

ORIGINAL ARTICLE

Adherence to the Ayres Sensory Integration® Fidelity Measures: Malaysian Occupational Therapists' Practices

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ABSTRACT

Introduction: A popular intervention for paediatric clients, Ayres Sensory Integration® (ASI) must adhere to sensory integration (SI) fidelity. This study describes fidelity adherence in ASI intervention by occupational therapy practitioners in Malaysia. **Methods:** A questionnaire on ASI fidelity was developed before being tested for its validity by seven experts and for its internal consistency and test-retest reliability by 30 occupational therapists. The questionnaire was then used nationally to collect data on ASI practitioners. Data were collected from 161 occupational therapists working in various settings. **Results:** The mean of the sub-scales I-CVI was excellent, ranging between 0.97 and 1.00. The total S-CVI/Ave of the form was also reported as excellent, at 0.98, with subscales S-CVI ranging between 0.75 and 1.00. Cronbach's alpha was 0.80 for the questionnaire's internal consistency and the ICC for test-retest reliability ranged from 0.80 to 0.95. The survey received 161 responses, indicating that most respondents perceived themselves as having 'moderate competence' and showing 'high interest' in ASI implementation. Most fidelity aspects were addressed in their practices. Majority of the respondents adhered to the process elements. It was indicated that three aspects of physical space under the structural elements could not be provided by most occupational therapists in the study. **Conclusion:** To implement evidence-based practice, adherence to fidelity when providing ASI is important to ascertain its effectiveness. Improvements to ensure optimal space, ASI certification, and more related training are the first steps that can be taken by the related agencies to ensure effective ASI intervention could be delivered.

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INTRODUCTION

Occupational therapy is one of the paediatric healthcare services (1) in which sensory integration is a popularly requested intervention; this is widely used for children with Autism Spectrum Disorder (ASD) (2). The sensory integration approach refers to the concept and theory developed by Dr A. Jean Ayres (3). Dr Ayres (18 July 1920 to 16 December 1988) was an occupational therapist and neuropsychologist involved in numerous research projects throughout her career (3). She conducted various studies pertaining to sensory integration, and she developed sensory integration theory and various related assessment tools (i.e., the Southern California Sensory Integration Tests (SCSIT) in 1975, the Sensory Integration Praxis Test (SIPT) in 1989 (3), and the sensory integration intervention in 1972, which is now trademarked as the Ayres Sensory Integration® (ASI) intervention (4). Over

the years, many research studies have contributed evidence of this intervention's effectiveness (1, 4-8), especially for those with sensory processing issues and ASD. ASI is often used in occupational therapy practices, and the increasing number of studies on this approach since 2004 have established strong evidence for its use in clinical practice (9).

Sensory integration theory postulates that the ability of the brain to process and integrate various sensory stimuli effectively is the foundation for successful adaptive behaviour (3, 10). The study by Schaaf and Mailloux (11) explained the sensory integration process as the coordinated interaction of various sensory systems, such as the vestibular (balance and movement), proprioceptive (joint sense), tactile (touch), visual (sight), auditory (hearing), gustatory (taste), and olfactory (smell) systems. The sensory integration approach focuses on the sensory-motor functions that affect one's behaviours, developmental and learning skills, and engagement and active participation in activities.

The sensory integration approach differs from

intervention using sensory-based approaches as it must adhere strictly to its core principles, i.e., the process and structural elements (12). These elements are the essential features of the fidelity tool, demonstrating its adherence to the theory and practice of ASI (11). During sensory integration sessions, the process elements ensure that the important aspects of therapist–child interaction are present, such as 1) ensuring physical safety, 2) presenting sensory opportunities, 3) maintaining appropriate levels of alertness, 4) challenging postural, ocular, oral, or bilateral motor control, 5) challenging praxis and organisation of behaviour, 6) collaborating in activity choices, 7) tailoring activity to the present just-right challenge, 8) ensuring that activities are successful, 9) supporting the child’s intrinsic motivation to play, and 10) establishing a therapeutic alliance (12). In comparison, the structural elements address the intervention setting, including the qualifications of the therapist(s) involved; the physical elements of the environment in which intervention is provided; and the assessment process, goal setting, and interaction with parents (13). Implementing ASI requires a qualification following formal post-professional SI training and guidance from a therapist who is trained and skilled in SI (13). Without these two criteria, any results obtained from the Ayres Sensory Integration Fidelity Measure (ASIFM) might be compromised. However, the process and structural elements can be used as guidance for ASI intervention in a clinical setting (11).

