Manualization of Occupational Therapy Using Ayres Sensory Integration® for Autism

Joanne Hunt1, Elke van Hooydonk2, Patricia Faller2, Zoe Mailloux3, and Roseann Schaaf3

Abstract
This article reports on the development of a Stage 3 manual (following pilot effectiveness study) for implementing occupational therapy using Ayres Sensory Integration® (OT/ASI) for children with autism spectrum disorders to enhance participation in daily occupations. Three stakeholder groups were surveyed to aid in translation of manual from research to practice (i.e., Stage 3 manual) and an expert consensus meeting was held to finalize recommendations. Data indicated that the manuals usability could be improved by including a section on frequently encountered problems and solutions, and by including video case examples. Also recommended were greater chapter uniformity, improved clarity of forms and charts, and inclusion of a glossary. Changes were made and subject to expert review and consensus using modified Delphi process. The Stage 3 manual has been rigorously vetted and is ready for practice and research replication.

Keywords
sensory integration, knowledge translation, autism

Introduction
Translation of research evidence to clinical practice is urgently needed to promote evidence-based practice (Clark, Park, & Burke, 2013; Forsyth, Summerfield-Mann, & Kielhofner, 2005; Murphy & Gutman, 2012; Schaaf, 2015), and one important way to bridge this gap is the translation of research intervention manuals and protocols to clinical practice (Blanche, Fogelberg, Diaz, Carlson, & Clark, 2011; Lopata, Thomeer, Volker, Nida, & Lee, 2008; Schnyer & Allen, 2002). Manuals that provide guidelines for practice and research also assure that interventions can be replicated and utilized with high fidelity (Carroll & Nuro, 2002). To translate an evidence-based, manualized intervention from research to clinical practice, Carroll and Nuro (2002) proposed a three-stage progression in which a Stage 1 manual tests the feasibility of implementation of the intervention, a Stage 2 manual evaluates efficacy of the intervention, and a Stage 3 manual translates the intervention for clinical use with the potential to evaluate its efficacy with diverse populations. As the level of complexity evolves through each stage of testing an intervention, a more explicit framework to guide clinical practice is achieved (Des Jarlais, Lyles, Crepaz, & TREND Group, 2004). Westen (2002) advised that seeking input from clinicians during the development of a Stage 3 manual is important to ensure clinical utility and applicability of the intervention for practice.

Occupational therapy using the principles of Ayres Sensory Integration® (OT/ASI) is a frequently utilized and requested intervention for children with autism spectrum disorders (ASDs) to facilitate the child’s participation in activities and improve the quality of life (QoL) for the family. More than 95% of occupational therapists (OTs) working in pediatrics report using this approach as part of their practice (Mailloux & Smith Roley, 2010), and it is one of the most utilized services by parents of children with ASD (Goin-Kochel, Mackintosh, & Myers, 2009; Green et al., 2006; Mandell, Novak, & Levy, 2005). OT/ASI is a complex intervention that utilizes individually tailored sensory motor activities to facilitate participation and QoL. The intervention activities are based on the child’s unique needs, which are identified in the assessment data. The intervention involves active participation of the child, with the therapist guiding the process by facilitating therapeutic activities in the context of play. The
therapeutic activities involve sensory motor experiences aimed at a level of challenge that is considered “just-right” for the child, and that produce an “adaptive response” as a basis for enhancing the child’s participation in play, activities of daily living, learning and social activities in the home, school, and community (Ayres, 2005; Parham & Mailloux, 2015). Outcomes of this approach are measured at the proximal (sensory) and distal (participation/occupation-based) levels. The core principles of the intervention are described elsewhere (Parham et al., 2011; Schaaf & Mailloux, 2015).

Although OT/ASI is frequently utilized as an intervention for children with conditions such as ASD and is highly requested by parents, a manual that systematically describes the procedures of this approach has not been published prior to the effort explained in this article. The lack of a manual has resulted in the identification of research studies that claim to be using an ASI approach but are, in fact, not consistent with the principles of this approach (Clark, 2012; Schaaf & Case-Smith, 2014). The publication of a manual on this approach will help eliminate this confusion.

The American Occupational Therapy Association (AOTA) published practice guidelines for OT using sensory integration (Watling, Koenig, Davies, & Schaaf, 2011), and although this document presents the evidence available at the time, as well as general guidelines for practice, it was not intended to provide specific step-by-step procedures to assure the intervention is replicable, systematic, and focuses on occupation-based outcomes. Thus, more specific guidelines were needed for implementing OT/ASI in clinical practice and research in a consistent, replicable manner with high fidelity (May-Benson & Koomar, 2010; Miller, Coll, & Schoen, 2007; Parham et al., 2007; Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson, 2011).

