behaviors. Please mark one option for every statement.

**Use these guidelines to mark your responses.**

When presented with the opportunity, my child...

responds in this manner **Almost Always** (90% or more of the time)

responds in this manner **Frequently** (75% of the time)

responds in this manner **Half the Time** (50% of the time)

responds in this manner **Occasionally** (25% of the time)

responds in this manner **Almost Never** (10% or less of the time)

If you are unable to answer because you have not observed the behavior or believe it does not apply to your child, please click **Does Not Apply**.

## AUDITORY Processing

My child...

1. reacts strongly to unexpected or loud noises (for example, sirens, dog barking, hair dryer)

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

2. holds hands over ears to protect them from sound

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

3. struggles to complete tasks when music or TV is on

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

4. is distracted when there is a lot of noise around

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

5. becomes unproductive with background noise (for example, fan, refrigerator)

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

6. tunes me out or seems to ignore me

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

7. seems not to hear when I call his or her name (even though hearing is OK)

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

8. enjoys strange noises or makes noise(s) for fun

Almost Always  Frequently  Half the Time  Occasionally  Almost Never  Does Not Apply

Comments (optional):



**VISUAL Processing**

**My child...**

**9. prefers to play or work in low lighting**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**10. prefers bright colors or patterns for clothing**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**11. enjoys looking at visual details in objects**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**12. needs help to find objects that are obvious to others**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**13. is more bothered by bright lights than other same-aged children**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**14. watches people as they move around the room**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**15. is bothered by bright lights (for example, hides from sunlight through car window)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**Comments (optional):**

## TOUCH Processing

My child...

**16. shows distress during grooming (for example, fights or cries during haircutting, face washing, fingernail cutting)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**17. becomes irritated by wearing shoes or socks**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**18. shows an emotional or aggressive response to being touched**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**19. becomes anxious when standing close to others (for example, in a line)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**20. rubs or scratches a part of the body that has been touched**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**21. touches people or objects to the point of annoying others**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**22. displays need to touch toys, surfaces, or textures (for example, wants to get the feeling of everything)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**23. seems unaware of pain**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**24. seems unaware of temperature changes**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**25. touches people and objects more than same-aged children**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**26. seems oblivious to messy hands or face**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**Comments (optional):**

## MOVEMENT Processing

My child...

**27. pursues movement to the point it interferes with daily routines (for example, can't sit still, fidgets)**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**28. rocks in chair, on floor, or while standing**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**29. hesitates going up or down curbs or steps (for example, is cautious, stops before moving)**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**30. becomes excited during movement tasks**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**31. takes movement or climbing risks that are unsafe**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**32. looks for opportunities to fall with no regard for own safety (for example, falls down on purpose)**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**33. loses balance unexpectedly when walking on an uneven surface**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**34. bumps into things, failing to notice objects or people in the way**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**Comments (optional):**

**BODY POSITION Processing**

**My child...**

**35. moves stiffly**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**36. becomes tired easily, especially when standing or holding the body in one position**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**37. seems to have weak muscles**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**38. props to support self (for example, holds head in hands, leans against a wall)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**39. clings to objects, walls, or banisters more than same-aged children**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**40. walks loudly as if feet are heavy**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**41. drapes self over furniture or on other people**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**42. needs heavy blankets to sleep**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**Comments (optional):**

## ORAL SENSORY Processing

My child...

**43. gags easily from certain food textures or food utensils in mouth**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**44. rejects certain tastes or food smells that are typically part of children's diets**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**45. eats only certain tastes (for example, sweet, salty)**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**46. limits self to certain food textures**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**47. is a picky eater, especially about food textures**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**48. smells nonfood objects**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**49. shows a strong preference for certain tastes**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**50. craves certain foods, tastes, or smells**

Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply

**51. puts objects in mouth (for example, pencil, hands)**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**52. bites tongue or lips more than same-aged children**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**Comments (optional):**



**CONDUCT associated with sensory processing**

**My child...**

**53. seems accident-prone**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**54. rushes through coloring, writing, or drawing**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**55. takes excessive risks (for example, climbs high into a tree, jumps off tall furniture) that compromise own safety**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**56. seems more active than same-aged children**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**57. does things in a harder way than is needed (for example, wastes time, moves slowly)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**58. can be stubborn and uncooperative**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**59. has temper tantrums**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**60. appears to enjoy falling**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