The sensory integration approach is highly utilised in occupational therapy intervention worldwide, including in Malaysia (14). However, the nature or degree of adherence to the fundamental principles of ASI intervention practised by those practitioners was not clearly understood. Limited published data exist on the practice of providing sensory integration intervention by occupational therapists in Malaysia. One Malaysian study indicates that the rigorousness of the sensory integration intervention protocol might be further improved if the fidelity measurement was closely observed (15). However, the authors only touched briefly on how fidelity could be ascertained. During their occupational therapy training, occupational therapy students/trainees in Malaysia are exposed to and taught about the theory, frame of reference, and basic principles of sensory intervention through a minimum of a two-credit course. This is equivalent to 80 hours of learning, that may consist of 28 hours of direct lectures, with the remaining hours used for independent learning and assessments. Additionally, several qualified occupational therapists attend the course to gain a deeper knowledge of this form of intervention, either locally or abroad. Some even take further courses to become certified trainers so they can train and counsel other professionals who wish to be trained in the field.

It is important that occupational therapists who practise

ASI intervention adhere to the structural and process elements to provide comprehensive evaluations, deliver intervention safely in an adequately equipped space, and collaborate actively with family and other professionals (13). Compliance to ASI intervention fidelity measures should ensure accurate documentation and monitoring of the deliverables; enable duplication of the intervention, especially in a randomised controlled trial (RCT) study; and identify the intervention as ASI, as opposed to other types of intervention that might seem similar (12). However, as with any intervention, ASI intervention also has been criticised over the years for its lack of evidence. These controversial claims can only be resolved through accurate conformity to the properly documented ASI intervention process, which occupational therapists must take seriously. This may assist in establishing evidence-based practice, based on the effectiveness of the interventions.

A descriptive study undertaken in 2007 found that SI intervention practised by Malaysian occupational therapy practitioners in clinical settings contained elements of both the structural element of ASI intervention and the sensory-based intervention approach (16). However, no further information from the 2007 study was available on the nature of the intervention delivery, such as the degree of adherence to the core principles of ASI intervention practised by those practitioners and their challenges in practice (16). However, a more recent study conducted by Wan Yunus et al. in 2020 provided clearer guidelines on the sensory integration protocol (15). These were valuable guidelines for those in practice. Therefore, there is a need to examine the current status of SI intervention practice in the country and study its effectiveness as reported by the practitioners. Hence, the objective of this study was to report on the current profile of adherence to ASI fidelity among occupational therapists in Malaysia, i.e., on the structural and process elements, which are both essential in providing ASI intervention. Such information could benefit the occupational therapy profession in Malaysia, especially in planning for services, staff training, as well as suitable equipment and facilities.

MATERIALS AND METHODS

Study design

This study utilised a descriptive survey methodology and consisted of two phases. Phase 1 involved the development of the questionnaire used in the study and the process of testing its validity and reliability. The questionnaire was updated from a previous study (16) and the ASI Fidelity Measure (12, 13, 17). The newly developed questionnaire was then used in Phase 2 of the study to survey occupational therapists about their ASI intervention practices. These two phases are explained accordingly.

Phase 1

Development process of the survey instrument

A new questionnaire was specifically developed for the current study, entitled 'the Sensory Integration Intervention Practice Questionnaire Survey'. This was adapted and updated from the Sensory Integration Survey Form (an unpublished tool), originally developed by Harun (16); it was also based on the Fidelity Measure of Ayres Sensory Integration® Intervention (12, 13, 17). The newly developed questionnaire includes currently used assessment tools and updated ASI intervention elements.

The validity process of the developed questionnaire

Validity and reliability processes were followed to ensure the usability of the developed questionnaire. As part of the validity process, the questionnaire was first sent to seven experts. These experts included five SI-certified occupational therapists with either diploma, bachelor's, or master's qualifications in the occupational therapy field; one language expert with a bachelor's degree; and one clinical psychologist with a master's degree qualification in their respective fields. The aims of sending the newly developed questionnaire to the experts were to ensure that the questionnaire's design worked in practice; to detect and modify problematic questions; and identify issues relating to the layout, wording, content, length, or instructions in the questionnaire; this would further refine the questionnaire. The experts were invited to review the questionnaire and give their feedback, either verbal or written, on the new questionnaire.