To meet this need, a Stage 1 manual that operationalized the principles of OT/ASI into clinical guidelines was developed (The Sensory Integration Research Collaborative, 2011) and tested in a feasibility study. Findings showed that the OT/ASI was safe and feasible to deliver and that parents and therapists rated the intervention as acceptable (Schaaf, Benevides, Kelly, & Mailloux-Maggio, 2012). Revisions to the Stage 1 manual were made to help clarify and guide the interventionist’s clinical reasoning.

These substantial revisions included the use of a preliminary version of the data-driven decision-making process (Schaaf, 2015) as the organizing framework to guide the OT process during ASI to ensure that the manual was contextualized within occupation and participation, and that outcome measurement was an integral part of the approach. This Stage 2 manual was tested in a randomized control trial (RCT) for children with ASD (Schaaf et al., 2014). This study found that children who received OT/ASI using the manualized intervention scored significantly better on individual goals, \( r(23) = -3.23, p = .003, ES = 1.2 \). In addition, using the Pediatric Evaluation of Disability Inventory as a second outcome measure (Haley, Coster, Ludlow, Haltiwanger, & Andrellos, 1992), we found that caregivers rated children in the treatment group as needing less assistance for participation in the occupations of daily living skills (\( p = .008, ES = 0.9 \)) and socialization (\( p = .04, ES = 0.7 \)). With the Stage 1 manual tested for feasibility and the Stage 2 manual tested in an RCT, the next stage for development of this manualized intervention is to gather data from key stakeholders to facilitate translation of the manual from research to clinical practice (Stage 3). Therefore, the purpose of the study reported here was to gather and analyze data that informed the advancement of the Stage 2 manual to a Stage 3 manual.

**Method**

**Overview:** The study was approved by the University institutional review board of the fourth and fifth authors. Participants: Three groups of key stakeholders were included in the study: occupational therapy practitioners (OTP) who used OT/ASI in their clinical practice (\( n = 25 \)), occupational therapy interventionists (OTI) who used the Stage 2 manual during the Schaaf et al.’s (2014) RCT (\( n = 4 \)), and a group of occupational therapy experts (OTE) on OT/ASI (\( n = 10 \)). We surveyed each group of participants to obtain the data using a step-by-step process, and then, as a final step, a modified Delphi process was used with the OTEs to reach consensus. The participants, methods, and findings for each step are shown in Figure 1 and described below.

**Step 1: Survey of OTPs and OTIs**

**Participants**

**OTPs.** The OTPs consisted of a convenience sample of 25 OTs from central and northern New Jersey. They were surveyed to obtain recommendations for the type of information they perceived would be useful for an OT/ASI intervention manual. Experience ranged from 1 to 25 years with nine (56%) practicing for 1 to 5 years, one (6%) for 7 years, four (25%) for 16 to 20 years, and two (13%) for...
more than 25 years. Twelve were educated at the master’s degree level and four at the bachelor’s degree level. Six completed Certification in Sensory Integration via a 60-hr program offered by the University of Southern California and Western Psychological Services® (2015). All the OTPs reported using sensory integration theory frequently and four reported using it always, within their practices.

OTIs. A second group of participants in step 1 were the therapists who participated in the Schaaf et al. (2014) RCT of OT/ASI (n = 4). These therapists were surveyed to gather their recommendations for the Stage 3 manual. The OTIs had an average of 22 years of experience, and all completed Certification in Sensory Integration via the University of Southern California and Western Psychological Services® (2015) program. Two were educated at the master’s level and two were educated at the bachelor’s level.

*Instruments.* Separate online surveys for the OTP and the OTI groups consisted of targeted, forced-choice questions, using a Likert-type scale, and open-ended questions. Response options for the OTP survey were always, frequently, occasionally, seldom, and never for the forced-choice questions. An example question from the OTP survey was, “I would benefit from a treatment manual that would guide clinical reasoning of OT/ASI.” Open-ended questions then queried the participants about the content that would be helpful in such a manual.

The response options for the OTI survey were strongly agree, agree, disagree, and strongly disagree for the forced-choice questions. An example question from the OTI survey was, “Using the manual provided structure in the evaluation process,” and open-ended questions provided an opportunity for respondents to indicate specific content they felt would be useful in a manualized protocol. An expert in survey development reviewed the surveys and made recommendations to improve clarity and to ensure that the items were clear and relevant to the research area.

*Data analysis.* Summary statistics were compiled and responses were calculated and reported as a percentage. Qualitative data from the open-ended questions were analyzed using an inductive reasoning process.

