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Schizophrenia Spectrum Disorders: Linking Motor and Process Skills, Sensory Patterns, and Psychiatric Symptoms

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Schizophrenia Spectrum Disorders: Linking Motor and Process Skills, Sensory Patterns, and Psychiatric Symptoms

Abstract

Background: Consistent evidence suggests sensory abnormalities and skill deficits in people with Schizophrenia Spectrum Disorder (SSD). Further exploration of their sensory patterns and performance skills is warranted to promote community participation among these individuals.

Method: This study examined sensory patterns and motor and process skills in relationship to psychiatric symptoms in adult patients with SSD. Participants were evaluated using the Adolescent/Adult Sensory Profile, the Assessment of Motor and Process Skills, and the Brief Psychiatric Rating Scale.

Results: Of the 18 participants, the majority showed sensory differences, deficits in motor and process skills, and the presence of moderate to severe symptoms. There were significant relationships between sensory differences, skill deficits, and psychiatric symptoms. These findings are preliminary because of a small sample.

Conclusion: Sensory patterns and performance skills of individuals with SSD should be routinely evaluated to address their impact on function. Future research regarding this topic requires larger samples.

Comments

This research has been presented at the Connecticut Occupational Therapy Association conference, March 3rd, 2018, in CT; at the Sacred Heart University College of Health Professions Faculty Showcase, May 9th, 2018, in CT; and at the American Occupational Therapy Association conference, April 4th, 2019, in New Orleans, LA.

The authors report they have no conflicts of interest to disclose.

Keywords

activities of daily living, assessment, mental health, occupational participation, occupational performance

Cover Page Footnote

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Credentials Display

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Schizophrenia Spectrum Disorders (SSD) is a collection of diagnoses in which one of five criteria, such as hallucinations or delusions, is present (American Psychiatric Association [APA], 2013). Included in this spectrum are schizophrenia and schizoaffective disorder. Schizophrenia, the most prevalent, is a serious mental illness affecting 2.4 million Americans and 1% of the population worldwide (Javitt, 2010; National Alliance on Mental Illness [NAMI], 2017). The hallmark symptoms of this disease include psychosis (loss of contact with reality); positive symptoms, such as hallucinations (false perceptions) and delusions (false beliefs); negative symptoms, such as flat affect, lack of motivation and spontaneity, and social and emotional withdrawal; cognitive deficits, such as impaired information processing, reasoning and problem-solving, and disorganized speech and behavior; and occupational and social dysfunction (APA, 2013; Javitt, 2010; Lieberman et al., 2008). In the United States, people with schizophrenia have a shorter life expectancy, are often dependent on others, and report worse quality of life when compared to the general population and people with physical illnesses (Lieberman et al., 2008). Schizoaffective disorder impacts less than 1% of the population but shares the symptomatology of schizophrenia coupled with features of mood disorders (APA, 2013). These individuals show a similar neurological picture and brain abnormalities to those with schizophrenia (Amann et al., 2016). Although individuals with this disorder may have a better outcome than those with schizophrenia, they face similar daily living challenges.

Evidence shows that both conditions are neurodevelopmental and neurodegenerative diseases that are not limited to any specific cortical region (Andreasen & Pierson, 2008; Boks, Russo, Knegtering, & van den Bosch, 2000; Javitt, 2010). There has been consistent evidence of an increase in neurological soft signs (NSS) (such as problems with sensory integration and motor coordination and planning) in this population that is unrelated to medication (Amann et al., 2016; Dazzan & Murray, 2002; Thomann et al., 2009), and there may be a relationship between NSS, illness severity, and social functioning (Jahn et al., 2006; Peralta & Cuesta, 2017).

Using therapeutic modalities, such as occupational therapy, cognitive remediation, cognitive behavioral therapy, and vocational rehabilitation improves functional outcomes among people with schizophrenia (Bjørkedal, Torsting, & Møller, 2016; Lystad et al., 2017). Studies have reported that early recovery is possible for people with schizophrenia who have lesser social and functional impairments, supportive families, higher levels of motivation, and opportunities to participate in treatment planning (Lim, Barrio, Hernandez, Barragán, & Brekke, 2017). Moreover, occupational therapy informed by a client-centered approach can enhance clients' recovery in the early stages of schizophrenia by "enabling meaningful occupations" (Bjørkedal et al., 2016, p. 98). Because SSD are neurodevelopmental and neurodegenerative diseases, and individuals with SSD demonstrate impaired function and limited participation in their communities, further exploration of their sensory patterns, motor and process skills, and need of assistance is warranted.

