



## Research paper

# Positive affective functioning in anhedonic individuals' daily life Anything but flat and blunted



V.E. Heininga<sup>a,\*</sup>, E. Van Roekel<sup>a,c</sup>, J.J. Ahles<sup>b</sup>, A.J. Oldehinkel<sup>a</sup>, A.H. Mezulis<sup>b</sup>

<sup>a</sup> University of Groningen, University Medical Center Groningen, Department of Psychiatry, Interdisciplinary Center Psychopathology and Emotion regulation The Netherlands

<sup>b</sup> Department of Clinical Psychology, Seattle Pacific University, USA

<sup>c</sup> Tilburg University, Department of Developmental Psychology, The Netherlands

## ARTICLE INFO

## Keywords:

Ecological momentary assessment (EMA)

Anhedonia

Reward

Positive affect (PA)

Emotional reactivity

Mood-brightening effect

## ABSTRACT

**Background:** Anhedonia, the decreased interest and pleasure, is often described as ‘flat’ or ‘blunted’ positive affect (PA). Yet, little is known about PA functioning in anhedonic individuals’ daily lives. The current study investigates PA reactivity to pleasurable experiences in anhedonia together with its relevant temporal dynamics (i.e., variability, instability, and inertia), and expands current knowledge by exploring the role of arousal therein. **Methods:** Using the Experience Sampling Method (ESM), we collected 90 assessments of real-life PA experiences across 30 days in 18–24 year old individuals with anhedonia (N=69) and without anhedonia (N=69).

**Results:** Multilevel analyses showed that anhedonia was associated with less intense pleasure experience, and lower levels of PA. Contrary to predictions from laboratory research and depression theory, individuals with anhedonia showed more variability and less stability in PA, and no signs of blunted PA reactivity. In fact, when exploring high and low arousal PA, individuals with anhedonia showed a slightly stronger reactivity to pleasurable experiences in high-arousal PA but not low-arousal PA.

**Limitations:** We did not control for previous pleasure experiences and, instead of the last positive event, accumulation of positive events may have determined the change in high-arousal PA.

**Conclusions:** Individuals with anhedonia are likely less ‘flat’ or ‘blunted’ than generally thought. Although replication is warranted, impairments in high-arousal positive emotions may be of particular interest in the clinical treatment of anhedonia.

## 1. Introduction

In psychology and psychiatry, positive moods such as feeling enthusiastic, cheerful, or relaxed are collectively referred to as Positive Affect (PA). In addition to its natural ebbs and flows (Peeters et al., 2006), PA is transiently elicited by appetitive cues. The uplift in PA in response to these cues has the power to establish, maintain, or disrupt an individuals’ ongoing relations to the environment and facilitates action tendencies to approach or to avoid (Eid and Diener, 1999; Frijda, 1988; Lang and Bradley, 2010). Whereas high levels of PA foster a wide array of positive outcomes in one’s daily life (Fredrickson and Joiner, 2002; Fredrickson, 2013; Lyubomirsky et al., 2005; Tice et al., 2007), dysregulation of PA plays an incremental and crucial role in mood disorders – and in anhedonia in particular.

Anhedonia is clinically defined as the “markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly

every day” (American Psychiatric Association, 2013). The symptom is common in eating disorders, substance use disorders, and schizophrenia, and is most known for its prominence in the depression diagnosis. That is, anhedonia is one of the two core symptoms of depression, has a prominent role in both adult depression (e.g., see Pizzagalli, 2014, for a review) and youth depression (e.g., see Forbes and Dahl, 2012, for a review), and is present in about 72% of emerging adults’ first major depressive episode (Lewinsohn et al., 2003). Despite the transdiagnostic nature of anhedonia and its prominence in depression diagnosis, PA functioning in anhedonia is not yet fully understood.

## 2. PA reactivity in anhedonia: hypo or hyper?

Based on conceptual models of depression, there are two relevant views on how anhedonia impacts individuals’ PA functioning. The first relevant view is called the Positive Attenuation hypothesis, which

\* Corresponding author.

E-mail address: [v.e.heininga@umcg.nl](mailto:v.e.heininga@umcg.nl) (V.E. Heininga).

<http://dx.doi.org/10.1016/j.jad.2017.04.029>

Received 24 November 2016; Received in revised form 11 January 2017; Accepted 19 April 2017

Available online 21 April 2017

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predicts a reduced responsiveness to appetitive stimuli in depression, manifested by reduced reactivity to positive emotional stimuli or contexts (Rottenberg et al., 2005). The second view is the Emotion Context Insensitivity (ECI) theory which predicts constricted affective reactions to both positive and negative contexts, because depression would flatten the emotional landscape as a whole and would cause insensitivity to any given emotional context (ECI; Rottenberg, 2005). Irrespective of the inclusion of negative affect (NA), both views postulate that depressive symptoms go along with flat and blunted PA that is hypo reactive to positive contexts or stimuli.

In line with these conceptual models, laboratory research consistently shows blunted reward responses to stimuli in individuals with depression or depressive symptoms (see for a meta-analysis: Bylsma et al., 2008), and in individuals with social and physical anhedonia (Kerns et al., 2008). Contrary to predictions by conceptual models of depression and findings from laboratory research, however, studies designed to capture momentary ratings of experiences using the Experience Sampling Method (ESM; Csikszentmihalyi and Larson, 1987) or Ecological Momentary Assessment (EMA; Stone and Shiffman, 1994) show quite a different picture. That is, the few ESM studies investigating PA reactivity to pleasurable experiences show either no evidence of blunted reactivity in relation to depression or depressive symptoms (Bylsma et al., 2011; Oorschot et al., 2013; Thompson et al., 2012; van Roekel et al., 2015), or evidence for the opposite: a stronger PA response to positive events in depressed versus non-depressed (Peeters et al., 2003).

