



## Research paper

## Sensory profiles as potential mediators of the association between hypomania and hopelessness in 488 major affective outpatients



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## ABSTRACT

**Introduction:** Extreme sensory processing patterns may contribute to the pathophysiology of major affective disorders. We aimed to examine whether significant correlations exist between sensory profiles, hypomania, self-reported depression, and hopelessness and whether sensory profiles may be potential mediators of the association between hypomania and depression/hopelessness.

**Methods:** The sample consisted of 488 euthymic affective disorder patients of which 283 diagnosed with unipolar and 162 with bipolar disorder with an age ranging from 18 to 65 years (mean = 47.82 ± 11.67).

**Results:** Lower registration of sensory input and sensory sensitivity significantly correlated with elevated self-reported depression, hopelessness, and irritable/risk-taking hypomania while sensation seeking and avoiding significantly correlated with elevated depression and hopelessness but not with irritable/risk-taking hypomania. Moreover, individuals with lower ability to register sensory input and higher hypomania showed higher self-reported depression than those with good registration of sensory information. According to SEM analyses, there was both a direct/indirect effect of irritable/risk-taking on depression-hopelessness with the mediation model explaining 48% of the variance in depression-hopelessness.

**Limitations:** The relatively small sample size and the cross-sectional nature of the study design do not allow the generalization of the main findings.

**Conclusion:** Low registration was associated with enhanced depressed mood and hopelessness while sensory seeking may be considered a resilient factor.

## 1. Introduction

Sensory processing refers to the ability to register/modulate sensory information and organize sensory input in order to respond to situational demands (Humphry, 2002). Extreme sensory processing patterns include hyper- or hyposensitivity to non-aversive stimuli (Miller et al., 2007). Impairments concerning sensory processing have been first described in 1960's and 1970's (Bogdashina, 2003), using the following terms: “sensory dysfunction”, “sensory perceptual impairments”, and “disturbances of sensory modulation/information processing”.

Here, we specifically refer to the model which was proposed by Dunn (1997). This model refers to the relationship between subjective

neurological thresholds and behavioural self-regulation strategy (Dunn, 1997; Brown and Dunn, 2002). Individuals with hyposensitivity have higher neurological threshold while those with hypersensitivity have lower neurological threshold. Those who use passive behavioural strategies allow stimuli to occur based on their threshold, while individuals using an active behavioural strategy usually counteract their threshold and control the amount/type of sensory input they perceive (Dunn, 1997).

Subjects with sensory processing disorders may be considered as being continuously under sensory overload. As a result, their nervous system is really stressful and shows an important inflexibility together with the inability to modulate stimuli that are perceived as

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overwhelming, and difficult to manage.

The model proposed by Dunn refers to four patterns of sensory processing with the first two related to hyposensitivity: (1) Subjects with low registration failing to detect sensation and not actively seeking for sensory input (usually described as unmotivated, withdrawn, and inattentive); (2) Individuals who are sensory seekers that commonly enjoy rich sensory environments/activities. Sensation seekers may show impulsivity and risk-taking behaviors. The other two patterns are related to hypersensitivity: (3) Subjects who are sensory sensitive and feel discomfort with regular sensations but they do not actively restrict their exposure to uncomfortable stimuli; (4) individuals who are sensation avoiders and are usually described as introspective as they actively limit the exposure to sensory information. When sensory processing patterns do not impair with daily life activities, they may be considered individual/specific trait characteristics.<sup>6</sup> However, when they are extreme and significantly interfere with psychosocial functioning and/or participation/involvement in daily life, they need to be considered as sensory processing disorders (SPD) (Miller et al., 2007; Dunn, 2001).

Sensory processing problems are generally not recognized as factors involved in the negative outcome of psychiatric conditions nor mentioned as differential diagnoses able to negatively impact on the illness course although significantly affecting psychosocial functioning and determining emotional instability. For instance, major affective disorders are worldwide associated with long-term disability, psychosocial impairment, and poor intervention outcomes including suicidal behavior (Pompili et al., 2011, 2012) but the involvement of impairments regarding emotional processes or sensory processing has been only marginally hypothesized and not systematically addressed in the pathophysiology of these conditions (Van Rheenen and Rossell, 2013; Leitman et al., 2010). SPD appear to share important clinical similarities with major affective disorders (e.g., some of the criteria for juvenile bipolar disorder, specifically the item five of the ‘Core Phenotype – Research Diagnostic Criteria’ for juvenile bipolar disorder) (Papolos, 2005).