After improvements had been made to the questionnaire based on the experts' recommendations and suggestions, the questionnaire was sent to the same experts, this time for rating purposes. The experts were asked to give a rating to enable an evaluation of the Content Validity Index (CVI), both on each item (I-CVI) and the scale (S-CVI) (18) of the questionnaire in regard to three aspects: (1) the relevance of each question, (2) the clarity of each question, and (3) unambiguity in the intent and meaning of each question.

To assist with the rating process, the experts were given a form and requested to give responses based on a four-point Likert scale from 1 (very weak/not suitable) to 4 (very strong/suitable) (19). The form and a copy of the developed questionnaire were distributed to the experts to facilitate the rating process. The experts were also given the option to convey their opinions or make suggestions regarding the developed questionnaire by completing the open-ended questions at the end of the rating form.

The reliability process of the questionnaire

The questionnaire was then further tested on 30 occupational therapy practitioners, who were recruited

using convenience sampling. The inclusion criteria included those who had had experience of working or were currently working with a paediatric population using the sensory integration approach for one year or more. Those working outside Malaysia and those who had never used the approach were excluded. Their academic qualifications were to include a diploma, a bachelor's degree, or a master's degree in occupational therapy. Data were collected physically using pen and paper, which was completed in a day for each participant. This process provided reliability data with which to assess the internal consistency and test-retest reliability of the questionnaire, with a ten-day interval between the first and second administration for each participant (20). The internal consistency data were only analysed based on the first administration of the questionnaire as this was considered sufficient for the intended purpose.

Phase 2

Respondents

Using the questionnaire developed in Phase 1, a cross-sectional study was conducted to investigate the extent to which ASI intervention practices in Malaysia adhered to the fidelity measures. To be eligible for this study, the respondents were required to have at least one year of work experience with children and/or adolescents in the provision of occupational therapy services while working in government or private settings (hospitals, clinics, higher institutions, school-based) or non-government organisations, as well as having experience in implementing ASI. Those who were not Malaysian citizens, were working outside Malaysia, and/or had never practised ASI were ineligible for the study.

A total of 550 occupational therapists were identified as potential respondents for the study. These potential respondents were recruited from centres identified as providing ASI services. Information about the potential respondents was obtained by contacting the administration officers/ managers and/or heads of departments of these centres.

Data collection process

The data collection process started in November 2018 and ended in March 2019. Packets containing survey invitation letters, information about the study, consent forms, copies of the questionnaire, and stamped self-addressed return envelopes were mailed to the heads of department/managers of the relevant centres, according to the number of staff available at those centres. The heads of department/managers at the study centres were asked to deliver information about the study to their staff, as well as distribute and collect the completed questionnaires to be returned to the researchers. Through their head of department/manager, the occupational therapists were informed to take ample time when considering the decision to participate in the

Table III: Comparison between the demographics, laboratory parameters and clinical phenotypes of JAK2^{V617F}, CALR and patients negative for both JAK2^{V617F} and CALR mutations in this study.

Parameters	JAK2 (n=21)	Mutations CALR (n=6)	JAK2/CALR negative (n =53)
Mean Hb (g/dL)	13.2	11.5	15.4
Mean Haematocrit (%)	41.6	36.6	47.0
Mean WCC (10 ⁹ /uL)	18.1	18.1	14.5
Mean Platelets (10 ⁹ /uL)	655	856	374
Gender	7 Females 14 Males	5 Females 1 Male	11 Females 42 Males
Mean Age	59	61	54
LE picture on FBP	5 (23.8%)	3 (50%)	5 (9.4%)
Phenotype	12 ET 4 MF 5 PV	3 ET 2 MF 1 atypical CML	8 ET 1 MF 7 PV 1 MDS/MPN 36 MPN-U
Ethnicity	15 Malays (71%) 6 Chinese (29%)	1 Malay (20%) 5 Chinese (80%)	31 Malays (58.5%) 18 Chinese (34%) 2 Burmese (3.5%) 1 Bangladeshi (2%) 1 Indian (2%)

LE: leucoerythroblastic, FBP: Full blood picture, ET: essential thrombocytosis, PV: Polycythemia Vera, MF: myelofibrosis MDS: myelodysplastic syndrome, MPN-U: MPN-Unclassifiable.

study. After the occupational therapists had signed their consent form, they were handed the questionnaire and given two weeks to complete the survey. A reminder via a telephone call to the administration office was made one week after the questionnaire distribution to ensure acceptable response rates could be obtained (21). The collected questionnaires were kept in a secure locker and could only be accessed by the researchers involved in the study.