- 
- 
- 
- 
- 
- 

**61. resists eye contact from me or others**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

- 
- 
- 
- 
- 
- 

**Comments (optional):**

**SOCIAL EMOTIONAL responses associated with sensory processing**

**My child...**

**62. seems to have low self-esteem (for example, difficulty liking self)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**63. needs positive support to return to challenging situations**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**64. is sensitive to criticisms**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**65. has definite, predictable fears**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**66. expresses feeling like a failure**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**67. is too serious**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**68. has strong emotional outbursts when unable to complete a task**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**69. struggles to interpret body language or facial expression**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**70. gets frustrated easily**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**71. has fears that interfere with daily routines**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**72. is distressed by changes in plans, routines, or expectations**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**73. needs more protection from life than same-aged children (for example, defenseless physically or emotionally)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**74. interacts or participates in groups less than same-aged children**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**75. has difficulty with friendships (for example, making or keeping friends)**

**Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply**

**Comments (optional):**

**ATTENTIONAL responses associated with sensory processing**

My child...

**76. misses eye contact with me during everyday interactions**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**77. struggles to pay attention**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**78. looks away from tasks to notice all actions in the room**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**79. seems oblivious within an active environment (for example, unaware of activity)**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**80. stares intensively at objects**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**81. stares intensively at people**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**82. watches everyone when they move around the room**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**83. jumps from one thing to another so that it interferes with activities**

Almost Always Frequently Half the Time Occasionally Almost Never Does Not Apply

**84. gets lost easily**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**85. has a hard time finding objects in competing backgrounds (for example, shoes in a messy room, pencil in "junk drawer")**

**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**86. seems unaware when people come into the room**

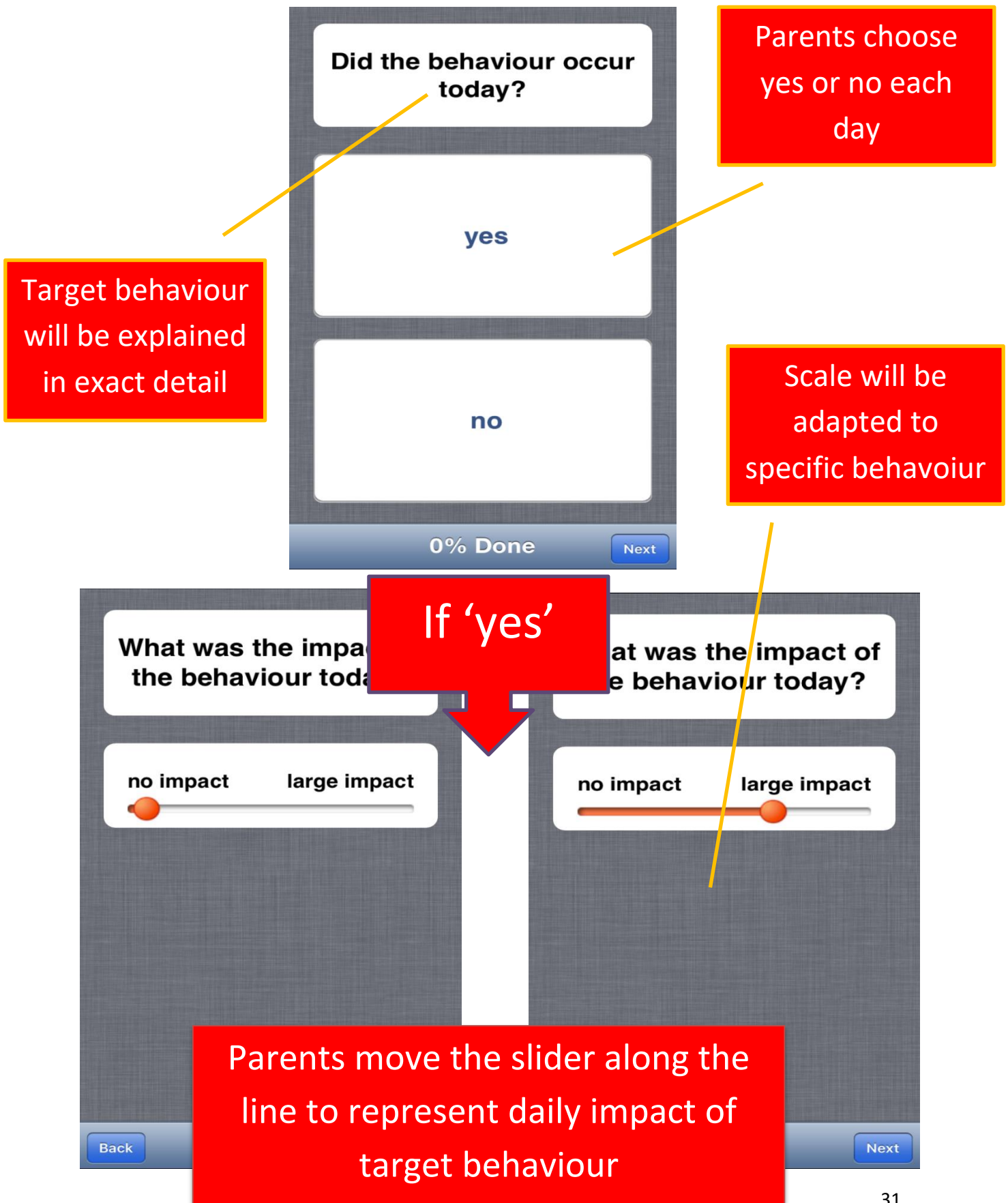
**Almost Always Frequently    Half the Time    Occasionally    Almost Never    Does Not Apply**