Literature Review

Predictive markers have long been the focus of SSD research, with the intention of identifying mechanisms for early intervention and prevention. These markers range from prenatal and birth complications; altered brain morphology early in life; subtle motor abnormalities during infancy; and social, emotional, motor, and cognitive deficits during childhood and adolescence; to a history of trauma and substance abuse and a diagnosis of a schizotypal personality disorder (Hans, Auerbach, Auerbach, & Marcus, 2005; Tsuang, Stone, & Auster, 2010). Neuroscientists have attributed SSD etiology to abnormal brain development followed by exaggerated synaptic pruning (elimination of weak synapses and other neural structures) along with neurodegenerative processes (Forsyth & Lewis, 2017; Lesh, Niendam, Minzenberg, & Carter, 2011; Lieberman et al., 2008; Pettersson-Yeo, Allen, Benetti, McGuire, & Mechelli, 2011; Zhang et al., 2014). Systematic reviews, meta-analyses, and historical reviews concur that motor abnormalities are predictive of SSD (Burton et al., 2016; Filatova et al., 2017; van Harten, Walther, Kent, Sponheim, & Mittal, 2017). Even the presence of mild motor function impairment in family members of those with SSD may be a marker (Schäppi, Stegmayer, Viher, & Walther, 2018).

Evidence continues to emphasize the prevalence of motor deficits and NSS in people with SSD. It is so compelling that including such deficits as a diagnostic trait (Bombin, Arango, & Buchanan, 2005; Burton et al., 2016) and developing motor-based assessments specific for this population (Morrens, Docx, & Walther, 2014; Peralta & Cuesta, 2017; van Harten et al., 2017) have been identified as necessary. While evidence suggests that antipsychotic medications negatively affect hand function (Nowak, Connemann, Alan, & Spitzer, 2006; Putzhammer et al., 2005); cause motor side effects, such as tremors and akathisia (van Harten et al., 2017); and may also compromise motor learning (Keedy, Reilly, Bishop, Weiden, & Sweeney, 2015); it has long been demonstrated that motor deficits and NSS exist in SSD before medications are introduced and side effects are experienced (Amann et al., 2016; Dazzan & Murray, 2002; Peralta & Cuesta, 2017; Schäppi et al., 2018; Thomann et al., 2009).

Deficits in motor coordination and sequencing and sensory integrative functions are more prevalent in people with SSD than in people with other psychiatric diagnoses (Annandale, van Jaarsveld, van Heerden, & Nel, 2017; Boks et al., 2000; Bombin et al., 2005). Relationships between motor learning deficits and NSS in schizophrenia have been reported (Chrobak et al., 2016). NSS correlate significantly with severity of illness, negative symptoms, and lower social functioning in people with schizophrenia (Jahn et al., 2006; Peralta & Cuesta, 2017).

In addition to motor deficits, multiple studies have reported sensory abnormalities in people with schizophrenia, such as impaired sensory gating (poor ability to habituate to repeated sensory stimuli, causing a sensory overload) (Braff as cited in Brown, Cromwell, Filion, Dunn, & Tollefson, 2002; Potter, Summerfelt, Gold, & Buchanan, 2005); abnormal mismatch negativity (inefficient cortical responses to a deviant sensory stimulus) (Jahshan et al., 2012; Javitt, 2009, 2010); impaired sensory attenuation (deficiencies in distinguishing between self-produced and externally generated movement) (Shergill, Samson, Bays, Frith, & Wolpert, 2005); and diminished body ownership (one's ability to perceive body sensations as unique to self) (Thakkar, Nichols, McIntosh, & Park, 2011).