Ethical clearance

This study was approved by the Medical Research and Innovation Secretariat, Universiti Kebangsaan Malaysia (No. NN-2018-169) and the National Medical Research Registration (NMRR) Ethics Committee, Ministry of Health, Malaysia (No. NMRR-19-2441-50131 (IIR)).

Data analysis

The responses collected were keyed into the Statistical Package for Social Sciences (SPSS) version 22 by the researcher involved. The data were then analysed quantitatively using the software. No missing data were found during this process.

RESULTS

Phase 1

Review and recommendations from experts

The initial questionnaire, which consisted of 17 sub-scales and a total of 101 items, was further improved based on the experts' opinions and suggestions. Changes

were made to the initial questionnaire, including the layout of the table format, as some experts suggested that certain questions were too long and repetitive. Besides that, some wordings were amended to ensure better understanding and grammatical mistakes were corrected. During the review process, no suggestions were made by the experts to omit any sub-scales or items in the initial questionnaire.

Finding from the CVI process

The findings from the CVI ratings showed good to excellent validity acceptance (22). The mean of the sub-scales I-CVI was excellent, ranging between 0.97 and 1.00. The total S-CVI/Ave of the instrument was also reported as excellent, at 0.98, with a subscales S-CVI range between 0.75 and 1.00. Therefore, no items/questions needed to be removed from the initial questionnaire.

Final development of the questionnaire

The development of the self-administered questionnaire was then finalised to include three sections: a) The respondents' demographic information (gender, age, race, professional qualifications, and work experience), b) the Ayres Sensory Integration® Intervention Process Element, and c) the Ayres Sensory Integration® Intervention Structural Element.

Ten factors were evaluated under the process elements: (1) ensuring physical safety, (2) presentation of sensory opportunities, (3) supporting sensory modulation, (4) facilitating postural, ocular, and bilateral integration levels, (5) facilitating the praxis and organisation of behaviour, (6) therapist-child collaboration (7) providing just-right challenges, (8) maximising the child's success, (9) creating play contexts, and (10) establishing a therapeutic alliance. These ten elements were evaluated with regard to the therapists' perceptions of their 'level of importance', 'use of the elements', and 'level of comfort/confidence' in their practices.

Meanwhile, six core structural elements were evaluated: (1) competency and interest, (2) a safe environment, (3) a record review, (4) the physical space, (5) communication with parents and teachers, and (6) equipment availability. The questionnaire was utilised to collect data in the next phase of this study. The completed questionnaire can be accessed from the first author upon request. The developed questionnaire is known as Sensory Integration Intervention Practice Questionnaire Survey.

Findings from the reliability process

All 30 occupational therapy practitioners also participated in the re-test process. The internal consistency determined from the first test showed that Cronbach's alpha was 0.80, while the ICC for test-retest reliability ranged from 0.80 to 0.95, so the questionnaire demonstrated excellent test-retest reliability (23).

Phase 2

Response rates

In all, 161 occupational therapists returned their questionnaires during the four-month data collection period, thus giving a valid response rate of 29.3% for the total of 161 respondents, which can be considered acceptable for a mailed survey (24).

Characteristics of the respondents

The results show that the gender breakdown of the occupational therapists who took part in the study was 84.5% female and 15.5% male. The majority of the respondents were aged between 21 and 30 (60.8%), and the majority were Malays (78.9%). In terms of the occupational therapists' professional qualifications in occupational therapy, most were diploma holders (61.5%). Moreover, 29.8% of the occupational therapists had more than ten years of work experience as occupational therapy practitioners, and 49.7% reported having between one and three years of experience in treating paediatric cases. The majority of the occupational therapists worked in government hospitals (67.7%). Table I shows the detailed characteristics of the respondents involved in the survey.

With regard to the sensory integration approach/ techniques, 59.0% of the occupational therapists reported that they had been practising it in their OT intervention for between one and three years, 66.5% had gained sensory integration knowledge from attending courses organised by universities/colleges (attending after graduating from occupational therapy colleges/universities), and the majority (52.2%) reported having received supervision from qualified professionals in sensory integration. However, 89.4% of them had yet to acquire professional certification to become certified sensory integration practitioners. Children and adolescents with ASD, ADHD, and global developmental delay were reported as those most in need of sensory integration intervention, whereas the Sensory Profile/ Short Sensory Profile were the assessment tool most commonly used by the majority of the occupational therapists (96.3%) involved in the survey.