**Comments (optional):**

Appendix B

Visual Analogue Scale – P.I.E.L Survey



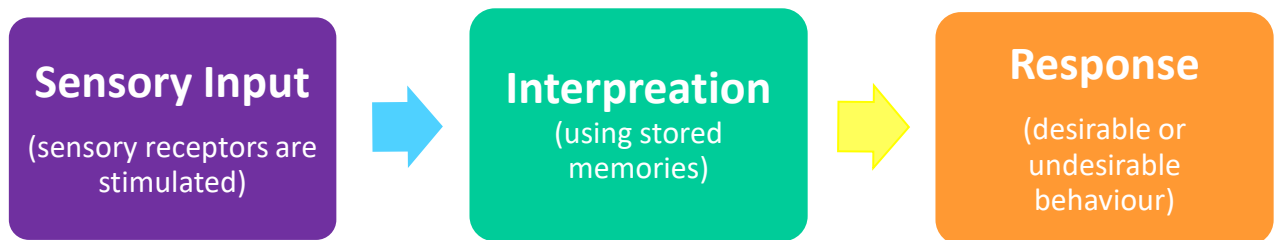
## Appendix C

# Parent Handout

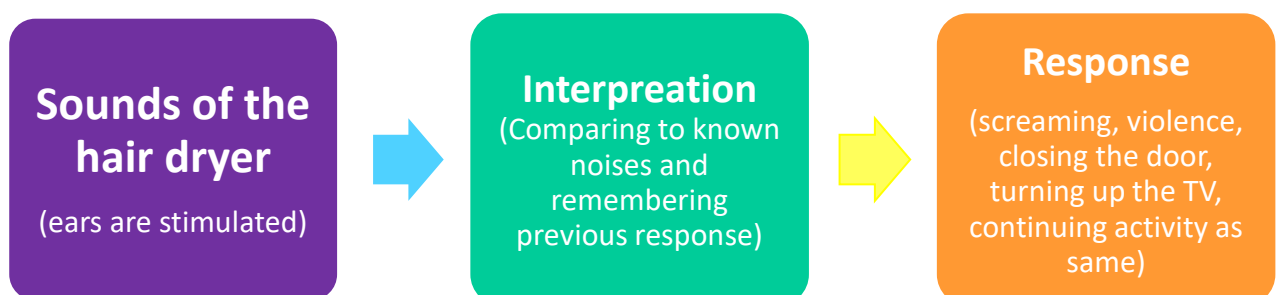
### Sensory Processing

Sensory processing refers to gathering sensory information from the environment through sensory receptors (ears, eyes, nose, mouth, skin and muscle), interpreting this information with stored memories and generating a response. The response will either be a desirable or undesirable behaviour depending on your child's sensitivities and arousal level.