In addition to the surprising stronger PA response, Peeters et al. (2003) found a stronger decrease in NA in response to positive events in individuals with MDD. This improvement of mood that was counter-intuitively greater in depressed than non-depressed individuals was coined the “mood-brightening effect”. Since then, other studies of emotion reactivity to positive events in daily life observed the same effects: a greater reactivity in the sense that depressed individuals showed a stronger decrease in NA in response to positive events than their non-depressed counterparts (Bylsma et al., 2011; Thompson et al., 2012).

### 3. PA dynamics in anhedonia

To gain more insight into how the dynamics of positive affective experiences unfold in daily life, one can study PA in terms of its variability, inertia, and instability (Houben et al., 2015; Trull et al., 2015; Wichers et al., 2015). Whereas emotional variability refers to the spread or dispersion in scores (e.g., standard deviation or variance), emotional inertia refers to the resistance to change as captured by the autocorrelation (i.e., the correlation between PA on T and PA on T-1 within the individual that can vary randomly across individuals). High inertia means high moment-to-moment transfer of emotions, and strongly consistent continuation in feeling as one has felt previously may indicate low context sensitivity. Emotional instability is generally measured by the Mean Squared Successive Difference (MSSD; Jahng et al., 2008), which captures the magnitude of consecutive emotional change after a frequency of shifts correction.

Although anhedonia is often operationalized as lack of PA (e.g., Bedwell et al., 2014), ‘flat’ PA (e.g., Myin-Germeys et al., 2000), or ‘blunted’ PA (e.g., Shankman et al., 2014), only one ESM-study investigated the temporal dynamics of PA in anhedonia. van Roekel et al. (2015) were the first and only to zoom in on the anhedonia symptom. Contrary to what the authors expected, however, those adolescents who endorsed the anhedonia symptom did not differ from those who did not endorse the symptom in terms of their variability, stability, and inertia in PA. According to the authors, this lack of associations might stem from the fact that anhedonia was assessed with a single item on loss of interest, which is why the authors call for a replication with a more extensive measure of anhedonia. Furthermore, the few ESM-studies that investigated the temporal dynamics of PA

among depressed individuals or individuals with depressive symptoms have shown inconsistent findings. Whereas some find more depressive symptoms related to higher levels of PA variability and PA instability (van Roekel et al., 2015), others find no differences in temporal dynamics in PA related to depression (Peeters et al., 2003; Thompson et al., 2012).

### 4. The possible role of arousal in PA functioning

In addition to the valence dimension of affective experiences, affect most likely also holds an arousal dimension that conveys information on an individuals’ general action readiness or behavioral activation (Bradley and Lang, 2007; Harmon-Jones et al., 2013; Lowe and Ziemke, 2011). Individuals with anhedonia have consistently been found to exhibit reduced motivation and impaired effortful decision-making in depression and schizophrenia (Franzen and Brinkmann, 2016; Gold et al., 2013; McCarthy et al., 2015; Shankman et al., 2014; Yang et al., 2014). Notwithstanding the large variation in how the valence and arousal dimension of affective experiences are related to each other (Barrett, 1995; Kuppens, 2008), the valence-arousal relation may co-vary by other psychological characteristics (Kuppens et al., 2016). So far, there is support for the role of an arousal-related deficit in anhedonia (Germans and Kring, 2000), yet only one laboratory study by Kerns et al. (2008) explored whether impairments in PA functioning in anhedonia particularly resided in high-arousal PA. Although the authors found social and physical anhedonia both associated with decreased PA reactivity to lab stimuli, this decrease was not specifically pronounced in high-arousal PA. However, the difference in PA functioning for low and high arousal PA has never been investigated in daily life, and by means of ESM.

### 5. The present study

Given the prominence of anhedonia in the depression diagnosis and its transdiagnostic nature, the present study describes PA functioning in individuals with anhedonia with the aim to contribute to the existing literature in two important ways. First, we investigated PA reactivity to pleasurable experiences in anhedonia together with its relevant temporal dynamics (i.e., variability, instability, and inertia), providing a complete picture of PA functioning in the daily life of emerging adults with anhedonia. Second, we distinguished between high and low arousal PA functioning, and are the first ESM study to explore the role of arousal in the PA functioning of anhedonic individuals.

We compared PA functioning in daily life between individuals with and without anhedonia, and expected individuals with anhedonia to show: 1) less intense pleasure experiences; and 2) lower levels of PA. Furthermore, given that predictions from laboratory and ESM studies on PA reactivity are contradictive, we expected those with anhedonia to show 3) deviations in PA reactivity to pleasure experiences, and 4) deviations in temporal dynamics of PA (i.e., variability, instability, and inertia). Finally, we explored the potential role of arousal by re-examining the second to fourth hypotheses on PA functioning while distinguishing low from high arousal PA.

## 6. Method

### 6.1. Sample

Data come from the experience-sampling part of the ‘No Fun No Glory’ (NFNG) study. The NFNG randomized controlled study is registered in the Dutch Clinical Trial Register (NTR5498), was approved by the Dutch Central Medical Ethics Committee from the University Medical Center Groningen (no. 2014/508), and is described in more detail by van Roekel et al. (2016). In short, the NFNG study included an online screening-tool among 2937 emerging adults living in the Northern part of the Netherlands (78% women;  $M_{age}=21.4$  years,

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