A number of studies have described motor learning and control and visuomotor deficits among people with schizophrenia (Bolbecker et al., 2009; Exner, Weniger, Schmidt-Samoa, & Irle, 2006; Frantseva et al., 2008; Schwartz, Rosse, Veazey, & Deutsch, 1996; Silver, Shlomo, Schwartz, & Hocherman, 2002; Thomann et al., 2009). Other studies pertaining to motor performance in SSD have reported difficulties with rapid hand movement and reduced hand movement amplitude, force, and regularity, and decreased movement fluency because of deficient motor sequence planning (Delevoye-Turrell, Giersch, Wing, & Danion, 2007; Putzhammer et al., 2005; Schäppi et al., 2018).

Occupational Therapy Perspective

For over four decades, the occupational therapy literature has had limited research articles identifying sensory and/or motor deficits in people with SSD. While King (1974, 1990) called attention to abnormal postural and movement patterns in schizophrenia and suggested sensory integrative interventions for the people affected by it, others began documenting accounts of this treatment (Bailey, 1978; Jorstad, Wilbert, & Wirrer, 1977; Rider, 1978) as well as questioning the fidelity of its research (Parham et al., 2007). Specific sensory and/or motor deficits of SSD have been described, noting the importance of understanding them in the context of occupational engagement (Brown et al., 2002; Champagne & Frederick, 2011; Dunn, 2001; Falk-Kessler & Bear-Lehman, 2003; Falk-Kessler & Quittman, 1990; Lin et al., 2015; Wang et al., 2014). Sensory deficits are not unique to SSD and have been documented in other populations, such as in people with autism (Lane, Young, Baker, & Angley, 2010), attention deficit hyperactivity disorder (ADHD) (Lane, Reynolds, & Thacker, 2010), obsessive-compulsive disorder (OCD) (Rieke & Anderson, 2009), and borderline personality disorder (BPD) (Brown, Shankar, & Smith, 2009).

Purpose of the Study

This study aimed to examine the sensory patterns and motor and process skills of adults receiving inpatient treatment for SSD. An improved understanding of the sensory patterns and motor and process skills, and their relationship with the symptomology in SSD, may be necessary to develop refined treatment and rehabilitation models for this client population.

The researchers hypothesized that the study participants would demonstrate sensory differences (when compared to most people) and motor and process skill deficits. The researchers also hypothesized that statistically significant relationships would be found between sensory differences and skill deficits; sensory differences and severity of psychiatric symptoms; and skill deficits and psychiatric symptoms.

Method

Study Design

An exploratory study using a nonintervention associational design on a single cohort (Gilner, Morgan, & Leech, 2017) was used. Institutional review board (IRB) approval was granted by two separate agencies: The hospital in which the study was conducted and the university to which the authors were affiliated. IRB-approved procedures were followed to ensure proper data storage and to preserve the subjects' confidentiality.

Participant Recruitment

The research team recruited adult patients receiving acute inpatient treatment for SSD and whose symptoms had stabilized. Criteria for inclusion were: minimum 18 years of age, minimum of 5-year-long psychiatric history, schizophrenia spectrum diagnosis, symptom stabilization, and no major medication side effects at the time of the study. Criteria for exclusion were non-English speakers, a history of neurological conditions, recent substance abuse, intellectual disability and developmental disorders, presence of acute symptoms (such as active hallucinating, catatonia, extreme disorganization, and extreme fatigue or physical discomfort), and severe side effects (such as dizziness, tremor, drowsiness).

All patients admitted to the hospital during the span of the study who met the above criteria were approached by psychiatric nurses serving as study recruiters. Those patients who expressed interest in participating met with the principal investigator (PI) who was not employed or involved in patient care at the hospital at the time of the study, for consent. Those who provided signed consent became study participants.

Assessment Instruments

Assessments used in this study were the Adolescent/Adult Sensory Profile (AASP) (Brown & Dunn, 2002), the Assessment of Motor and Process Skills (AMPS) (Fisher, 2010), and the Brief Psychiatric Rating Scale (BPRS) (Kopelowicz, Ventura, Liberman, & Mintz, 2008).