#### Sensory processing steps:



#### Example:





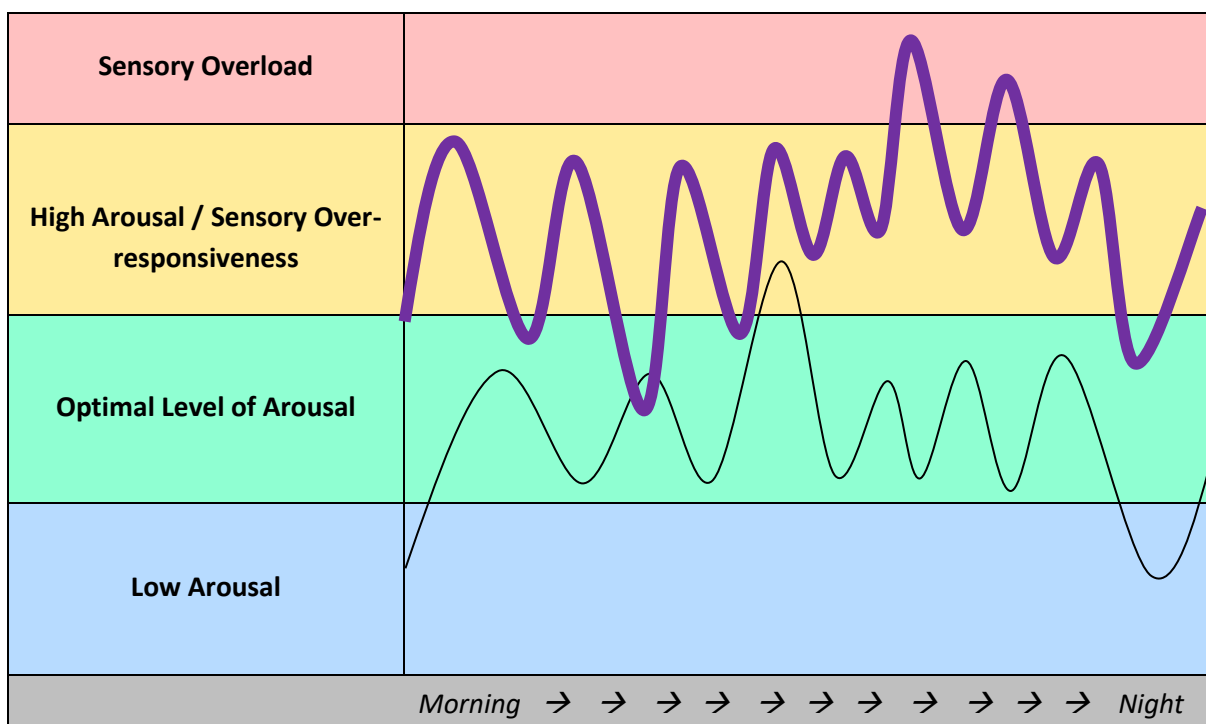
## Arousal Levels

Children without sensory processing difficulties spend most of their day within an optimal level of arousal (illustrated by black line below). These children may briefly enter high or low arousal during the day but they are able to adapt and return to an optimal level of arousal with ease.

## High Arousal / Sensory Over-responsiveness

Children who are over-responsive to sensory stimuli spend most of their day in high arousal (illustrated by purple line below). When they are in high arousal they are unable to accurately register and interpret sensory information and exhibit sensitivity behaviours.

## Visual representation of arousal levels:



## Is my child entering high arousal?

You can anticipate when your child is entering high arousal by understanding the triggers to the behaviour and your child's body language and facial expressions. Every child has different triggers and will show different signs. Watch your child closely and take note of any environmental triggers that occur prior to the undesirable behaviour.

### Environmental Triggers (sensitivities):

Visual	Hearing	Touch	Smell	Movement	Task
<ul style="list-style-type: none"> <li>• Crowds</li> <li>• Bright lights</li> <li>• Flickering lights</li> <li>• Sunlight</li> </ul>	<ul style="list-style-type: none"> <li>• Yelling, squeals</li> <li>• Vacuum, hair dryer, lawn mower, traffic</li> <li>• Toilet flushing</li> </ul>	<ul style="list-style-type: none"> <li>• Heat</li> <li>• Wind</li> <li>• Other person touching</li> <li>• Tickling</li> <li>• Touching water</li> <li>• Teeth brushing, hair brushing</li> <li>• Putting on clothes (tags/fabrics)</li> </ul>	<ul style="list-style-type: none"> <li>• Strong odours e.g. perfume,, cleaning products, petrol, cooked egg, tuna</li> </ul>	<ul style="list-style-type: none"> <li>• Spinning / rocking</li> <li>• Lying upside down</li> </ul>	<ul style="list-style-type: none"> <li>• Non-desired activity</li> <li>• Changes to plan</li> </ul>

