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Extreme sensory processing patterns and their relation with clinical conditions among individuals with major affective disorders

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ABSTRACT

Previous studies highlighted the involvement of sensory perception in emotional processes. However, the role of extreme sensory processing patterns expressed in hyper- or hyposensitivity was not thoroughly considered. The present study, in real life conditions, examined the unique sensory processing patterns of individuals with major affective disorders and their relationship with psychiatric symptomatology. The sample consisted of 105 participants with major affective conditions ranging in age from 20 to 84 years (mean = 56.7 ± 14.6). All participants completed the Temperament Evaluation of Memphis, Pisa, Paris and San Diego (TEMPS-A), the second version of the Beck Depression Inventory (BDI-II), and Adolescent/Adult Sensory Profile (AASP). Sensory sensitivity/avoiding hypersensitivity patterns and low registration (a hyposensitivity pattern) were prevalent among our sample as compared to normative data. About seventy percent of the sample showed lower seeking tendency. Stepwise regression analyses revealed that depression and anxious/cyclothymic affective temperaments were predicted by sensory sensory/avoiding. Anxious and irritable affective temperaments were predicted by low registration. Hyperthymic affective temperament and lower severity of depression were predicted by sensation seeking. Hyposensitivity or hypersensitivity may be "trait" markers of individuals with major affective disorders. Interventions should refer to the individual unique sensory profiles and their behavioral and functional impact in the context of real life.

1. Introduction

Several studies highlighted the involvement of sensory perception in emotional deficits of higher-order processes (Van Rheenen and Rossell, 2013; Leitman et al., 2010). Extreme sensory processing patterns, also termed as *Sensory Processing Disorders* (SPD) encompass difficulties in registering and modulating sensory information and organizing sensory input to execute successful adaptive responses to situational demands (Humphry, 2002; Miller et al., 2007). These patterns are mainly expressed in hyper- or hyposensitivity to non-aversive stimuli (Bundy et al., 2002; Liss et al., 2005). Dunn suggested a model which refers to the interaction between the neurological threshold and active and passive self-regulation strategies. This model investigates the relationship between the individual neurological thresholds and behavioral responses derived from self-regulation strategies (Brown et al., 2001; Dunn, 1997). In low neurological threshold, the nervous system is activated by minimal stimuli while in high neurological threshold a large amount of stimuli is needed for activation. In regard to self-regulation strategies, individuals with passive strategies allow stimuli to occur while subjects with active strategies act to control the amount of stimuli around them (Dunn, 2001).

According to Dunn's model, four sensory processing patterns exist. Each of these patterns describes the interaction between the individual's neurological threshold and behavioral responses. The first two patterns refer to individuals with hyposensitivity: (1) low

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registration – may be found in individuals with high neurological thresholds (requiring high intensity stimuli to detect sensory input) and passive self- regulation strategies (failing to detect stimuli that others are able to perceive). They may be considered as indifferent, having lack of motivation or interest in initiating social relationships. They may show inability to recognize emotions, express emotions or infer other's emotions from bodily language or facial expressions but they may also lack of sense of humor (Dunn, 1997). (2) Sensation Seeking – may be identified in individuals with high neurological thresholds and active self-regulation strategies. They experience pleasure from exciting sensory environments and behaviors. They often show risk-taking behaviors that are usually expressed by lack of physical boundaries. They may be also considered by others as irresponsible, impatient and lacking of respect (Dunn, 2001; Brown et al., 2001).

The two last patterns refer to individuals with hypersensitivity: (3) sensation avoiding – can be found in individuals with low neurological thresholds (requiring low intensity stimuli to react) and active self-regulation strategies. They are usually engaged in behaviors that limit exposure to stimuli, and experience exclusion and social withdrawal (Miller et al., 2007). (4) Sensory Sensitivity – may be identified in people with low neurological thresholds and passive self-regulation strategies who often experience distractibility and discomfort with sensation. They usually let things happen and do not actively act to avoid them (Dunn, 2001, 1997). These individuals can have aggressive and negative reactions to sensory stimuli that they experienced as intense, overwhelming, and invasive (Miller et al., 2007). Their intense reactivity to sensations may explain why they tend to be characterized by feelings of tension, anxiety, and nervousness, inability to be comforted and relax as well as by problems in initiating relationships.

Recently, Dunn's Model for Sensory Processing (Dunn, 1997) has been also updated: the new version is called Dunn's Sensory Processing Framework (2014), which is outlined in the Sensory Profile 2 manual (Dunn, 2014).

Sensory hyposensitivity has been associated with depression and lower levels of arousal, whereas sensory hypersensitivity has been linked with anxiety and higher levels of attention and arousal (Kinnealey and Fuiek, 1999; Pfeiffer et al., 2005).