Adherence to the process elements in ASI intervention Regarding the level of importance of the process elements, the majority of the occupational therapists reported that it was very important to adhere to these process elements, while the presentation of sensory opportunities, establishing a therapeutic alliance, and facilitating postural, ocular, and bilateral integration levels were the leading three elements indicated as very important by the respondents. Meanwhile, most respondents reported 'always' adhering to the use of three process elements in their practice: ensuring physical safety, establishing a therapeutic alliance, and the presentation of sensory opportunities. In addition, most respondents indicated feeling 'very confident/

Table I: Respondents' characteristics

Characteristics	N	Frequency (percentage)
Gender		
Female	136	84.5%
Male	25	15.5%
Age		
21-30 years old	98	60.8%
31-40 years old	54	33.5%
41-50 years old	6	3.6%
More than 50 years old	3	1.8%
Race		
Malay	127	78.9%
Chinese	10	6.2%
Indian	8	5%
Others	16	9.9%
Professional Qualification in occupational therapy field		
Diploma	99	61.5%
Bachelor	54	33.5%
Master	8	5%
Working experience as an occupational therapist		
1-3 years	37	22.9%
4-6 years	51	31.7%
7-9 years	25	15.5%
More than 10 years	48	29.8%
Experience in treating paediatric cases or working with children		
1-3 years	80	49.7%
4-6 years	48	29.8%
7-9 years	14	8.7%
More than 10 years	19	11.8%
Years of sensory integration approach/ techniques in occupational therapy service		
1-3 years	95	59.0%
4-6 years	31	19.3%
7-9 years	21	13.0%
More than 10 years	14	8.7%
Current practice setting		
Government hospital	109	67.7%
Private clinic/centre	30	18.6%
Government clinic	15	9.3%
Higher institution	4	2.5%
School based	2	1.2%
NGO	1	0.6%
Source of knowledge in sensory integration		
University/college		
Attending courses	107	66.5%
Internet resources	75	46.6%
Books	57	35.4%
Journals	55	34.2%
Guidance/supervision/mentor in sensory integration from qualified professional	28	17.4%
Yes	84	52.2%
No	77	47.8%
Professional certification in sensory integration (Certified SI Practitioner)		
Yes	17	10.6%
No	144	89.4%
Frequency usage of sensory integration to condition		
Autism spectrum disorder	158	98.1%
ADHD	155	96.3%
Global developmental delay	144	89.4%
Learning disability	141	87.6%
Down's syndrome	134	83.2%
Cerebral palsy	123	76.3%
Others	46	28.6%
Usage of assessments used to evaluate sensory processing/integration in clinical setting		
Sensory profile/short sensory profile	155	96.3%
Sensorimotor clinical observations	56	34.8%
Sensory integration praxis test	11	6.8%
Sensory processing measure	7	4.3%
Others	8	4.8%

comfortable' when practising the process elements in ASI, except for the aspect of maximising the child's successes. Details of the process elements results are presented in Table II.