### Body language and facial expressions:

- |                         |                             |                            |
|-------------------------|-----------------------------|----------------------------|
| ✓ Stiff movements       | ✓ Decreased eye contact     | ✓ Fearful of movement      |
| ✓ Walking on tippy toes | ✓ Increased heart rate      | ✓ Resistant to touch       |
| ✓ Clenched fists        | ✓ Faster, shorter breathing | ✓ Moving away from stimuli |
| ✓ Grinding teeth        | ✓ Changes in tone of voice  | ✓ Shutdown                 |
| ✓ Gagging               |                             |                            |
| ✓ Dilated pupils        |                             |                            |

### **What should I do if my child is entering high arousal?**

Be proactive not reactive. This means engaging your child in calming proprioceptive activities prior to a trigger occurring and/or during the trigger and when you notice your child showing signs of entering high arousal. Facilitate these activities for 10-15 minutes.

### **What are proprioceptive activities?**

The primary sensory receptors for proprioceptive input are small parts of muscle. The muscles are activated when the child moves a muscle, an even more so when the muscle moves against resistance. Therefore, activities where your child is pushing, pulling, carrying, lifting, chewing, sucking or gaining another form of resistance are proprioceptive activities. Your child can gain proprioceptive input from engaging any muscle of the body in these proprioceptive activities.

### **Why use proprioceptive activities?**

Proprioception is the most organising type of sensation when provided to the body. Unlike other sensory stimuli, for example, sound or touch, children are rarely sensitive to proprioception. Proprioceptive input is calming as it provides an inhibitory effect on the body's central nervous system. Therefore, although the input may be applied to different body areas (such as legs or arms), the input goes directly to the brain to provide a generalised calming effect on the child's whole body.

### **How do I do proprioceptive activities with my child?**

The activities are to be completed while your child is playing, doing homework, or tasks around the house. The following will enhance the effects of the proprioceptive activities:

- Have your child play an active role in the proprioceptive activity. This is so they get the most proprioceptive stimulation possible from the activity.
- Focus on your facial expressions and tone of voice when facilitating proprioceptive activities. You may need show a level of excitement to initially engage your child in the activities but try to soften your facial expression and tone of voice as the activity progresses.
- Facilitate deep breathing from your child's diaphragm muscle during the activities.

Incorporating these strategies will ensure the proprioceptive activities have the greatest calming effect on your child's body, and thus the undesirable behaviour should be minimised.

## Individual Family Plan

**Target Behaviour** (*child's individual factors will be added*):

What time does the behaviour generally occur?	What are the environmental / external triggers?	What are the child's body language / facial expressions before the behaviour / entering high arousal?
<i>e.g. morning (9-11am) and afternoon (2-5pm)</i>	<i>e.g. lawn mower, vacuum, traffic, non-desired activity, other person touching</i>	<i>e.g. stiff movements, moving away, decreased eye contact, increased heart rate, faster breathing</i>

**Activities** (*activities that are not appropriate to the family will be deleted*):

Body	Legs, feet	Arms, hands	Mouth
<p><b>Child Burrito:</b></p> <p>Roll child in sheets, add "ingredients to burrito" (deep pushes) and have them try to get themselves out</p>	<p><b>Child Sandwich:</b></p> <p>Sandwich the child's legs between cushions, have them try to get themselves out</p>	<p><b>Hug:</b></p> <p>Hug the child tightly. Have them try to get themselves free by pushing out with their arms</p>	<p><b>Chewing:</b></p> <p>Provide your child with a chewy necklace or chewy foods (dried fruit, gum)</p>
<p><b>Animal crawls:</b></p> <p>Have the child get on all fours and crawl like a dog, cat, bear, monkey or any animal of your choice. Add a something weighted on their back to make it a turtle crawl</p>	<p><b>Chair elastic:</b></p> <p>Put elastic (or theraband) around the chair legs. Have child push their feet / ankles against it when seated</p>	<p><b>Playdough:</b></p> <p>Have the child roll, squeeze, pinch and flatten playdough (or theraputty)</p>	<p><b>Sucking:</b></p> <p>Have your child suck their drink through a thin and/or curly straw (or thicker liquid e.g. yogurt through a straw)</p>
<p><b>Obstacle course:</b></p>	<p><b>Leg press:</b></p> <p>Have child lay out their back. Place</p>	<p><b>Squeeze toy :</b></p> <p>Provide your child with a squeeze toy that has some</p>	<p><b>Crunching:</b></p> <p>Have your child eat crunchy food such</p>

