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Experiences of sensory input in daily occupations for people with serious mental illness

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ABSTRACT

Background: There is growing evidence that people with serious mental illness have impaired capacity for processing sensory inputs which affects daily occupation. Although this is known, research regarding the target groups experiences of sensory inputs in daily occupations is lacking.

Aim: To investigate the experience of sensory input and strategies used in daily occupations among people with serious mental illness.

Material and methods: Fourteen people with serious mental illness were interviewed regarding their experiences of sensory processing and strategies for managing sensory inputs in daily occupations. Data were analysed using content analysis.

Results: Sensory processing issues affected occupational engagement and strategies to control inputs were intuitively used to cope with sensory challenges. Informants either ignored, reduced or avoided sensory inputs. Informants also enabled daily life through strategies such as creating a home that provides rest, finding a safe place, using nature and animals for relaxing and using effects of calming and alerting occupations.

Discussion: Specific sensory inputs were difficult to process, which was experienced as stressful and affected occupations negatively. The results imply a need for further research exploring the management of sensory input and the use of sensory modulation approaches to enable engagement in daily activities.

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Serious mental illness; occupation; recovery; sensory processing; sensory modulation

Background

Rates of serious mental illness are increasing worldwide, including in Sweden [1]. Research shows that people experiencing mental illness encounter changes in thought processes, emotions, interpersonal behaviours, activity levels and bodily sensations [2–3]. However, the significance of changes in bodily sensations and the processing of sensory inputs has not been widely recognised. Sensory input is the stimuli received through the sensory organs, including visual, olfactory, gustatory, auditory and tactile modalities. It also includes proprioception (sense of movement and force in muscles and joints) and vestibular input (sense of balance and acceleration) [4]. There is considerable neuroscientific evidence that people with diagnoses such as Schizophrenia, Post Traumatic Stress Disorder and Anxiety Disorders may have associated sensory processing issues [5–6]. This includes difficulties in

‘gating’ or filtering out less important stimuli as well as hypersensitivity to specific input [7]. Furthermore, when acutely distressed, individuals with or without serious mental health issues may become over-sensitive to input such as noise or bright light, or under responsive to other input, such as visual cues [8]. Difficulties with sensory processing are presumed to significantly affect engagement in daily occupations, such as attending to work tasks and socialising with others [5,9]. However, there is currently limited published evidence exploring how atypical sensory processing is experienced in adults with mental illness and how it affects occupational participation [6].

In order to explain variations in responses to sensory input, Dunn [10] developed a model of sensory processing. The model shows how neurological thresholds and behavioural self-regulation strategies interact to create the individual’s unique pattern of

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sensory processing. According to the model [10] the neurological threshold indicates how intensive the sensory input has to be for the person to notice it. This means that if an individual's threshold is very high, it would take a lot of sensory input before the person notices it, while an individual with a low threshold notices even small levels of sensory input. An individual's threshold may differ across sensory modalities [11]. Behavioural self-regulation refers to the way in which people respond in relation to their neurological threshold [10]. An individual's behavioural response to sensory input can range from passive to active and reflects varying forms of self-regulation [11].

Most individuals are able to regulate multi-sensory input so that their sensory processing patterns support their participation in daily occupation. However, research shows that individuals with trauma, mental illness, substance abuse, or those with behavioural issues, are often unaware of their sensory needs or stress responses [8,11,12]. Increased awareness of one's sensory tendencies in daily occupation may lead to exploring ways to function more optimally [12].

Sensory modulation strategies are used as an occupational therapy intervention to help people with mental illness to cope in daily occupations. It is an approach that focuses on assisting individuals to more effectively self-regulate their emotional and physiological arousal in order to optimise their wellbeing [13–14]. The ability to self-regulate sensory input has been shown to prevent distress and support social and occupational engagement for people with serious mental illness [5,14–16]. Still, most studies are within clinical wards and no studies have been conducted exploring sensory modulation strategies in the context of daily occupations. Research regarding this is important, since increased awareness of one's sensory tendencies may lead to increased occupational performance [12,17].

Although sensory strategies are being used within mental health care contexts [18–24], there is a lack of research on the challenges with sensory processing people may experience in their daily life. The aim of this study is hence to investigate the experience of sensory input and sensory strategies used to manage physiological and emotional arousal in daily occupations among people with serious mental illness.