The AASP is a standardized self-report measure "designed to evaluate behavioral responses to everyday sensory experiences" in patients who are 11 to 65 years of age (Brown & Dunn, 2002, p. 1). The 60-item, 5-point scale rates responses to visual, auditory, touch, taste, smell, movement stimuli, and a general category of activity level. The obtained scores cluster along the sensory threshold (low registration vs. sensory sensitivity) and behavioral response (sensation seeking vs. sensation avoiding) categories. This classification system describes individual responses as compared to most people and locates the individual along a continuum of distributed scores rather than indicating whether their responses substantiate a concern (Brown & Dunn, 2002). The AASP is a reliable and valid tool to use in practice settings (Brown, Tollefson, Dunn, Cromwell, & Filion, 2001).

The AMPS is an observation-based measure of the effort (in motor performance), efficiency (as demonstrated by process skills), safety, and independence exhibited by a person completing at least two chosen and familiar activities of daily living (ADL). Sixteen motor and 20 process skill items are scored on a 4-point ordinal scale, with 1 being equivalent to a deficient skill and 4 being equivalent to a competent performance. Rater training and calibration are required to administer the AMPS. Final AMPS scores are established using the Occupational Therapy Assessment Package (OTAP) software. Research on the AMPS indicates good reliability and validity, including validity for use with males and females of different ages across various cultures and diagnostic groups (Fisher & Bernspång, 2007), and it also supports the idea that AMPS is a valid tool to use when evaluating the need for assistance in the community (Merritt, 2011). The AMPS has been used with SSD populations to determine need for assistance (Fossey, Harvey, Plant, & Pantelis, 2006; Girard, Fisher, Short, & Duran, 1999; Moore, Merritt, & Doble, 2010). It has been suggested that the process skills measures may predict work-related outcomes in SSD (Haslam, Pépin, Bourbonnais, & Grignon, 2010).

The IRB limited the AMPs activities used in the study to 17 choices because the participants resided in an acute inpatient unit. These activities were considered safe by the hospital administration and were performed in parts of the facility that best allowed for the observation of ADL skills (patient room, dining room, laundry room, etc.). Each participant performed two ADL tasks that they had identified as familiar and at least somewhat difficult.

The BPRS is widely used to assess the positive, negative, and affective symptoms of individuals with SSD. It assesses an individual's behavior during the interview and over the previous 2 to 3 days (this can be reported by the patient's family). The assessment employs a Likert scale ranging from 1 (*not present*) to 7 (*extremely severe*) to describe symptom severity. The 24-item BPRS consists of four symptom categories: positive symptoms, agitation and mania symptoms, negative symptoms, and depression and anxiety symptoms (Kopelowicz, Ventura, Liberman, & Mintz, 2008). We chose the 24-item version of the BPRS, since it includes symptoms that may be relevant to this investigation, such as bizarre behavior, self-neglect, distractibility, and motor hyperactivity. The BPRS has been recognized as a psychometrically adequate instrument (Thomas, Donnell, & Young, 2004) and its four-factor structure is supported as stable and reliable (Kopelowicz et al., 2008).

Study Procedure

Following the informed consent procedure, the participants were assessed using the AASP and the AMPS. Both assessments were administered and interpreted by the PI, who was also an AMPS certified rater. The AMPS scores were sent to the Center for Innovative OT Solutions for further analysis. Following the AASP and the AMPS assessments, selected psychiatric nurses conducted the BPRS with each participant. These nurses were trained in using the BPRS by the psychiatrist involved in the study, and inter-rater reliability was established with an intraclass correlation coefficient (ICC) of 0.938.

The PI was blind to the results of the BPRS during the AASP and the AMPS results interpretation phase. The nurses were blind to the AASP and the AMPS results when conducting the BPRS.

Data Analysis

Statistical analysis was conducted in this study using the IBM SPSS Statistics 24 software. A confidence interval of 95% was used throughout. Descriptive data was collected on gender, age, diagnosis, and assessment category results. Because the data collected was either interval or ordinal, parametric and nonparametric statistics were used accordingly (Portney & Watkins, 2015). Mann Whitney U test or the *t*-test was used to assess differences in assessment performance between the participants with no or mild symptoms as compared to those with moderate or severe illness. Pearson or Spearman Rho tests were used to examine the relationships between sensory differences, ADL skill deficits, and illness characteristics and severity. Effect size, where appropriate, was calculated in order to assess the practical significance of the statistic (Maher, Markey, & Ebert-May, 2013). The final sample size of 15 participants, which was the number of participants who completed all assessments, was confirmed using G*Power 3.1 calculator (Faul, Erdfelder, Lang, & Buchner, 2007). This assumed an effect size for correlations 0.6 (medium to strong) and a power of 0.8. If findings of small sample studies reach significance with moderate to large effect size, there is evidence to explore further (Hackshaw, 2008).