**Results of Step 1**

**Findings from OTP survey.** Sixteen of the 25 OTPs (64%) returned the survey. One hundred percent of survey respondents indicated that a manual for ASI would always or frequently aid with consistency in practice, including guiding clinical reasoning for assessment and intervention. They recommended that the Stage 3 manual include case examples to exemplify the treatment process, and description of frequently encountered problems with suggested solutions to guide clinical reasoning.

Findings from the OTI survey: One hundred percent of the OTIs returned their surveys. The data showed that (a) 75% recommended greater organization and uniformity in chapters; (b) 50% recommended greater clarity in the Goal Attainment Scale (GAS) forms, tables, and charts; and (c) 100% recommended consistent terminology throughout the manual using a glossary of terms.

**Step 2: Revisions Based on Survey Findings From OTP and OTI**

The five main suggestions from the survey data, namely, (a) video case examples, (b) frequently encountered problems and suggested solutions, (c) greater uniformity in chapters, (d) greater clarity in GAS forms and tables, and (e) a glossary of terms were considered for revision in the Stage 3 manual as described below.

To address the recommendation for frequently encountered problems and suggested solutions, reflective questions and tips were developed for each of the main treatment areas of the manual. Adult learning theory supports the use of strategies such as self-reflection questions and tips to enhance clinical reasoning and to facilitate transformational learning in which critical reflection is central to the learning process (Merriam, 2001), and thus adult learning guided the development of these.

To address the recommendation for consistent terminology, a glossary of terms was developed by identifying terms in the Stage 2 manual that were specific to ASI and not part of the usual English lexicon. For example, terms such as sensory perception, sensory reactivity, and praxis were identified, and then, classic literature on sensory integration and neuroscience was used to define these (e.g., Bundy, Lane, & Murray, 2002; Kandel, Schwartz, & Jessell, 2000; Parham & Faxio, 1997).

To address the recommendation for greater clarity of forms and charts, revisions were made to the organizational structure of the GAS quick tips check sheet, the GAS technical checklist, and the parent interview template for GAS. Research by Beaumont and Russell (2012); Casati and Bjugn (2012); Kerber, Hofer, Meurer, Fendrick, and Morgenstern (2011); Mason (2012); and Haynes and colleagues (2009) reported that templates and checklists have good utility in standardizing patient care processes and optimizing clinical assessment by cueing important elements. They also show that templates and checklists are useful strategies for standardizing patient care and promoting completeness of documentation. Thus, recommendations regarding clarity and organizational structure from this literature guided revisions of these forms.

The suggestions to include video case examples and greater organization and uniformity of chapters deferred as it was decided that these enhancement would be better addressed in concert with a publisher and copy editor in the development and production of a published manual.
Step 3: Review of Revised Documents by the OTE

Participants. The OTE group was comprised of twelve experts in OT/ASI who were recruited to review the additions and revisions to the manual. These individuals were chosen because of their expertise in ASI and OT. Experience ranged from 11 years to more than 25 years in practice, with 70% currently practicing in the area of pediatrics for more than 25 years in a variety of settings, including private practice, academia, hospital-based setting and schools. All the OTEs were educated at the doctoral level and had completed Certification in Sensory Integration in a recognized program. Within the group of experts, 60% were involved in teaching continuing education courses in sensory integration, and 85% had authored or coauthored in publications on the topic of sensory integration.

Instruments. An online survey was developed and was subject to expert validation as described previously. The OTE survey consisted of targeted forced-choice questions using a 4-point Likert-type scale with responses of strongly agree, agree, disagree, and strongly disagree, as well as open-ended questions. Responses of strongly disagree or disagree triggered an open-ended question for responders to provide suggestions for improvement. Following are examples of OTE survey questions: “The Goal Attainment Scale technical checklist template provides sufficient structure to guide the technical assessment of the goal attainment scales” and “The reflective questions and tips section address useful areas to guide clinical reasoning of the therapist in providing Ayres Sensory Integration.” The criterion for acceptance of manual revision was set as a rating of agree or strongly agree by 90% of expert participants.

Data analysis. Frequency distribution of all responses were analyzed and described with the percentage of total response to each of the Likert-type scale answers.

Results. Eleven of the 12 (92%) OTEs reached consensus on the reflective questions and tips; thus, this section reached acceptable criterion. An example of the final reflective questions and tips is shown in Table 1.