Material and methods

A qualitative descriptive approach was employed using qualitative content analysis according to

Graneheim and Lundman [25]. Qualitative data help the researcher to describe and understand the similarities, differences, causes and contexts relevant to a phenomenon. The aim of qualitative research is to create a deeper and more complete understanding of the phenomenon being studied further corroborated with our study aim. The study was approved by the local Research Ethics Committee, with dnr number; 2017/43.

Informants

The primary inclusion criterion was that individuals had a serious mental illness, which here is defined as when a person has a mental disorder and a history of psychiatric treatment for two years or longer [26]. Further criteria were; being aged between 18–65 years old and being an outpatient within the County Council of Region Skane in Sweden. Exclusion criteria were persons with a primary substance abuse issue, acute symptoms of mental illness, dementia or developmental disorders, and who did not speak Swedish.

A total of 14 informants, seven women and seven men, were included in the study. Their ages ranged from 27 to 62 years, with a mean age of 42.7 years (SD 11). Regarding educational background; one of the informants had not completed nine-year compulsory school, three had completed nine-year compulsory school, eight had completed 6th form college and two had a university or college degree. Ten informants were on sick leave and four worked or studied. Twelve of the informants were living in their own apartments or house, without support, and two were living in shared accommodation. Eight informants were living with a partner and six had children. According to their self-report, three had psychosis, five had bipolar disorder, two had emotionally unstable personality, two had generalised anxiety disorder and two persons had severe depression. Most of the informant had had a long duration of mental illness. It ranged from 2 years to 43 years, with a mean of 20 years (SD 11). The informants characteristics varied in terms sex, age, diagnosis, place to stay (countryside city), family situation and educational background. In line with Graneheim and Lundman [25] these aspects will increase the credibility of the study.

Procedure

Mental health staff from three outpatient units in the southern part of Sweden were informed by the

researcher about the study. Initial contact with possible informants was made by a staff member who informed the persons regarding the purpose of the study both written and orally. Upon agreement, they were asked to give their written consent. Participants were informed that they may withdraw from the study at any time. Seventeen individuals were asked to participate following the procedure described below, and all consented. Three of them later cancelled the interviews because of deterioration in mental state.

Data collection

In order to create a comfortable atmosphere for the informants, the interviews took place at a familiar space at their unit. Before the interview began the researcher clarified the aim of the study. The interviews were in-depth, and a semi-structured interview guide was used to focus the conversation on the experience of sensory input and the effect on their daily occupations. Initially, a broad question about the informant's experience of mental illness was asked. The interviewer then shortly explained terms such as sensory inputs and sensory processing and proceeded to ask questions about sensory input and the impact of this on daily occupations. An example of research questions was; Does your ability to process sensory input affect your ability to perform daily occupations in any way? If yes, in what way? The interview was recorded and transcribed verbatim. A pilot interview was conducted to test the questions. Since no changes were needed, the pilot data were included in the study. Using an interview guide strengthens the dependability because the questions are similar to all the informants. All interviews were carried out by the same person within a two-month period and were all performed in the same type of environmental context, a room at the mental health service where the informant was treated. This factor contributes to the dependability and restricts the potential influence of unknown factors.

Data analysis

The transcribed interviews were analysed using a qualitative content analysis according to Graneheim and Lundman [25]. The first step of the analysis concerned reading the data several times to get a sense of the whole material. The material from the two first interviews was then analysed and coded by two authors (HA and EA). After this test analysis, all data

were put into one analysis unit, and later divided into meaning units. During this process all meaning units were labelled with a preliminary code to start the analysis. In the next step the meaning units were condensed and then abstracted and labelled with a code. The material was sorted into categories according to similarities and differences, twice. Through this analytic passage, final categories, corresponding sub-categories, and also a main theme, representing the latent content, emerged. Finally, all authors reviewed and revised the categorised material to reach consensus and to increase the conformability of the study [25].

The first author performed the interviews (HA). She works as an occupational therapist at a mental health service but has no earlier contact with the informants. The interviewer's experience and knowledge of how to provide support to persons with mental illness can be viewed as an important quality which made it possible for the uncomfortable informants to get suitable support. Furthermore, the researchers' pre-understanding may have influenced the analysis of the data. To make this influence explicit, this was discussed and reflected upon before and during the analytical process.

