



Anhedonia in schizophrenia and psychosis spectrum disorders: An integrative review[☆]

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ABSTRACT

Anhedonia and related motivation and pleasure (MAP) deficits are prevalent in schizophrenia and psychosis spectrum disorders, are generally persistent over time and show limited treatment response. These symptoms are of clinical importance as they contribute to the profound social impairment and reduced quality of life in schizophrenia and psychosis spectrum disorders. This selective narrative review examines methods for assessing anhedonia and MAP deficits followed by a summary of current research on factors that contribute to these symptoms with a focus on identifying continued gaps in our understanding. Literature spanning affect and hedonic responding is reviewed with an examination of the role of cognitive deficits, neural mechanisms, dysfunctional beliefs, behavior, sleep and environmental factors. Current treatment approaches are highlighted including recent advances in pharmacotherapy and psychosocial treatments.

At its broadest, anhedonia is defined as the reduced experience of pleasure. Anhedonia was included in the first descriptions of the core deficits characterizing schizophrenia (Bleuler, 1950; Kraepelin, 1919) and anhedonia figured in early models of genetic factors and associated phenotypes related to schizophrenia spectrum disorders (Meehl, 1962, 2001). In contemporary models of schizophrenia symptomatology, anhedonia is considered a core negative symptom that is included various negative symptom measures (Andreasen, 1989; Kay et al., 1987; Kirkpatrick et al., 2011; Kring et al., 2013).

Anhedonia has been identified across schizophrenia spectrum disorders and other psychotic disorders and is evident across all stages of the illness including in first episode psychotic disorders (Ricci et al., 2025) and in those at ultra-high risk of psychosis (Pelizza et al., 2020). Evidence indicates that anhedonia (across measurement modalities) is persistent over time and appears to represent a durable symptom across stages of the illness (Blanchard et al., 2001; Buck and Lysaker, 2013; Rucci et al., 2023). Anhedonia and more broadly motivation and pleasure deficits assessed in clinical interviews have repeatedly shown to have robust associations with poorer functioning (Blanchard et al., 2017; Blanchard et al., 1998; Kring et al., 2013). Despite recent medication developments, anhedonia and other negative symptoms remain an unmet therapeutic need and require additional research to enhance interventions (Aleman et al., 2017; Correll and Schooler, 2020;

Marder, 2026).

This selective narrative review will highlight developments in our understanding of anhedonia. In discussing research on anhedonia this will include findings from the broader experiential domain of motivation and pleasure (MAP) negative symptoms (Blanchard et al., 2017; Kring et al., 2013). The MAP facet includes anhedonia and correlated symptoms reflecting diminished motivation for engagement in social, vocational or recreational activities and this MAP facet been used in research reports examining anhedonia (Blanchard et al., 2017a; Kring and Barch, 2014; Kring et al., 2013; Merchant et al., 2022). This approach is not to judge whether anhedonia is best measured as an independent first order facet or within a broader second order domain of MAP (Ahmed et al., 2022; Paul et al., 2023; Strauss et al., 2018) but rather is an acknowledgement of measurement approaches found in the research literature. Finally, in this review we focus on schizophrenia spectrum disorders but will also include a dimensional transdiagnostic perspective (Insel, 2014; Kozak and Cuthbert, 2016; Morris et al., 2022) to include studies of psychosis spectrum disorders that incorporate individuals with schizophrenia (Guloksuz and van Os, 2018; Jonas et al., 2024; Kotov et al., 2022).

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1. Assessing anhedonia

The assessment of anhedonia can be conducted across methods including clinical symptom interviews, self-report questionnaires, and digital assessments such as experience sampling methodology (ESM). Negative symptom interviews typically include some assessment of anhedonia. However, as we have noted previously (Blanchard et al., 2011b; Horan et al., 2006b) older instruments (Andreasen, 1989; Kay et al., 1987) can be problematic for a variety of reasons including the item content that is inconsistent with definitions of the construct of anhedonia. A further problem with older negative symptom measures is that interview items can be driven by purely behavioral referents when the construct of anhedonia is defined by experiential deficits (i.e., reduced pleasure and interest). Thus, clinical ratings of anhedonia in these older interviews risk being based on assessments of social success and functioning rather than the internal experiences that are core to anhedonia's defining characteristics. This is problematic as social success can be determined by multiple factors other than experiential deficits in pleasure and interest. For example, less frequent social contact can be the result of behavioral skills deficits (Bellack et al., 1994; Mueser et al., 1991), lack of opportunity due to environmental or economic factors (Luther et al., 2025b; Strauss, 2021; Strauss et al., 2025b), and problematic social relations (Cloutier et al., 2021; Izon et al., 2018) including stigma and social rejection (Lincoln et al., 2021; Savage et al., 2024).