Have your child crawl over, under and through furniture	cushion on their feet and have them push it up	resistance – could use a home-made stress ball with balloons and flour.	as carrot or celery sticks or have them crunch down on ice
<b>Moving toy box:</b>  Have your child carry or drag their heavy toy box from one room to another in order to play	<b>Animal hops:</b>  Have your child hop like a kangaroo or frog ensuring that they get down low each time	<b>Hand squeezes:</b>  Squeeze your child’s hands to prompt them to squeeze back	<b>Blowing:</b>  Have your child blow bubbles, windmill or dandelions
<b>Emptying the dishwasher:</b>  Ensure the child is completing bending and reaching during the task	<b>Uneven surfaces:</b>  Have your child walk / run / jump on uneven surfaces e.g. mattress, crash mat, cushions	<b>Wall pushes:</b>  Complete wall push ups with your child and get them to help you keep the wall up when it ‘is falling down’	<b>Musical instruments:</b>  Have your child blow instruments such as recorder, harmonica, whistle
<b>Dancing and Yoga:</b>  Engage your child in dancing or yoga with lots of bending and stretching movements and/or standing on uneven surfaces	<b>Exercise ball kicks:</b>  Have your child sit or lie down and kick against an exercise ball (that you are holding / throwing)	<b>Cleaning surfaces:</b>  Have your child wipe surfaces such as a table or window with big movements. Also have them mop or sweep the floors.	
<b>Play equipment:</b>  Have the child climb up and down on play equipment (avoid swings and see-saws)		<b>Carrying bags:</b>  Have your child help to carry the groceries and always carry their own backpack (if it is not heavy enough, add another water bottle or a bag of rice, total	

		weight should not exceed 10% of body weight).	
<b>Steamroller:</b>  Roll an exercise ball over your child's whole body		<b>Pouring waters:</b>  Have your child pour water from a full jug into another jug or glasses	

## Does your child have Autism Spectrum Disorder? Are their sensory needs creating undesirable behaviours?

The University of Sydney is trying to learn more about how to improve behaviours of children with Autism Spectrum Disorder (ASD) through Sensory Based Intervention.

### We want to work with you to:

1. Identify a behaviour of your child's that is impacting on their daily lives
2. Implement a sensory based intervention to improve the target behaviour
3. Review the effectiveness of the intervention on the target behaviour

This study will help Occupational Therapists understand how to implement sensory based intervention to improve behaviours of children with ASD.

### Are you willing be involved in the study?

- Is your child aged 3-14 years with a primary diagnosis of ASD
- We will work close with you throughout the research period (9 weeks)
  - o We will identify a target behaviour with you
  - o You will be required to rate the behaviour daily
  - o We will train and guide you to implement the sensory based intervention in your home environment

### If you are interested in being involved:

Please contact Victoria Jarman at [vjar1807@uni.sydney.edu.au](mailto:vjar1807@uni.sydney.edu.au).

We look forward to hearing from you!

## Appendix E: Participant Information Statements – Parent & Child



Discipline of Occupational Therapy  
Faculty of Health Science

ABN 15 211 513 464

---

**Dr Yu-Wei Chen**

Room J115

*Lecturer*

Cumberland Campus

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9798

Facsimile: +61 2 9531 9197

Email: [yu-wei.chen@sydney.edu.au](mailto:yu-wei.chen@sydney.edu.au)

Web: <http://www.sydney.edu.au/>

### **The ‘Hidden Sense’: Targeting the proprioceptive system to improve target behaviours for children with Autism Spectrum Disorder**

#### **PARTICIPANT INFORMATION STATEMENT**

##### **(1) What is this study about?**

You are invited to take part in a research study about improving undesirable behaviour of children with Autism Spectrum Disorder (ASD). The study aims to explore the effectiveness of a parent-implemented daily program of activities with proprioceptive input on behaviours for children with ASD and co-occurring sensory modulation difficulties.



You have been invited to participate in this study because you are a parent of a child with ASD. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the research. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving your consent to take part in this study you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

You will be given a copy of this Participant Information Statement to keep.