Results

The informants gave a detailed picture of how their sensory processing affected their daily occupations and described different strategies that were used in order to better cope with sensory challenges and to gain control. The findings resulted in a main theme: *Sensory stimuli affects engagement in daily occupation and self-modulation strategies are used in order to enable daily life*. Within the findings, three categories with related subcategories were identified (see Table 1). Along with the descriptions of the categories below, quotes are given, and informants are referred to by pseudonyms information.

Sensory processing issues affect occupational engagement

All informants described a wide constellation of reactions to overwhelming sensory input, which invariably affected their attention and ability to engage in daily occupations. When multiple strong sensory inputs were experienced simultaneously, such as when informants had dinner with family and friends, this was experienced as very stressful. Sensory inputs were easier to process if the inputs were self-selected or predictable.

Table 1. Compiled results in categories and sub-categories.

Sensory processing affects everyday occupation and self-modulation strategies are used in order to enable daily life									
Sensory processing issues affect occupational engagement		Controlling inputs to cope with sensory challenges			Enabling daily life through sensory strategies				
Sensory inputs trigger emotional reactions	Background sensations interrupt occupation	Multiple sensations impact attention	Ignoring sensory input by using distractions	Reducing sensory stimuli	Avoiding occupations to lessen exposure to sensory input	Creating a home that provides rest	Finding "The Safe Place"	Relaxing through nature and animals	Effects of calming and alerting occupations

Sensory inputs trigger emotional reactions

The informants had difficulty with visual, auditory, olfactory, gustatory, and tactile sensations, as well as activity level and movement processing. A wide constellation of reactions were reported after being exposed to stressful sensory inputs, which included feelings of anxiety, stress, fear, nausea, headache, dizziness, tension, confusion and body pain. Informants also described feelings of being overwhelmed, exhausted and fatigued as well as becoming angry and even violent. Some informants were sensitive to specific forms of sensory input, while others experienced general problems.

Scents from foods, perfumes, household cleaners and laundry detergents caused negative reactions for several informants. Even taste and smell triggered difficult memories. For example, Anna described how after exposure to the smell of perfumes she often experienced nausea, which led to irritation, anger and anxiety as the sensations brought back childhood memories.

There are also smells like really strong perfume. I don't like it, I feel as if I'm getting a headache and can feel sick. Sometimes it can bring back memories, yes, some smells can bring back horrible memories from my childhood or experiences, people also smell different and I can for example smell if someone has anxiety or is scared. Anna

Experience of sensory input was individual. Exposure to certain form of sensation could be seen as pleasant for one informant while another would find it unpleasant. As illustrated above, Anna had unpleasant smell sensations while Eddie described positive reactions. The smell of perfumes and the scent of lilacs made him feel harmonious and calm.

Smells calm me, preferably women's perfume. I become calm, it's like a rush through the body especially from perfumes. If I walk into a florist I become very calm and at peace. I also like smelling flowers out in the wild. One smell in particular is special and that is lilac, not an essence but really big bushes of lilac. I can bury my whole head in a bunch of lilac [and] smell. Eddie

Background sensations interrupt occupation

Some sensory inputs distracted the informants by evoking irrelevant thoughts that disrupted their daily occupations. It became difficult to concentrate which took energy from what mattered. The thoughts came automatically and usually the informants did not notice until after a while, that irrelevant thoughts had distracted their occupation. Simply sitting in the waiting room could lead to sensory stimuli that made thoughts wandering. Sofia gives an example;

When I came in here at the clinic it smelt of food. I started to think about it a lot, what smell is it, where does it come from and who is eating. Thoughts starts to wander. It bothers me as I can't find answers to my questions and then it bothers me that I think like that, why do I care about it? Why should I waste energy on this when I don't have that extra energy, I need my energy for other things. Sofia

Wera has been sensitive to sensory input since childhood and it has become worse over the years. At home she had trouble with too many background sensory inputs which distracted her from what she was supposed to do.

It is so much noise (at home) and I can not let my eyes off the TV, if something happens there. If I am to do something at home and the TV is on, that is not possible, because my thoughts wander to where the noise and light is, and I cannot do what I am supposed to.