Table II: Adherence to 10 core Process Elements in ASI intervention

Level of importance				
Process elements	Not Important n (%)	Slightly Important n (%)	Important n (%)	Very Important n (%)
Ensuring physical safety	2 (1.2%)	8 (5.0%)	46 (28.6%)	105 (65.2%)
Presentation of sensory opportunities	0	0	41 (25.5%)	120 (74.5%)
Supporting sensory modulation	1 (0.6%)	3 (1.9%)	56 (34.8%)	101 (62.7%)
Facilitating postural, ocular, bilateral integration level	0	1 (0.6%)	47 (29.2%)	113 (70.2%)
Facilitating praxis and organization of behaviour	0	7 (4.3%)	66 (41.0%)	88 (54.7%)
Therapist-child collaboration	0	6 (3.7%)	61 (37.9%)	94 (58.4%)
Providing just-right challenges	0	10 (6.2%)	57 (35.4%)	94 (58.4%)
Maximizing child's success	0	3 (1.9%)	64 (39.8%)	94 (58.4%)
Creating play context	0	3 (1.9%)	61 (37.9%)	97 (60.2%)
Establishing therapeutic alliance	0	3 (1.9%)	41 (25.5%)	117 (72.7%)
Use of the elements				
Process elements	Never n (%)	Seldom n (%)	Often n (%)	Always n (%)
Ensuring physical safety	2 (1.2%)	8 (5.0%)	46 (28.6%)	105 (65.2%)
Presentation of sensory opportunities	3 (1.9%)	13 (8.1%)	62 (38.5%)	83 (51.6%)
Supporting sensory modulation	2 (1.2%)	30 (18.6%)	70 (43.5%)	59 (36.6%)
Facilitating postural, ocular, bilateral integration level	0	4 (2.5%)	80 (49.7%)	77 (47.8%)
Facilitating praxis and organization of behaviour	0	33 (20.5%)	70 (43.5%)	58 (36.0%)
Therapist-child collaboration	2 (1.2%)	26 (16.1%)	79 (49.1%)	54 (33.5%)
Providing just-right challenges	2 (1.2%)	24 (14.9%)	72 (44.7%)	63 (39.1%)
Maximizing child's success	1 (0.6%)	25 (15.5%)	67 (41.6%)	68 (42.2%)
Creating play context	0	31 (19.3%)	69 (42.9%)	61 (37.9%)
Establishing therapeutic alliance	0	12 (7.5%)	63 (39.1%)	86 (53.4%)
Level of comfort/confidence				
Process elements	Not at all n (%)	Slightly n (%)	Very n (%)	Extremely n (%)
Ensuring physical safety	2 (1.2%)	16 (9.9%)	89 (55.3%)	54 (33.5%)
Presentation of sensory opportunities	2 (1.2%)	19 (11.8%)	89 (55.3%)	51 (31.7%)
Supporting sensory modulation	3 (1.9%)	28 (17.4%)	84 (52.2%)	46 (28.6%)
Facilitating postural, ocular, bilateral integration level	1 (0.6%)	15 (9.3%)	90 (55.9%)	55 (34.2%)
Facilitating praxis and organization of behaviour	0	36 (22.4%)	81 (50.3%)	44 (27.3%)
Therapist-child collaboration	2 (1.2%)	27 (16.8%)	91 (56.5%)	41 (25.5%)
Providing just-right challenges	2 (1.2%)	23 (14.3%)	90 (55.9%)	46 (28.6%)
Maximizing child's success	1 (0.6%)	25 (15.5%)	78 (48.4%)	57 (35.4%)
Creating play context	0	28 (17.4%)	81 (50.3%)	52 (32.3%)
Establishing therapeutic alliance	0	18 (11.2%)	82 (50.9%)	61 (37.9%)

Adherence to the core structural elements in ASI intervention

The results show that most respondents indicated that they were ‘moderately competent’ when applying ASI intervention in their practices (59.6%) and ‘highly interested’ in practising the intervention (75.8%). Most respondents were able to provide appropriate structural elements when applying ASI intervention, except for the provisions that no less than three hooks are used for hanging suspended equipment; one or more rotational devices are attached to a ceiling support to allow 360° of rotation; and one or more sets of bungee cords are on hanging suspended equipment under the physical space aspect. Most respondents reported having 50% or more of the equipment required to practise ASI intervention in their clinical settings (64.0%). Table III details the

findings from the aspect of the core structural elements practised by the respondents.

DISCUSSION

The fidelity measure in ASI focuses on two essential elements (1) process elements and (2) structural elements, which are important aspects underlying the theoretical principles and procedural guidelines in ASI intervention. To assess this measure, a self-administered questionnaire with three sections was developed in Phase 1 of the study. During the testing process, the questionnaire exhibited high validity and reliability. The questionnaire was used in Phase 2 of the study to collect information from occupational therapists in Malaysia about their practices when applying ASI intervention.