Extreme sensory processing patterns, or SPD, may be found among 2–14% of the typical population (Brown and Dunn, 2002), they may lead to maladaptive behaviors, impaired functioning and altered quality of life (Ben-Avi et al., 2012; Miller et al., 2007; Humphry, 2002). The prevalence of SPD is higher among individuals with psychiatric disorders such as schizophrenia (Brown and Dunn, 2002), major depression and anxiety (Engel-Yeger et al., 2013) as SPD are closely related to mood, affective temperaments, and daily life functioning (Baranek, 1999; Engel-Yeger, and Dunn, 2011a). Indeed, some researchers already used the term ‘sensory affective disorder’ several decades ago (Wilbarger and Wilbarger, 1991). Individuals with major depressive disorder (MDD) may exhibit elevated “emotional allodynia”, namely sensitivity to the emotional impact of experimental thermal pain as measured by emotional unpleasantness (Ushinsky et al., 2013). The higher sensory sensitivity (e.g., altered negative emotional response to normally non-aversive stimuli) could be a stable characteristic of individuals with MDD across the life span independently of acute mood states. Also, individuals with bipolar disorders (BD) show hypersensitivity to emotional stimuli and higher arousability, even during remission phases (Henry et al., 2012). Interestingly, two types of bipolar depression have been proposed: one being characterized by emotional hypo-reactivity and global behavioral inhibition, and a second characterized by emotional hyper-reactivity (Henry et al., 2010).

Based on behavioral and neurophysiological studies, sensory processing patterns were also found to be associated with emotional and arousal processes (Dunn, 1997) but existing studies on SPD among patients with affective disorders were mainly performed in laboratory settings. Importantly, specific SPD characteristics of individuals with major affective and anxiety disorders together with their expressions in all sensory modalities of daily life have been not investigated thoroughly.

Subjects with major affective disorders experience significant psychosocial disability, long-term functional impairments, and suicidal behavior (Pompili et al., 2013; Gonda et al., 2012). The overall social burden encourages researchers to identify common risk factors underlying these conditions in order to provide early management and adequate treatments.

Affective temperaments have been also suggested to play a significant role in the psychopathological characteristics of mood disorders including the direction of polarity, the nature of symptomatology, the evolution of minor/major mood episodes and long-term course (Rihmer et al., 2010; Oedegaard et al., 2009; Lara et al., 2006; Sayin and Aslan, 2005; Akdeniz et al., 2004; Liraud and Verdoux, 2001). Screening for affective temperament profiles has importance for designing both treatment and rehabilitation plans in affective disorder patients (Pompili et al., 2013). Unfortunately, there are currently no studies in literature concerning the differential association between sensory profiles and affective temperaments in individuals with major affective disorders.

Based on the above context, the present study aimed to: (1) characterize the prevalence of SPD among individuals with major affective disorders; (2) examine the relationship between SPD, severity of affective symptomatology, and affective temperaments; (3) examine the sensory pattern that may significantly predict affective symptoms; (4) ascertain whether this prediction is stronger than that exerted by socio-demographic variables.

2. Methods

2.1. Subjects

Based on power analysis of .80 ($p=0.05$ and effect size of 0.25), the study should include 85 participants. Our sample included 105 participants with an age ranging from 20 to 84 years (mean$=56.75 \pm 14.62$). Participants were distributed as follow: 55.2% of them were diagnosed with unipolar MDD and 44.8% with Bipolar Disorder type I (BD-I) and type II (BD-II). Individuals with BD, when consecutively admitted, were diagnosed as follow: BD-I with manic or mixed episode (12.8%); BD-I with depressive episode (17%); BD-II with hypomanic episode (6.4%); BD-II, with depressive episode (51%); cyclothymia (12.8%). They were all consecutive outpatients who had visited our hospital for at least 6 months and whose medication regimens had been stable for at least 6 months prior to recruitment. Overall, participants took the following medications: 29.5% short half-life, 25% middle half-life, and 4% high half-life benzodiazepines, respectively; 64.8% antidepressants (68.4% Selective Serotonin Reuptake Inhibitors, 17.4% Serotonin Noradrenaline Reuptake Inhibitors, and 14.1 other antidepressants); 34.6% mood-stabilizers; 21.6% second-generation antipsychotics.

All participants were consecutively admitted to the Department of Neuroscience (DINOGMI), University of Genoa, between July and December 2014. The inclusion criterion was a diagnosis of MDD, BD-I, and BD-II, based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, TR) (American Psychiatric Association, 2000). Exclusion criteria were any condition affecting the ability to fill out the assessment including delirium, mental retardation, dementia or any severe neurological and medical diseases, and denial of the informed consent. Psychiatric histories were carefully collected by clinical psychiatrists