Results

The number of patients approached for this study was unknown, as the IRB requirements did not permit the PI to be involved in recruitment. Further, information pertaining to selected participants' demographics, such as length of illness and treatment duration, was also not available to the PI because of the stringent IRB procedures.

Eighteen participants 22 to 56 years of age agreed to participate in this study: 10 (53%) males and eight (47%) females. Mean subject age was 36 years. One participant withdrew from the study, leaving the number of participants at 17. Out of the 17 participants, 13 (76%) of the participants were diagnosed with schizophrenia and four of the participants (24%, all females) were diagnosed with schizoaffective disorder. There were no statistical differences between males and females on any of the test measures. The participants' demographic data is detailed in Table 1.

Table 1

Demographics of the Study Participants (Initial N = 18)

Participant Number	Gender	Age	Diagnosis
1	Female	31	Schizoaffective Disorder
2	Female	42	Schizoaffective Disorder
3	Male	45	Schizophrenia
4	Withdrew from the study		
5	Female	28	Schizophrenia
6	Female	47	Schizophrenia
7	Female	24	Schizoaffective Disorder
8	Male	22	Schizophrenia
9	Female	36	Schizoaffective Disorder

10	Female	56	Schizophrenia
11	Male	33	Schizophrenia
12	Male	37	Schizophrenia
13	Female	44	Schizophrenia
14	Male	24	Schizophrenia
15	Male	34	Schizophrenia
16	Male	27	Schizophrenia
17	Male	39	Schizophrenia
18	Male	52	Schizophrenia

One aim of this study was to describe the sensory differences in comparison to a normal population, noted as “most people” in patients with SSD. The participants’ sensory patterns as measured by the AASP are summarized in Table 2.

Table 2
Sensory Differences in Study Participants (Percentage in Parentheses)

Types of Sensory Differences	Participants (N = 17)
Low Registration	12 (70.6)
Sensation Seeking	11 (64.7)
Sensory Sensitivity	10 (58.8)
Sensory Avoidance	10 (58.8)

A second aim of the study was to describe the ADL skills deficits in patients with SSD. Of the 17 AMPS activities offered, the following tasks were selected by the participants: making a bed, setting a table, making a sandwich, loading and starting a washing machine, hand washing laundry, folding a basket of laundry, cleaning windows, sweeping the floor, mopping the floor. The ADL skills of the study participants as measured by the AMPS are summarized in Table 3. Levels of assistance in the community, based on the participants’ overall status and not just motor and process skill scores (Fisher, 2010), were also assessed. Forty seven percent required minimal level of assistance, and 17.6% required moderate to maximal assistance. The remaining 35.3% required minimal assistance because of symptom severity leading to hospitalization.

Table 3
ADL Skill Deficits in Study Participants (Percentage in Parentheses)

Type of ADL Skill Deficit		Participants (N = 17)
Motor	Minimal effort	6 (35.3)
	Moderate effort	9 (52.9)
Process	Minimal inefficiency	6 (35.3)
	Moderate inefficiency	4 (23.5)
	Marked inefficiency	1 (5.9)

The BPRS measures illness severity. The total BPRS scores serve as criteria for none, mild, moderate, marked, severe, and extreme symptoms categories (Leucht et al., 2005) and are provided in Table 4. Two of the participants were discharged prior to the completion of the BPRS, resulting in 15 data sets for this assessment. No differences were found in any of the scores for ADL skills, or for sensory patterns, when the participants with no or mild symptoms were compared to those with moderate or severe illness.