The OTE group also reached consensus on 24 of the 37 glossary terms presented for discussion and their own expert opinion. A sample of glossary terms and definitions is shown in Table 2. The entire glossary description of an intervention so that it can be replicated in future studies and utilized in clinical practice. A crucial step in the manualization process is obtaining input from key stakeholders (Westen, 2002). In this study, key stakeholders were represented by the OTPs, OTIs, and OTEs who reviewed and contributed input for manual revisions.

Step 4: Modified Delphi Meeting With OTE

Participants. A Delphi meeting with the OTEs was held to gain consensus on the manual revisions. Seven of the original 12 OTEs accepted the invitation to participate in the Delphi meeting. One of the seven members was not able to join the meeting in person, but participated remotely.

Procedures. Delphi methodology was used to consider the revised items (Hartnett, n.d.). The modified Delphi methodology was utilized because this final step necessitated a methodology that allowed for determination of the extent to which the OTEs agreed with the revisions. Following this methodology, the Delphi meeting had an established time frame; a facilitator, note taker, and time keeper; rules regarding time for each item and the entire meeting; rules for facilitating consensus; and strategies for resolution of items that did not achieve consensus as described below. In keeping with Delphi methodology, the OTEs were asked to maintain mutual respect, be open to suggestions, and build on ideas. The procedures are outlined below:

- Total time for the meeting was set at 90 min.
- Time for each topic was 2 min.
- A time keeper tracked the discussion time and called for a vote at the 2 min mark.
- When 100% consensus was not reached, another round of discussion (2 min) occurred followed by a second vote.
- Items that reach consensus were considered resolved, while unresolved items were deferred.
- Unresolved items were given to a designated expert from the group who made the final recommendation.

Results. Of the thirteen revised glossary terms presented for review, discussion, and vote, consensus was reached on eight. Five glossary terms were deferred (sensory discrimination, bilateral integration, arousal, self-regulation, and sensory reactivity), and one of the OTEs was chosen by the group to make the final revision based on the panel’s conversation and their own expert opinion. A sample of glossary terms and definitions is shown in Table 2. The entire glossary can be found in the Stage 3 manual publication (Schaaf & Mailloux, 2015).

Discussion

Manualization of an intervention is an important part of evidence-based practice. Manualization provides a systematic description of an intervention so that it can be replicated in future studies and utilized in clinical practice. A crucial step in the manualization process is obtaining input from key stakeholders (Westen, 2002). In this study, key stakeholders were represented by the OTPs, OTIs, and OTEs who reviewed and contributed input for manual revisions.
Carroll and Nuro (2002) suggested that a manual’s utility can be increased by anticipating and acknowledging challenging clients and problem areas. They also recommended strategies such as trouble shooting guidelines, templates for organizing complex treatments, brief session summaries, and outlines to direct clinicians to the key points of the intervention. Consistent with this literature, our survey data showed that the OTPs and the OTIs recommended the use of self-reflective questions and tips to elucidate specific intervention principles and solutions. In keeping with Carroll and Nuro (2002), they also indicated that such strategies would enhance the clinician’s clinical reasoning process and assure adherence to the intervention. Adult learning theory also supports the use of strategies such as self-reflection questions and tips to enhance clinical reasoning and to facilitate transformational learning in which critical reflection is central to the learning process (Merriam, 2001) and guided the development of these. Thus, the use of reflective questions and tips for each intervention area in the Stage 3 manual may be useful strategies to shape clinical reasoning and decision making. In particular, these reflective questions help tailor the

<table>
<thead>
<tr>
<th>Reflective questions for sensory perception</th>
<th>Tips</th>
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<tr>
<td>Did I provide sensory opportunities (tactile, vestibular, and proprioception) that address the child’s participation-based challenges?</td>
<td>Choose activities that are rich in total body sensory experiences that are consistent with the child’s interests and needs.</td>
</tr>
<tr>
<td>In what ways did I provide opportunities tailored to the child’s needs?</td>
<td>Reflect on the child’s assessment data and assure the activities are targeted toward the identified areas.</td>
</tr>
<tr>
<td>Did the child respond to the therapeutic activities with appropriate adaptive responses?</td>
<td>Identify the adaptive responses and assure they are consistent with the stated goals for intervention.</td>
</tr>
<tr>
<td>What can I do differently next session to assure that the sensory activities are matched to the child’s needs?</td>
<td>Review the assessment data with an eye toward the sensory and motor factors that are affecting the child’s participation and choose activities that are a good match with these.</td>
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<table>
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<th>Praxis</th>
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<tr>
<td>Were the activities utilized rich in somatosensory experiences and require that the child plan and execute purposeful movements as a basis for participation?</td>
</tr>
<tr>
<td>In what ways did I support and present challenges to the child’s ability to conceptualize and plan novel motor activities, and to organize his or her own behavior in time and space?</td>
</tr>
<tr>
<td>What amount and type of structure did I need to provide for the child to execute and/or create new action ideas for play and other activities?</td>
</tr>
<tr>
<td>What changes did the child exhibit related to organized behavior for participation?</td>
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<th>Table 2. Sample Terms From Glossary.</th>
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<tr>
<td>Adaptive response</td>
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<td>Body awareness (body perception)</td>
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<td>GAS</td>
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<tr>
<td>Gravitational insecurity</td>
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Note. GAS = Goal Attainment Scale.
intervention to the child’s unique participation-based or occupation-oriented outcomes.