## **(2) Who is running the study?**

The study is being carried out by the following researchers:

- Dr Yu-Wei Chen, Occupational Therapist, Lecturer, University of Sydney
- Victoria Jarman, Occupational Therapist, Postgraduate Student, University of Sydney

Victoria is conducting this study as the basis for the degree of Master of Health Science (Developmental Disability) at The University of Sydney. This will take place under the supervision of Dr Chen.

## **(3) What will the study involve for me?**

Your involvement in the study will include completing a questionnaire for screening to determine if your child has sensory modulation difficulties, discussions with us to identify and create goals for a target behaviour for your child, daily recording of your child's undesirable behaviour via an application on a smart device and implementation of activities daily with your child. We will train and guide you through implementation of the activities. You will be provided with an opportunity to review the results from the research for your child.

You can continue other therapies for your child during the research however these interventions must not be addressing the target behaviour agreed upon for the research.

## **(4) How much of my time will the study take?**

The research period will last 9 weeks. You will be required to score your child's behaviour daily for the 9 weeks and implement the intervention for 5 weeks. Training will be provided within the intervention period.

## **(5) Who can take part in the study?**

You will need to meet the following criteria to participate in the study:

- Parent of a child with aged 5-12 years with a primary diagnosis of ASD (additional diagnosis of mild global developmental delay, mild intellectual disability, ADHD/ADD, anxiety, sensory processing disorder, language delay accepted).
- Reside in South Eastern Sydney
- Speak fluent English (parent)

## **(6) Do I have to be in the study? Can I withdraw from the study once I've started?**

Being in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of Sydney.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by talking the researchers.

If you decide to withdraw from the study, we will not collect any more information from you. Please let us know at the time when you withdraw what you would like us to do with the information we have collected about you up to that point. If you wish your information will be removed from our study records and will not be included in the study results, up to the point that we have analysed and published the results.

## **(7) Are there any risks or costs associated with being in the study?**

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study.

## **(8) Are there any benefits associated with being in the study?**

We cannot guarantee that you will receive any direct benefits from being in the study. We hope that the results from the study will contribute to knowledge about using sensory based intervention to address your child's undesirable behaviours. This information may help researchers to develop intervention strategies that can improve undesirable behaviours for children with ASD.

## **(9) What will happen to information about me that is collected during the study?**

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise.

Your information will be stored securely and your identity/information will be kept strictly confidential, except as required by law. Study findings may be published, but you will not be individually identifiable in these publications.

**(10) Can I tell other people about the study?**

Yes, you are welcome to tell other people about the study.

**(11) What if I would like further information about the study?**

When you have read this information, Victoria Jarman will be available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage during the study, please feel free to contact Victoria Jarman at [vjar1807@uni.sydney.edu.au](mailto:vjar1807@uni.sydney.edu.au)

**(12) Will I be told the results of the study?**

You have a right to receive feedback about the overall results of this study. You can tell us that you wish to receive feedback when completing the consent form. This feedback will be in the form of a one page summary. You will receive this feedback after the study is finished.

**(13) What if I have a complaint or any concerns about the study?**

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney [*INSERT protocol number once approval is obtained*]. As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the university using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** [human.ethics@sydney.edu.au](mailto:human.ethics@sydney.edu.au)
- **Fax:** +61 2 8627 8177 (Facsimile)

**THIS INFORMATION SHEET IS FOR YOU TO KEEP**

ABN 15 211 513 464

---

**Dr Yu-Wei Chen**

Room J115

*Lecturer*

Cumberland Campus

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9798

Facsimile: +61 2 9531 9197

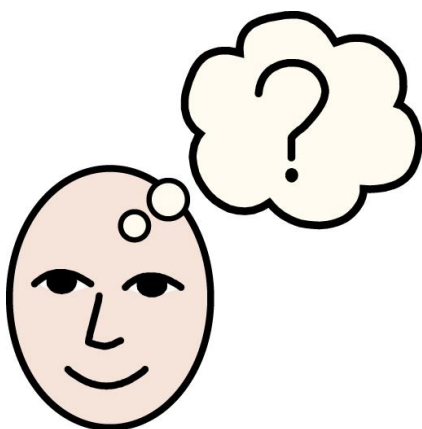
Email: [yu-wei.chen@sydney.edu.au](mailto:yu-wei.chen@sydney.edu.au)

Web: <http://www.sydney.edu.au/>

## **Study Information Sheet: The 'Hidden Sense': Targeting the proprioceptive system to improve target behaviours for children with Autism Spectrum Disorder**

Hello. Our names are

- Yu-Wei Chen
- Victoria Jarman



We are doing a research study to find out more about how sensory activities can improve behaviours and help children to feel calm.