Table 4
Symptom Severity in Study Participants (Percentage in Parentheses)

Symptom Severity	Participants (N = 15)
None	1 (7)
Mild	5 (33)
Moderate	6 (40)
Marked	2 (13)
Severe	1 (7)

To examine the relationship of the sensory differences with the skill deficits of the participants, both Pearson's and Spearman Rho tests were used. These tests revealed the following relationships:

- Pearson's test revealed a potential correlation between sensory avoidance and motor skill deficits
(r = .591, p = .072), with a moderate effect size (r^2 = 0.35).
- Spearman Rho test revealed that process skills deficits correlated with sensory avoidance interpretation (r = .514, p = .035), and that process skills interpretation was in a potential inverse relationship with sensory avoidance interpretation (r = - .547, p = .023).

This research also examined the relationship between the participants' sensory differences and skill deficits and the severity of their psychiatric symptoms. There was a strong correlation found between depression and anxiety and sensory sensitivity (r = .719, p = .029; with a large effect size: r^2 = .52) as well as a correlation between depression and anxiety and low registration (r = .689, p = .019; with a moderate effect size: r^2 = .47). In addition, the following relationships were revealed:

- Sensory sensitivity strongly correlated with sensory avoidance as revealed by Pearson's test (r = .949, p = .004), with a large effect size (r^2 = .90).
- Motor skill deficits strongly correlated with process skill deficits as revealed by Pearson's test
(r = .606, p = .010), with a moderate effect size (r^2 = .37).
- Depression and anxiety strongly correlated with positive symptoms (r = .675, p = .006), with a moderate effect size (r^2 = .46) as revealed by Pearson's test.
- Positive symptoms correlated with negative symptoms (r = .699, p = .004), with a moderate effect size (r^2 = .49) as revealed by Pearson's test.

Discussion

This exploratory study on a limited participant sample aimed to examine sensory patterns, ADL skills, and psychiatric symptoms of adults receiving inpatient treatment for SSD. Identifying the presence of and the relationships between sensory differences and skill deficits with symptoms is critical to occupational therapy treatment planning. It was hypothesized in this study that the participants would demonstrate sensory differences, as well as motor and process skill deficits, and that statistically significant relationships would be found between sensory differences, skill deficits, and the severity of psychiatric symptoms.

The statistical analysis employed in this study revealed sensory differences as compared to most people among the majority of the participants in terms of low registration, sensation seeking, sensory sensitivity, and sensory avoidance. The sensory patterns uncovered among the participants resemble those demonstrated by other psychiatric populations, such as children with autism (Lane, Young, et al.,

2010) and adults with OCD (Rieke & Anderson, 2009) and BPD (Brown et al., 2009). Moreover, the study results correspond with the findings related to prevalence of low registration in people with schizophrenia (Brown et al., 2002).

The relationship between sensory sensitivity and sensation avoidance revealed in this study may also play a role in daily life, as individuals sensitive to particular sensory stimuli may avoid or negatively react to those daily life occupations with such stimuli. As shown in another study, sensory deficits in those with serious mental illness impacted quality of life and one's ability to engage in their community (Pfeiffer, Brusilovskiy, Bauer, & Salzer, 2014). The mounting evidence of sensory issues in those with mental illness supports the need to further study their connection to function (Bailliard & Whigham, 2017).

Specific psychiatric symptoms may also be associated with deficient sensory patterns. In a related literature review, it was noted that studies examining positive and negative symptoms in relationship to sensory patterns have had mixed results, but propose sensory impairments may occur at different phases during the illness (Olson, 2010) rather than be absent altogether. This study's finding of a relationship between anxiety and depression with sensory sensitivity and low registration supports this notion, further justifying the importance of exploring the link between sensory deficits and psychiatric symptoms.

A feature of SSD is difficulty with goal-directed behaviors, which can impact ADLs (APA, 2013). Like the finding of those with schizophrenia in residential and outreach programs needing at least a minimal level of assistance (Fossey et al., 2006), it was found in this study that the participants showed deficits in ADL skills and similarly needed assistance in the community. The relationship between motor and process skills; the relationship of sensory avoidance with both motor and process skills; and the link between sensory sensitivity, sensory avoidance, ADL skill deficits, and depression and anxiety may provide insight into the mechanism behind functional difficulties and impaired quality of life among people with SSD. For instance, it may be reasonable to assume that increased sensory sensitivity in this population results in avoidance of tasks that are rich in sensory input and/or a deficient task performance. This, in turn, may lead to decreased energy and low motivation to participate in daily activities, increased social isolation, and increased feelings of depression and anxiety. Further research is merited.