Multiple sensations cause stress

The informants described difficulties when they experienced several different sensory inputs simultaneously. For example, to have dinner with family and friends meant managing multiple alerting sensory inputs at the same time. This included different auditory input for example from people talking, noise from children playing, background music and the sound of cutlery against plates. At the same time there was multiple visual stimuli as well as the smell of food and perfume and finally, the taste of the food. The informants needed to listen to what was being said as well as participate in the conversation and eat

their food. Their difficulties doing so resulted in the informants experiencing stress with behaviours of either becoming more silent at social gatherings or in general withdrawing from social situations. Maria described her experiences going to a pool party with her best friends, where sensory inputs became overwhelming and resulted in reactions of stress;

The kids were jumping on the trampoline a bit further away, and there was a conversation here, another conversation over there, and somewhere in between I couldn't succeed. My focus is really bad and I feel that I really have to sit and look at people and think are their mouths moving or what is happening. I want to be observant and I want to be friendly, but right now I can't hear what you are saying. Maria

Eric had experience of work that included interaction with others at an open-plan office. To process sensory input in the office was difficult since the lack of coordination in the office space made auditory and visual input unpredictable and was so stressful that Eric left his position.

It was so much noise when I was working in open space office. It made me cross and angry and my colleagues thought that I was a difficult person.

Controlling inputs in order to cope with sensory challenges

The informants made preparations in order to cope with sensory challenges. Using techniques such as focussing on something else, other than disturbing sensory input, were common. The informants also described that family, friends and colleagues had to adapt to their sensory needs. Getting enough sleep and having daily routines were factors that increased their capacity to process sensory inputs during the day. In order to protect themselves from over-stimulation, they often avoided being exposed. However, not being able to participate in different occupations or in social contexts was experienced as limiting.

Ignoring sensory input by using distractions

One strategy for engaging in occupations was to ignore stressful input and stay focussed on something else, reducing the impact of the difficult stimuli. Some used techniques like meditation or yoga to be able to better ignore stressful input in daily life. Other strategies were to focus the mind on something positive. For example, when one informant had difficulty dealing with sensory input in the shopping mall queue, he tried to focus on something positive that had

happened during the week. This distracted his attention and helped him to remain in the queue and ignore inputs despite the difficult sensations.

Another strategy was to focus on something outside the body. Finding a specific thing and turning all their focus on that would help to ignore difficult sensations and subsequent symptoms or anxiety. The specific thing could be a magazine near the queue at the checkout. Peter also used specific forms of distracting occupation, such as smoking a cigarette or having a coffee;

I focus my eyes on something and do my best to block everything. I don't look around but stare at one point. If I'm outdoors it helps if I have a cigarette or something similar I can fidget with, with my hands. I have something to do, something else to focus on. The anxiety will ease off a bit. Peter

A further strategy for controlling stressful sensory inputs was to block them out using audio stimuli, such as music. Several informants felt stressed by auditory input that was unfamiliar. At home it could be noise from neighbours or from the street outside. In order to reduce stress, one informant had a strategy where she ignored unfamiliar noises by playing music at home. Martin used headphones to listen to music or block out uncomfortable sounds.

Sometimes I've worn my own headphones to get away from sounds. If I can't do that I've sometimes tried to turn my thoughts inwards and tried to cut out the sound. I try to block it in some way. Sometimes it works, sometimes not. Martin

Certain work places could create stressful sensory inputs where the informants needed to block sensory stimuli. Eric, who works in an open office, used headphones to shut out distracting sounds. However, this distraction also diminished his ability to take in information needed at work, which created difficulties.

I put my headphones on and tried to shut out all the annoying sounds. But I don't want to listen to music eight hours a day, and when using headphones, you also miss important information. Eric

Knowledge of what caused the sensation made it easier to stay focussed on what mattered and ignore the sensory input. A familiar and predictable sound could be easier to ignore and did not add to anxiety, according to Wera;

It's me that runs the dishwasher, then I know that it is running, and I don't need to worry as I know what the sound is. Wera.

Reducing difficult sensory stimuli

Informants customised occupations to reduce the risk of sensory overload. It was common to try

occupations when the risk of being exposed to sensory input was less. Some informants preferred going for a walk at night because there was less auditory and visual input. Several informants preferred going shopping when fewer people were in the store, at closing time or in the early morning. To self-scan items was perceived as positive since there was no need to queue at the cashier.

To carefully plan occupations was another strategy used to reduce stimuli when for example going shopping. This could involve having an accurate shopping list with the items in the order in which the groceries were placed at the store. This reduced the time spent in the store and the visual overload of searching for items. Buying clothes can be exhausting and may limit shopping mall visits. For Robert, to cope with his purchases he needed to prepare himself beforehand and plan the event. At the shopping mall it was also important to make a careful plan.