Regarding the finding that the inclusion of a glossary with consistent and well-defined terminology would improve usability, Schnyer and Allen (2002) promoted the use of standard terminology in manual development as a basis for ensuring replicability, adherence, and internal validity of an intervention. They recommend that terminology be housed in the conceptual framework of the intervention and promote understanding of the intervention by both clinicians and researchers. Schnyer and Allen (2002) recommended the following terminology guidelines when developing manuals: (a) defining terms used, (b) providing a substantive term list, (c) stating the sources used, and (d) establishing agreement among clinicians about the use and meaning of the terms (Schnyer & Allen, 2002). We followed these guidelines when identifying and defining ASI terms. Although the glossary of terminology was challenging due to varying definitions of some of the terms, the use of consensus group methodology was particularly useful as it provided the mechanics to facilitate decision making among experts. This was especially important because we found inconsistent terminology in the literature, use of professional jargon rather than lay terminology, and that the same term was attributed to different concepts. This lack of consistent terminology is one factor contributing to unclear practice standards for ASI (Smith Roley, Mailloux, Miller-Kuhaneck, & Glennon, 2007), may affect clear articulation of the scope and domain of ASI, and contributes to ASI being misunderstood and mislabeled (Case-Smith, Weaver, & Fristad, 2015). Thus, the development of a glossary of terms and the use of OTE via the modified Delphi process is an important contribution. Given that the glossary of terms was subject to rigorous review and consensus, it has the potential to serve as a guiding document to assure that terms used are universally understood and communicated within and among professionals and parents.

Schnyer and Allen (2002) reported that case examples help to shape and tailor clinical reasoning as well as provide strategies for handling unique clinical situations. Because the literature on manualized interventions also provides support for our finding regarding use of systematic case examples to illustrate the assessment and intervention process, this recommendation was considered as highly important. The suggestion for video case examples was deferred so that it could be addressed more comprehensively in concert with a publisher and copy editor. Dimeff et al. (2009) showed that therapists learning a dialectical behavior therapy preferred multimedia on-line training to a written treatment manual. Thus, online video segments illustrating treatment concepts are a useful consideration for presentation of case material in conjunction with the Stage 3 manual. Similarly, the continuity of chapters in terms of organization, as suggested by the OTEs, was addressed by the copy editor in the published version of the manual.

Conclusion
Manualization of OT interventions, using the rigorous methodologies such as those described in this study, is essential to intervention development to provide standard procedures for research and clinical practice. Not only do manualized intervention protocols establish fidelity to intervention principles, but they also assist in developing the therapists’ clinical reasoning and facilitating the translation of research findings to the clinical setting. The methodologies outlined by Carroll and Nuro (2002), which supported the translation of a Stage 2 to a Stage 3 manual for clinical practice, can serve as a model for developing Stage 3 manuals for other areas of OT practice and research. Clinician input for the Stage 3 manual helped bridge the divide between research and practice.

The process used in the development of the Stage 3 manual complied with literature that recommends clinician involvement in the early stages of manual development as essential for the translation of research to practice (Carroll & Nuro, 2002). Thus, the Stage 3 manual for OT/ASI offers a detailed, tested protocol to guide research and practice for children with ASDs, thus facilitating evidence-based practice. Although the manual was specifically tested for children with ASDs, it is also easily translatable to other clinical populations that may have participation challenges related to difficulty processing and integration sensation. Furthermore, the manual describes the use of occupation-based outcomes as part of the OT/ASI approach, and clinicians and researchers may want to consider inclusion of such measures in their work. Of note, it is recommended that those utilizing the manual supplement their knowledge and skills by obtaining certification in the ASI approach by attending a recognized certification program.

Authors’ Note
This research was approved by the Thomas Jefferson University Ethics Committee/Institutional Review Board (phone: 215-503-8966). This work was completed by the first three authors in partial fulfillment of an occupational therapy doctoral degree at Thomas Jefferson University, Department of Occupational Therapy, College of Health Professions.

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