The sensory differences and the skill deficits revealed in this study, and the fact that these variables were in relationship with psychiatric symptoms, confirmed the use of occupational therapy assessments in the treatment and discharge planning for people with SSD. Lipskaya-Velikovsky, Jarus, and Kotler (2017) argued that participation in the community among people with schizophrenia could be predicted during acute hospitalization, while relying on a holistic functional assessment composed of measures of executive function and psychiatric symptoms, as well as personal and environmental factors, including previous hospitalization history. Current study results indicate that use of occupation-based assessments with a focus on ADL skills as well as measures of sensory processing may add to the validity of the inpatient functional assessment aimed at predicting function in the community.

Implications for Practice

The findings of this study are preliminary because of a small sample. However, they add to the growing body of evidence related to the prevalence of sensory differences and skill deficits in SSD and their relationship to the severity of psychiatric symptoms. Occupational therapy's domain of practice demands attention to how body functions and performance skills interact with and in daily occupations and affect one's occupational engagement. The interplay between sensory differences, skill deficits, and symptomatology may explain the functional impairments of people with SSD. Assessing sensory differences and ADL skill deficits in people with SSD should be included in the evaluation process to inform occupation-based interventions that address these deficits.

The above claim may be illustrated by the example of an individual with SSD who might avoid showering because of excessive sensitivity to running water or prefer isolation in her home because of the discomfort and fatigue experienced when being in noisy and crowded environments. Recommendations for this client may include bathing instead of showering or using earplugs in noisy environments. In a similar way, a client with schizophrenia who exhibits difficulty with registering movement-related sensory input might demonstrate the diminished motor skill of navigating his or her space and be prone to bumping into physical objects, resulting in decreased safety when performing ADL tasks. In this case, an occupational therapist can discuss with the client strategies to minimize clutter in the client's home.

The occupational therapy profession continually strives to meet current and future health care needs. To this end, entry-level and continuing education venues must include specific emphasis on how sensory differences and skill deficits impact participation for those with SSD. In addition, occupational therapy research must focus on effective interventions to address unique sensory patterns and the skill deficits of people with SSD to promote daily participation among this population. Such research requires larger participant samples, including participants with SSD outside of acute hospitals, to provide findings that are more generalizable to various stages of illness and recovery.

Study Limitations and Future Research

There are several limitations to this study, which should be taken into consideration in future research. The stringent participant recruitment protocol required by the IRBs, coupled with one participant withdrawing from the study, and the BPRS not completed on two additional participants because of an early discharge, resulted in a limited sample that did not allow the researchers to compare subgroups in the study sample. Should future studies recruit larger samples of participants with schizophrenia and schizoaffective disorder, it may be useful to compare these two subgroups on the schizophrenia spectrum.

To minimize potential safety issues, the IRB requirements limited the selection of AMPS tasks. It is unknown if the participants would have selected other tasks if given the opportunity or if this influenced the AMPS scores in any way.

The statistical analysis employed in this study used the AASP scores representing the participants' sensory thresholds (low registration and sensory sensitivity) and behavioral responses (sensation avoiding/sensation seeking), rather than the sensory processing categories of taste and smell, movement, visual, touch, activity level, and auditory. It may be valuable for future research on sensory processing in SSD to address specific sensory categories in addition to sensory thresholds and behavioral responses.

Conclusion

This study highlights the link between sensory differences, skill deficits, and symptoms of SSD as a part of the mechanism behind the functional difficulties in the affected individuals and supports the idea that most of them may need some level of assistance in the community.

In addition, it provides evidence for the use of occupation-based assessments and interventions in mental health practice. Sensory aspects of SSD, their relation to symptomatology, and the impact on skills and outcomes in those who are affected is an intriguing topic. An improved understanding of it may lead to discovering new treatment modalities for this client population.

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