I start to prepare myself a few weeks beforehand. I prepare myself mentally. I try to put myself in the situation. I think about that there will be a lot of people there, that it will be difficult but that I have to make it as I can't avoid it. I plan which shops I'll visit. Robert.

In order to reduce visual inputs some informants described that they had dimmed lighting at home. Sensitivity to light could be handled by using sunglasses, even on days with little sunshine. Another way was to pull down the blinds at home. Wera meant that blinds prevented her from being distracted by stimuli outside.

I pull the blinds down otherwise I can't keep focus, because if I'm to talk to my daughter about her homework I need to be there with the maths assignment and with her. I can't notice that someone is walking past the window and that she has a backpack and why has she got one? Wera

Informants also described how they would cut off labels from clothes to reduce the distraction of the label rubbing against their neck. To wear comfortable clothes, sweatpants or clothes in cotton material, was another solution.

Relatives and friends also helped to reduce the impact of difficult sensory inputs. Watching news and reading newspapers meant being swamped by impressions which could be visually overwhelming and distressing. Robert who could not manage received support from his father, who summarised the information and told him about the important items.

I have access to papers every day, but I don't read them as it gets too much to process. Instead I'll ask

my father if anything has happened or what they've said on the news. And then I only get to know the important things. That's how I survive. Robert

Avoiding occupations to lessen exposure to sensory input

To protect oneself against sensory overstimulation informants often avoided exposure to sensory input. It was seen as stressful to participate in social occupations, i.e. drink coffee at a café, eat dinner with friends or relatives, go to a party, go shopping, do sports or participate in community events. Informants rarely told their friends about their sensory difficulties with these events. Instead, they found a reason to leave early, and some avoid going at all. Not being able to go out was limiting. Robert says;

I don't go to events in town, I know there are lots and lots of people and lots and lots of sound, large speakers. So I avoid it, even if I really want to go I don't go there. It is too difficult. Robert

To eat lunch with colleagues was described by many informants as an almost impossible occupation. Lunch meant being exposed to auditory inputs and multiple conversations going on in parallel, while trying to eat and recover. Several informants avoided eating lunch at work or would eat lunch before or after lunch break to be alone. Sofia explains;

I think it's tough eating lunch with my colleagues, even though there are only five of us. Sometimes I go and eat earlier and then maybe sit with them for a while and then I go somewhere else. It's not necessarily that they chatter, sometimes it's enough that someone talks at all. It's also that they microwave their food and the microwave beeps and there's cutlery that rattles and plates grate and so there's a lot going on when you eat. Sofia

It was also difficult to participate in celebrations at work, such as Easter lunch or Christmas dinner, due to multiple sensory stimuli. However, informants expressed a desire to attend and hoped they would find strategies to reduce anxiety. Not being able to participate in social occupations was significantly limiting their daily life.

Enabling daily life through sensory strategies

In addition to limiting distressing sensory stimuli, the informants described strategies that calmed and alerted sensory inputs to help manage physiological and emotional arousal. These included creating a peaceful and restful home and finding other 'safe places' for rest needed in order to later be active.

Spending time with animals or in nature was seen as very peaceful and important for well-being. Physical and creative occupations such as listening to or playing music, painting, reading books and performing domestic occupations were described as both calming and alerting.

The importance of creating a home that provides rest

The home environment was viewed as an important place that provided rest from difficult inputs. Several informants spent time and effort on creating a peaceful home. Some felt colours helped creating a warm atmosphere, while others viewed white or grey hues as creating a calm atmosphere. Sofia says;

I really like it at home. I've made a lot of effort in my home so that I'll like it. It's really nice and cosy. It's sort of me. That's why I like it. I think it's quite important that it's neat and tidy. I think that a home's important, sometimes mine's like my fortress. Sofia

Having a minimum of things was preferred, as a crowded home was visually overwhelming. Tidiness was preferred as a messy home could create stress, nausea, anxiety and even panic. Nora describes the impact of visual and auditory inputs;

At home it has to be quiet and not a lot of visual impact. Not messy. Neat and tidy. Things don't work for me if it's untidy. It makes me confused inside and then I get filled with anxiety. Nora

Having "A Safe Place"