Table III: Adherence to 6 core Structural Elements in ASI intervention

1) Competency and interest	Not competent/interested (0, 1, 2, 3) (%)	Moderate competent/interest (4,5,6,7) (%)	Highly competent/interested (8,9,10) (%)
Competency level in applying ASI	10 (6.2%)	96 (59.6%)	55 (34.2%)
Interest level in practicing ASI	5 (3.1%)	34 (21.1%)	122 (75.8%)
2) Safe environment		Able to provide n (%)	Unable to provide n (%)
Mats, cushions and pillows to pad the floor underneath all suspended equipment during intervention.		149 (92.5%)	12 (7.5%)
Equipment is adjustable to child's size.		99 (61.5%)	62 (38.5%)
Equipment can be easily monitored for safe used by the therapist.		139 (86.3%)	22 (13.7%)
Equipment not being used is stored, anchored, or placed at the side of the room so that children would not fall or trip on it.		143 (88.8%)	18 (11.2%)
Routine and frequent monitoring and documentation of equipment and safety occurs		126 (78.3%)	35 (21.7%)
3) Record review			
Historical information		161 (100%)	0
Current information of child's occupational/social performance		161 (100%)	0
Assessment results		160 (99.4%)	1 (0.6%)
Goal setting when Ayres Sensory Integration is recommended		134 (83.2%)	27 (16.8%)
4) Physical space			
Adequate space is available to allow vigorous physical activity.		105 (65.2%)	56 (34.8%)
Equipment and materials are flexibly arranged to allow for rapid change of the physical and spatial configuration of the intervention environment.		119 (73.9%)	42 (26.1%)
No less than 3 hooks are used for hanging suspended equipment		73 (45.3%)	88 (54.7%)
One or more rotational devices are attached to a ceiling support to allow 360° of rotation.		63 (39.1%)	98 (60.9%)
A quiet space is available		109 (67.7%)	52 (32.3%)
One or more sets of bungee cords are on hanging suspended equipment.		72 (44.7%)	89 (55.3%)
5) Communication with parents and teachers			
The therapist routinely has ongoing communication/interchanges of information with the child's parents or teachers regarding the course of intervention.		160 (99.4%)	1 (0.6%)
The therapist routinely discusses with the parents or teachers on the influence of sensory integration and praxis on the child's performance of valued and needed activities.		156 (96.9%)	5 (3.1%)
The therapist routinely discusses with the parents or teachers on the influence of child's sensory integration and praxis abilities on the child's participation at home, in school and community		156 (96.9%)	5 (3.1%)
		Available 50% and more (%)	Available less than 50% (%)
6) Equipment availability		103 (64.0)	59 (36.0)

The majority of the occupational therapists involved in the study practised in a hospital-based setting. The data collected for this study came mostly from occupational therapists who had worked as occupational therapists with children and adolescents for one to three years. Experience in paediatrics plays an essential part in the skill level of an occupational therapist when handling clients who need ASI intervention. Despite the need for certified practitioners in sensory integration, it has been reported that limited numbers of practitioners have acquired this certification. Hence, evidence-based practice would not be a success, and this may impact the effectiveness of the interventions. Meanwhile, the occupational therapists in this study reported ASD as the most prevalently treated type of case in their practices. According to the Clinical Practice Guidelines (CPG) on the Management of Autism Spectrum Disorder (ASD) in Children and Adolescents developed by the Ministry of Health, Malaysia in 2014 (25), sensory integration intervention is listed as one of the treatments used to

manage ASD cases. Hence, Malaysian occupational therapists implemented SI when seeing ASD cases, while taking into consideration the sensory processing issues. This is fairly consistent with the reports from the occupational therapists involved in this study that children and adolescents with ASD formed the group for which the SI approach was the most utilised intervention to deal with sensory processing difficulties. It has been estimated that between 42% and 88% of individuals diagnosed with ASD have difficulties related to sensory processing, including under- and over-responsivity (26).

The Sensory Profile (SP)/Short Sensory Profile (SSP) was reported as the most frequently used assessment tool in SI, which might be due to the availability of that assessment over a long period (27). Interestingly, the occupational therapists chose this assessment tool as their leading choice rather than similar assessments listed in the questionnaire. This might be due to the administration duration, availability, and/or practicality of possible

assessments, which may influence the occupational therapists' choice of the assessment/s to use in their practices. Moreover, occupational therapists may have more exposure to the tool, as several talks and courses on the SP have recently been conducted in Malaysia. The only downside is that if this is the only tool used by occupational therapists when providing ASI intervention, the assessment may not be sufficient or appropriate. Thus, a client analysis before ASI intervention might be inaccurate because the SP/SSP had not been included in the test's postural, ocular, bilateral integration and praxis. However, a combination of clinical observation and other standardised assessments might capture more accurately the important components involved in ASI. A recent publication by Petersen et al. in 2021 indicated that the Evaluation in Ayres Sensory Integration (EASI), a new and comprehensive assessment of sensory, motor, and praxis functions, exhibits good concurrent and construct validity of the vestibular and proprioceptive tests for clinical utility in paediatric practices (28). Hence, this assessment tool could be taken into consideration by occupational therapists when performing ASI assessments during their practices.