We are asking you to be in our study because your parent contacted us for further information.

You can decide if you want to take part in the study or not. You don't have to - it's up to you.

This sheet tells you what we will ask you to do if you decide to take part in the study. Please read it carefully so that you can make up your mind about whether you want to take part.

If you decide you want to be in the study and then you change your mind later, that's ok. All you need to do is tell us that you don't want to be in the study anymore.

If you have any questions, you can ask us or your family or someone else who looks after you.

### **What will happen if I say that I want to be in the study?**

If you decide that you want to be in our study, we will ask you to do these things:

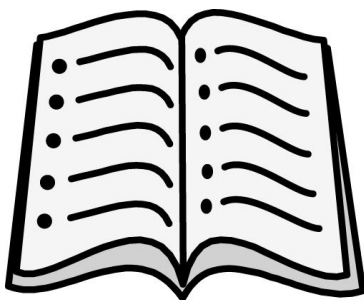
- Play games and do tasks around the house with your parent. These may change a little bit from how they are now.

We will also ask your parents to do these things:

- Change the games and tasks you do around the house so that they help your body feel calm
- Record your behaviour daily on a smart device

Victoria will sometimes watch you and your mother or father playing the games and doing tasks around the house.

### **Will anyone else know what I say in the study?**



All of the information that we have about you from the study will be stored in a safe place and we will look after it very carefully. We will write a report about the study and show it to other people but we won't say your name in the report and no one will know that you were in the study, unless you tell us that it's ok for us to say your name.

### **How long will the study take?**



The study will take 9 weeks. Your mother or father will change the games you play and tasks you do around the house a little bit during the 9 weeks.

**Are there any good things about being in the study?**



You won't get anything for being in the study, but you will be helping us develop therapy ideas that may help other children to feel calm during the day.

**Are there any bad things about being in the study?**



This study will take up some of your time, but we don't think it will be bad for you or cost you anything.

**Will you tell me what you learnt in the study at the end?**

Yes, we will if you want us to. There is a question on the consent form that asks you if you want us to tell you what we learnt in the study. If you circle Yes, when we finish the study we will tell you what we learnt.

**What if I am not happy with the study or the people doing the study?**



If you are not happy with how we are doing the study or how we treat you, then you or the person who looks after you can:

- Call the university on +61 2 8627 8176 or
- Write an **email** to [human.ethics@sydney.edu.au](mailto:human.ethics@sydney.edu.au)

*THIS SHEET IS FOR YOU TO KEEP.*

**THE PICTURES WE USED IN THIS SHEET ARE FROM MICROSOFT CLIP ART AND FROM THE PEOPLE AT INSPIRED SERVICES PUBLISHING ([WWW.INSPIREDSERVICES.ORG.UK](http://WWW.INSPIREDSERVICES.ORG.UK)). THEY SAID IT'S OK FOR US TO USE THEM.**

## Appendix F: Participant Consent Form



Discipline of Occupational Therapy  
Faculty of Health Science

ABN 15 211 513 464

**Dr Yu-Wei Chen**

Room J115

*Lecturer*

Cumberland Campus

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9798

Facsimile: +61 2 9531 9197

Email: [yu-wei.chen@sydney.edu.au](mailto:yu-wei.chen@sydney.edu.au)

Web: <http://www.sydney.edu.au/>

### The 'Hidden Sense': Targeting the proprioceptive system to improve target behaviours for children with Autism Spectrum Disorder

#### PARTICIPANT CONSENT FORM

I, ..... [PRINT NAME], agree to take part in this research study.

In giving my consent I state that:

- ✓ I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- ✓ I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.



- ✓ The researchers have answered any questions that I had about the study and I am happy with the answers.
- ✓ I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.
- ✓ I understand that I can withdraw from the study at any time.
- ✓ I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
- ✓ I understand that the results of this study may be published, and that publications will not contain my name or any identifiable information about me.

**Would you like to receive feedback about the overall results of this study?**    YES     NO

If you answered **YES**, please indicate your preferred form of feedback and address:

Postal: \_\_\_\_\_

Email: \_\_\_\_\_

Parent  
.....

Child  
.....

**Signature**  
.....

**Signature**  
.....

**PRINT name**  
.....

**PRINT name**  
.....

**Date**

**Date**