Several informants referred to the phenomenon of finding or having a "safe place", a place of solitude which was used in an acute situation when it was absolutely necessary to withdraw from sensory input. A safe place could be within the home, it was typically in the bedroom and in bed, and was often dark. One informant had blackout curtains and preferred silence in the bedroom. The informants often stayed from between ten minutes to an hour in their safe place. Sometimes sleep was necessary to recovery from sensory input. Wera explains;

I go into my bedroom and turn all the lights off and lie on my bed, breathe a little. The bedroom is pitch black and you can hardly hear anything. I lie down in a foetal position and am cross till it's bubbled down and then I usually cry and then it usually calms down. Wera

Sometimes a safe place was created outside home, when informants needed to withdraw in more public spaces. The car or a restroom for public use could

become a safe place where they could just sit for a while in order to create a calm state of mind.

Finding a safe place was often a strategy used in acute situations, but it was also seen as an on-going strategy for resting and preventing from reacting on distress in daily life. Informants were often at home just relaxing, watching TV and doing daily occupations in environments they experienced as calming. Being alone for a while in a calm and safe environment was necessary for the informants to process sensory overload. Caroline says;

Actually, I feel really good being on my own. When I feel as if lots of things have got stuck, things I've seen or heard, I need to process it, so it doesn't get chaotic, sort of a lot of mess and things in me. So I need peace and quiet, so I don't get stressed because then my body really gets going, it's better to do it in time. Caroline.

Relaxing through nature and animals

Being in nature was an important tool for restoration and experiencing calming sensations. The forest, the sea, open fields and the garden were locations that the informants turned to for recovery. Nature made them feel calm and gave them energy. Visual (e.g. green colours of forest or yellow rapeseed field), auditory (e.g. sound of ocean waves), olfactory (e.g. scents of forest) and tactile inputs (e.g. walking on soft sand) led to a peaceful mind and body. Martin explains;

I feel really well when you look out and see those yellow fields of rape. It's fantastic seeing the colour and the huge solid fields. When I see the fields, yes, it can spread a calmness inside you. When I drove here, you could feel the smell of rapeseed flowers and saw these fields, it's actually relaxing. Martin

Living close to nature was very important for some informants. One informant bought his home because of the beautiful garden which gave him a sense of calm. Another informant found it necessary to live close to the sea and take a walk there every day. Samuel preferred living in a forest. He moved there to avoid all the sensory stimuli connected to city life. He believed that he would not have been alive today if he had not moved closer to nature;

Then I hardly survived (when living in the city). When I was in my worst state I didn't have this place where I live now. Then I had plans to run off and build a wooden hut and live there. It's the peace and quiet in the woods. When I hear the birds. When I hear the wind, when it murmurs through the trees. When I hear the rain splattering, like that makes me calm. Samuel

Being with or watching animals provided peace, joy, reduced anxiety and created a general feeling of trust, as shown in John's account;

I've always loved horses. I know there's something about me that makes animals like me a lot. Everything about horses makes me calm. To be with them, touch them. The strange thing about me and animals is just that, that I'm calmer when I'm with animals. John

The informants suggested that because the animals were more attuned to potential threatening sensory inputs, they could let go of their hyper-alertness and instead trust the animal. Watching TV programmes of animals or nature also gave a sense of peace and joy.

Effects of calming and alerting occupations

Physical occupations could be both alerting and calming. Some informants needed exercise to release energy and induce a calm state. Nora had been exercising every day since she was a teenager;

I really don't work unless I exercise every day. I used to go to the gym and I've done that since I was fifteen, every day of my life. I release... I release energy. It makes me calmer. It's a way of releasing energy. Maybe the consequence of that is that it makes me calm, or calmer. Nora

Creative occupations such as listening to or playing music, painting or reading books were described as both alerting and calming. Tyra had been singing in a choir for a long time and felt that it gave her both pleasure, energy and connectedness to other choir members. She would also sing as calming and altering strategy when doing occupations at home;

I sing once a week. It makes your soul feel good. Once when I had psychosis, I couldn't sing but then after a few years it was better. It gives me something here inside. It's the soul. It feels good. I get energy, I get strength – I – learn something new. I use my voice. I feel so pleased with myself when I come home and I have been to choir singing. I sing all the time even when I'm brushing my teeth. Tyra