The majority of the occupational therapists emphasised the necessity of practising in accordance with all the process elements in SI, as they described ASI fidelity by indicating that it was either 'slightly important', 'important', or 'very important'. Parham et al. (12) reported that the structural and process sections of ASI fidelity precisely signify the important features of the ASI intervention. The instrument is responsive to the dynamic therapy process that distinguishes ASI from other interventions. Its unique and essential elements differentiate SI from other sensory-based interventions and other interventions in general. It is important to correctly define SI using specific fidelity as the first step to evaluating evidence of intervention (1). Recent systematic reviews have also highlighted the importance of correct SI definition (1, 4). Poorly defined intervention may change the research/study results, thus providing irrelevant research evidence.

However, according to the occupational therapists involved in this study, there is evidence of discrepancies in the adherence to structural elements when implementing ASI. This applied to one of the ASI fidelity structural elements outlined by May-Benson et al.: the physical elements of the environment in which intervention is provided distinguish this intervention from others (13). The physical space component and the equipment currently available at the setting were less strongly adhered to, as reported by the occupational therapists involved in this study. It is crucial to have suspension equipment to implement SI, specifically when targeting vestibular sensory processing in children. Specific sensory techniques are frequently incorporated into ASI intervention to support a child's performance during the intervention sessions (12). For example, the

use of stretchy fabric is beneficial for tactile sensory stimulation. However, some occupational therapists may have limited space in which to provide suspension equipment, especially those who work in smaller departments with fewer occupational therapists. The majority of the occupational therapists who participated in this survey were aware of the importance of having a complete set of SI equipment; however, reports showed they were implementing ASI with limited equipment. This may be due to budgetary constraints and restrictions on purchasing add-on equipment for their setting, as the majority of the occupational therapists were working in public hospitals and had to adhere strictly to purchasing procedures. In comparison, occupational therapists practising in private clinics may have greater control of equipment purchase and space usage than those working in other settings (13). However, further study is needed to explore and conclude this issue.

The respondents also reported limitations in providing a safe environment, like their counterparts in South Africa, who also reported having fewer safety measures at their facilities (13). In contrast, occupational therapists in the United States were reported to have higher levels of safety monitoring (13). These differences may reflect a lack of understanding of the significance of systematic safety monitoring and inadequate choices regarding the types of affordable equipment. These deficiencies could be resolved at individual facilities by determining safety monitoring procedures and increasing the types of equipment available. It may be necessary to design and construct inexpensive equipment that can be used functionally in some settings. Cultural differences would be reflected in education levels and potentially the availability of mentoring.

The effectiveness of the intervention provided might be affected due to the limited number of practitioners who have acquired ASI certification. It is suggested that training for ASI certification should be taken by practitioners to improve the current practice in Malaysia. Meanwhile, considering sharing the resources and training offered by certified practitioners during training may develop deeper levels of understanding of ASI intervention among practitioners yet to obtain their certification. This may help them to improve their understanding of the fidelity measures needed. The higher and relevant authorities, on the other hand, could invite certified personnel to be consultants and actively involved in room setting planning to ensure the fidelity measures are properly addressed.

One limitation of this study is the representation in the sample, with a majority of the occupational therapists involved working in hospital settings. There may have been social desirability when reporting their facilities. For future research, representation could be improved by widening the settings, as well as performing direct observation of the practices and settings rather than

collecting therapists' reports. Additionally, future studies could include a comparative analysis of the provision of ASI intervention in different countries, which would provide a better picture and understanding of the practices of occupational therapists. The current study focused mainly on the adherence to the fidelity measures when providing ASI intervention among occupational therapists in Malaysia. Thus, it is recommended that future studies attempt to understand their challenges as well. Considering that most participants in this study indicated that it was important to adhere to the process and structural elements when providing ASI intervention, some elements still could not be fulfilled. Therefore, understanding their challenges might give a better perspective on the problems they faced, enabling the appropriate formulation of solutions.

CONCLUSION

The results of this study show that, regardless of the differences in the participants' cultural backgrounds, educational levels, and healthcare systems, they illustrated their consistent knowledge and understanding, allied with the evidence base regarding ASI structural and process elements when they practised sensory integration intervention. Occupational therapists providing ASI intervention should take careful measures to ensure that they adhere strictly to the process and structural elements of the intervention. Furthermore, strict adherence to the fidelity measures when providing ASI intervention is highly recommended to ensure accurate and comprehensive documentation and monitoring of the intervention delivered, which would provide information on evidence-based practices. Such information could be presented to the higher authorities to influence budgeting and policies for occupational therapy services in Malaysia.

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