Overall, consistent evidence indicated that subjects with unipolar/bipolar disorders are impaired in their ability to process sensory environmental information (Serafini et al., 2016a, 2016b) but these subjects, who presumably represent a subgroup at higher risk of negative outcome are clinically not adequately recognized. Extreme sensory processing patterns have been proposed as a stable dimension able to characterize individuals with major affective disorders (Engel-Yeger et al., 2016a, 2016b). Indeed, subjects with extreme sensory processing patterns frequently presented impairments in modulating emotional/behavioural responses. Sensory processing disorders may be considered as a leading cause of disability in major mood disorders, especially the hypo-sensitive pattern of low registration which is associated with enhanced depressed mood in specific subtypes of major affective disorders (Engel-Yeger et al., 2016a).

It is also well known that the careful evaluation of previous hypomania episodes in individuals with major affective disorders needs specific attention and even caution in psychiatric practice (Maj et al., 2002). Subjects do not always perceive hypomania as pathological, and, as a result, they do not spontaneously report it in the current clinical practice (Scott, 2001). Thus, the correct recognition of hypomanic episodes is abnormally delayed altering the appropriate diagnostic identification (Baldessarini et al., 2010). To this regard, it is well known that subjects with bipolar disorder (BD) often report that, although their symptoms occur early in life, the adequate diagnosis is usually delayed of approximately ten years (Hirschfeld et al., 2003). Misdiagnosis in BD is a very relevant public health problem as it is usually associated with delayed therapeutic interventions and unfavorable treatment outcomes. Untreated hypomania is commonly associated with financial, legal, occupational, and psychosocial problems (Yatham et al., 2013). Thus, the periodic screening of hypomanic symptoms in subjects presenting atypical depressive episodes may be crucial for the

early detection and adequate BD treatment. Hypomania is also associated with impulsive decision-making and risk-taking behavior that may arise from hypersensitivity to reward and early influence of attention on reward processing, providing support for reward dysregulation in major affective disorders (Mason et al., 2012).

Furthermore, major affective disorders are worldwide associated with poor intervention outcomes including suicidal behavior (Pompili et al., 2011, 2013). According to cognitive assumptions, suicidal behavior has been conceptualized as an exit of hopelessness/despair (Minkoff et al., 1973). Hopelessness has been proposed as a pessimistic cognitive structure for the future and identified as an independent predictor of suicidal behavior (Pompili et al., 2013). Unfortunately, there are no studies in the current literature investigating the specific relation between extreme sensory processing patterns/SPD and hopelessness neither studies addressing the complex interaction between sensory processing patterns/SPD, hypomania, and self-reported depression during emotion processing.

Thus, the present manuscript is mainly aimed to: (1) examine whether significant correlations exist between extreme sensory processing patterns, hypomania, self-reported depression, and hopelessness; (2) investigate whether sensory profiles may be potential mediators of the association between hypomania and depression/hopelessness.

We mainly hypothesized that: 1) individuals with specific sensory processing patterns (the hypo-sensitive pattern of low registration) might exert higher hypomanic symptoms (evaluated using the hypomania checklist) and higher hopelessness (assessed using the Beck Hopelessness Scale) as well as 2) sensory profiles may significantly mediate the relation between hypomania and depression/hopelessness.

## 2. Methods

### 2.1. Participants and procedure

The sample consisted of 488 currently euthymic affective disorder patients of which 283 diagnosed with unipolar and 162 with BD (43 missing cases) having an age ranging from 18 to 65 years (mean =  $47.82 \pm 11.67$ ). Participants were distributed as follows when admitted: 63.1% of subjects were diagnosed with unipolar major depressive disorder (MDD), 16.2% with bipolar disorder type I (BD-I), and 20.7% type II (BD-II). They were all consecutive outpatients receiving only maintenance treatment that have been followed by our university outpatient service for at least 12 months. Specifically, their psychoactive medication regimens and their psychopathological conditions were stable for at least 6 months.

All participants were admitted to the Department of Neuroscience (DINOEMI), University of Genoa, outpatient service, between July 2014 and April 2016. The inclusion criterion was a diagnosis of major affective disorders such as MDD, BD-I, and BD-II as specified. Exclusion criteria were any condition affecting the ability to fill out the assessment including delirium, dementia or any severe neurological diseases including mental retardation, and denial of the informed consent. Diagnostic criteria were based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, TR) (American Psychiatric Association, 2001). Psychiatric histories were carefully collected by clinical psychiatrists and psychologists (GS and GC) and later verified using the Mini International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998). All patients accepted voluntarily to participate in the study and gave their informed consent. The study design was approved by the local Ethical Review Board. Participants' socio-demographic information have been summarized in Table 1.

### 2.2. Measurements

#### 2.2.1. The Adolescent/Adult Sensory Profile (AASP)

The AASP (Brown and Dunn, 2002) is a self-report psychometric tool

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