The informants liked to perform daily occupations that helped them manage their emotional arousal. To clean, wash clothes, do gardening, snow shovelling, chopping wood, or renovating cars could act as both calming and alerting occupations. However, it was important that these occupations were not carried out under time pressure since this would instead increase the informants' anxiety. Several informants found it difficult to get a 'just right' level of arousal with a balance of calming and alerting inputs. While they had occupations and strategies that were calming, they

found it difficult to find alerting sensory strategies that worked. Caroline expressed concern for how to cope in the future;

I used to have energy, before at least I could get going. I don't know if you can imagine it to work, you know, sort of motivate yourself. When the energy starts in your body. It doesn't do that anymore. I've tried to dance, you know like when you're on your own, when no one can see, to try and see if you can regain some kind of energy. Yes, temporally, but it's very limited, kind of. I'm sad about it, as I can feel that I don't know how to come back again. Caroline

Overall, the informant highlighted a range of difficulties created by sensory processing. However, they also described key strategies for coping with overwhelming sensory input in order to enable daily life. These strategies largely focussed on altering the environment or using the calming or alerting characteristics of specific occupations to manage their arousal.

Discussion

The aim of this study was to investigate the experience of sensory input in daily occupations and strategies use among people with serious mental illness. All informants experienced challenges with particular sensory input and became overwhelmed in certain situations, which affected their occupational engagement. However, the participants also described how they used the sensory characteristics of specific environments and occupations to manage their arousal levels, and achieve a calmer or more alert state while engaged in occupation. Experiences of sensory input was individual. Some sensations were pleasant for one informant but unpleasant for another. The finding that sensory preferences are individual align with reports from earlier studies [12,27], as do the findings that people with mental health issues may have extreme responses to everyday sensations, which affects daily occupations [6,8,11]. From a theoretical perspective, the informants' experience can be understood in relation to the transaction between the person, the occupation and their environment [28].

In relation to personal factors, the individual nature of sensory triggers and preferences was central to their accounts. All informants experienced challenges with processing sensory input and easily became overwhelmed. The informants intuitively used strategies in their everyday life, but were not always consciously aware of their triggers, sensory preferences or the strategies. This is in line with earlier research reflecting the experience of individuals with

trauma history [12]. The finding highlights the importance of helping service users to better understand their own sensory processing patterns, which has also been reported in earlier research [6,12].

Research shows that through identifying sensory preferences, individuals may learn that specific stimuli can either be avoided or increased to support a desired calm or alert state [13–14], which the informants also wished for. The informants tried to control sensory stimuli through ignoring, avoiding or limiting sensory inputs. Most informants recognised which sensory stimuli were most challenging and what they needed to do in order to reduce negative emotional responses. Earlier research also implies that awareness of preferences supports empowerment and helps individuals to become their own expert when expanding the range of sensory strategies in specific daily occupations [14,27].

According to occupational therapy research, engagement in occupation has been shown to be closely linked to health and well-being [29]. However, the informants' reported significant challenges with certain occupations, particularly those with complex social interactions. Previous quantitative studies have found that people with mental health issues with low registration and sensory sensitivity had reduced levels of engagement in social and community participation [17]. The present findings add to this evidence by offering descriptive accounts of the experience. Earlier research has also shown that attempts to control or avoid overwhelming input may lead to social withdrawal [8], which was evident in this study. It appears there is a balance to be struck between having a safe place in acute situations of overload, and relying on avoidance and withdrawal to the extent that it affects social connectedness.

Avoiding social occupations is not just limiting in the moment, but it may also reduce the possibility of personal recovery. Social connectedness is a key element in the process of recovery, not only to family and friends, but also to the wider community and feeling part of society. Personal recovery has been defined by Leamy et al. [30] as to involve aspects of connectedness, hope, identity, meaning and empowerment. Doroud et al. [31] also implied that connecting with others, and participating in and belonging to the community is of great importance for the recovery process of people with mental illness.

The informants also described using the calming and alerting characteristics of particular occupations to modify their arousal levels. Occupations such as looking after animals, singing, doing gardening, and

exercising, chopping wood and cleaning all had calming as well as alerting elements. The informants recognised the impact of the occupations on their arousal, many of which they used intuitively as coping strategies. Previous research shows that people develop own coping strategies to manage sensory processing and perform daily occupations [12]. The informants more easily described calming strategies and occupations than alerting ones, which helped them to manage overstimulation and emotional distress. Several informants had no alerting strategies, which was a problem, as such strategies could help to them to engage in daily occupations.

Finally, the environment was an important component for creating either distress or a safe space. Altering the environment by using calming features or moving to a less overwhelming context was the most common strategy reported for managing sensory overstimulation. Having some control over the environment was key, as it was found easier to process sensory input if they knew what caused it or if the input was organised and predictable. This is in line with theories of sensory modulation where calming stimuli are typically familiar and predictable, while alerting sensations are unpredictable and demanding [12]. Finding a safe place where input could be controlled and withdrawing from overwhelming sensations was helpful in acute situations. Research in ward settings found that sensory modulation within a safe place, such as a sensory room, can lead to reduced anxiety and distress [12–13]. In this sense, the informants created their own sensory rooms or spaces, using strategies such as blocking out auditory input or using self-selected music as well as visual, olfactory (e.g. scented candle light) and tactile inputs where they could feel calm. In addition to coping with acute situations, some informants needed to stay at home for up to a week to rest and recover from sensory overload.

Informants also reported controlling stimuli by avoiding potentially overstimulating contexts. According to Dunn's model of sensory processing [10], individuals with avoidant patterns have low neurological thresholds and stimuli quickly become overwhelming. Though, in the current study, the informants were not assessed for their specific sensory patterns, the findings highlight that mental illness is complex with multiple factors affecting responses and behavioural patterns. However, research shows that through self-regulation individuals can limit exposure to sensory input and make environmental stimuli more predictable [11,32].

Overall, the findings highlight important sensory related characteristics of the person, the occupation and the environment that interact to influence individuals' arousal levels, coping strategies and daily occupations. The findings reinforce that people with mental illness intuitively utilise sensory modulation strategies in their daily life. To rely on own reflections about oneself, the occupations performed and the environments the person is in, from a sensory perspective, is vital for persons with serious mental illness. Research have indicated that education is a key aspect of understanding sensory modulation [14]. However, the education should involve drawing out existing embodied or intuitive understanding, so that the service user can use strategies more consciously and expand their repertoire of helpful occupations.

The current study builds the knowledge on experience of sensory input among people with serious mental illness. As indicated by our results, there is a need to further study on both calming and altering strategies that enable engagement in daily occupations. A calm state should not always mean solitude, as mostly reported in the current study, but rather engagement in society, and alerting strategies need to support engagement more fully.

Methodological considerations

A limitation was that most informants were born in Sweden. A further study with informants from other cultural backgrounds would help us understand how sensory processing manifest in different occupations and environments and what strategies are used. Additionally, the interviews took place at the clinic. An alternative context could be the informant's home, where they may have felt safer and more comfortable to share their experiences. However, the access to staff support following the interview would then be prevented and an unknown person in the home could be stressful. It was hence argued that the clinic would be both comfortable and familiar. The pre-understanding of the first author (HA) connected to the role of being a clinical occupational therapist may have impacted the results. However, cautions were taken regarding this, and the pre-understanding was discussed and reflected on before and during the analytical process with the co-authors.

Conclusions and clinical implications

Our findings provide further evidence that helping raise awareness of sensory issues and applying a

sensory-focussed lens forms an important part of occupational therapy in mental health services. The results confirm earlier studies, that people with serious mental illness have difficulty processing sensory stimuli which affects daily occupations [8,11]. The results showed that experiences of sensory input were individual, which also is in line with earlier studies [27]. The informants described different self-modulation strategies that they intuitively used, but were often unaware of their sensory preferences and instead avoided occupations and social contexts. They used both calming and alerting strategies, although lack of alerting strategies limited occupational engagement. The results imply that users can benefit from occupational therapy to raise self-awareness of sensory preferences and helpful and distressing elements in daily occupations. Helping service users to understand their personal strengths and difficulties and to manage their own arousal levels is essential in order to enable occupational engagement [12]. Since understanding preferences is important researchers have developed so called sensory profiles [10] which has been shown to assist in creating awareness and need for particular forms of self-modulation [27]. Research underpinning the importance of sensory modulation intervention also imply that talking-based therapy may not be fully effective for people with sensory processing difficulties because the reactions originate in bodily sensation, rather than thought processes [4]. Accordingly, there is a need for further in-depth research for enhanced sensory approaches, but also efficacy studies, to support improvement in daily occupations in social contexts and wider community.

Disclosure statement

The authors report no conflict of interest.

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