Second-generation negative symptom interviews including the Clinical Assessment Interview for Negative Symptoms, CAINS (Kring et al., 2013) and the Brief Negative Symptom Scale, BNSS (Kirkpatrick et al., 2011) have sought to overcome the above limitations of earlier instruments and to adhere to recommendations for improved negative symptom assessment (Kirkpatrick et al., 2006). Similarly, a new measure for assessing negative symptoms in those at clinical high risk for psychosis has been developed (Strauss et al., 2025c). Although these scales differ in several respects they both include item content that explicitly assesses experiential aspects of pleasure and interest. Informed by research (Gard et al., 2007) indicating the potential importance of differentiating pleasure experienced in the moment (consummatory pleasure) from expected pleasure (anticipatory pleasure), both instruments include items to assess expected or anticipated pleasure (frequency of expected pleasurable events in the CAINS while the BNSS assesses intensity of expected pleasure) from future experiences. In both the CAINS and BNSS the experience of pleasure is assessed across multiple domains including social, recreation, and work/school (with additional probes for physical pleasure used in the BNSS). The BNSS includes an item assessing intensity of pleasure experienced over the past week. As part of its iterative scale development (Blanchard et al., 2011b) the CAINS initially assessed past pleasure intensity for social, recreational and vocational domains but these items were dropped after psychometric examination (Horan et al., 2011) indicated that pleasure intensity ratings did not perform well (e.g., these items were not strongly intercorrelated with one another and loaded on a third factor with other items consisting of eye contact and self-care items). Given that interview nature of the CAINS and BNSS, in assessing reports of pleasure both scales are relying on retrospective and prospective reports and thus are not directly assessing consummatory pleasure. Psychometric studies indicate that the CAINS (Blanchard et al., 2017; Kring et al., 2013) and BNSS (Kirkpatrick et al., 2011; Strauss and Gold, 2016) are reliable and valid indicators of negative symptoms including anhedonia or MAP. As noted above, factor analytic work has yielded models indicating the potential benefit of examining anhedonia-specific scales (Ahmed et al., 2022; Paul et al., 2023; Strauss et al., 2018) versus use of higher order MAP domain that combines experiential deficits in pleasure and motivation. Continued validation of these measurement approaches will be useful, and the research summarized below includes both anhedonia and MAP indicators.

A variety of self-report questionnaires can also be used to assess

anhedonia and this review will not assess all such scales, for example see (Krzyzanowski et al., 2022). Perhaps the most well-established questionnaires are the Chapman measures of social and physical anhedonia (Chapman et al., 1976) including revised and trimmed versions of the social anhedonia scale (Reise et al., 2011). These true-false questionnaires were developed to tap the anhedonia construct as developed by Meehl (Meehl, 1975) and were initially intended for use in the psychometric detection of schizotypy and psychosis proneness (Chapman et al., 1994; Gooding et al., 2005; Kwapił, 1998; Mishlove and Chapman, 1985). The social anhedonia questionnaire has shown associations with schizotypal and psychosis spectrum outcomes (Blanchard et al., 2011a; Cohen et al., 2020; Kwapił, 1998). Both physical and social anhedonia questionnaire scores have been found to be elevated in schizophrenia spectrum disorders (Horan et al., 2008).

Another example of a questionnaire intended to specifically assess anhedonia is the Snaith-Hamilton Pleasure Scale (SHAPS; Snaith et al., 1995). The SHAPS is a 14-item scale assessing the ability to experience pleasure or the anticipation of pleasurable experiences and has been used in a range of disorders. Items assess a range of experiences including pleasure from social, recreational, and physical (e.g., tastes, smells, sights) experiences. Meta-analytic results from 168 studies comparing patient samples and healthy participants have indicated elevated anhedonia scores in schizophrenia and other psychiatric disorders including major depression and substance use disorders (Trostheim et al., 2020). A more recent meta-analysis of 15 self-report questionnaires assessing anhedonia (including the SHAPS and Chapman questionnaires) in more than 13,000 people found moderate to large effect sizes differentiating individuals with schizophrenia-spectrum disorders from non-clinical participants across overall and domain-specific (e.g., social or physical) anhedonia (Krzyzanowski et al., 2022).

Comparison of interview-based assessments and self-report questionnaires of anhedonia indicate convergence (albeit with r s of approximately 0.30). For example, the Chapman social anhedonia scale has been found to be correlated with clinician-rated motivation-pleasure deficits on the CAINS, (Kring et al., 2013) as well as with the BNSS ratings of motivation and pleasure deficits (Strauss and Gold, 2016). Although this convergence across methods of assessment suggests modest agreement between questionnaire and clinician ratings of anhedonia, this is not entirely due to method variance (Campbell and Fiske, 1959). It is important to note that clinician-based assessments typically focus on the past one to two weeks while the self-report questionnaires are often trait-based and thus assess broader experiences over time. Further, the clinical ratings integrate both experiential reports and behavior across multiple domains (e.g., social and recreational) while some self-report measures are focused on a particular domain (e.g., only social). In any case, research findings indicate that questionnaire-based assessments should not be expected to replace clinician ratings and a multi-method assessment is likely advantageous.

Other self-report questionnaires have been developed to provide a direct assessment of negative symptoms with content the parallels clinician-ratings – for a review of various instruments see (Métivier and Dollfus, 2025). As one example, the Motivation and Pleasure-Self Report, MAP-SR, scale (Llerena et al., 2013) is intended to serve as a questionnaire-based assessment of MAP negative symptoms informed by the CAINS. Findings indicate that the MAP-SR has robust associations with clinician-rated MAP symptoms, self-reported social anhedonia and social closeness, and current social network relationships (Llerena et al., 2013). Other studies have replicated these findings showing convergence between the MAP-SR and clinician-rated MAP symptoms (Cernvall et al., 2024; Engel and Lincoln, 2016; Engel and Lincoln, 2017; Richter et al., 2019). Like the clinician-rated CAINS MAP, the MAP-SR has also been found to predict MAP deficits assessed in daily life based on ecological momentary assessment (EMA) methodology (Moran et al., 2017) – discussed in detail below. The MAP-SR has also been shown to be associated with relevant laboratory tasks including reduced effort-

cost decision-making across groups including those with schizophrenia and depression (Moran et al., 2023).

Clinical interviews and questionnaires are based on the recall of experiences and thus may be vulnerable to concerns regarding inaccurate or biased reporting (see discussion of the role of memory below). With advances in technologies, there is increased attention to the use of digital measures to assess clinical features of schizophrenia and other disorders (Horan et al., 2024a). EMA is increasingly used to address the limits of interviews and questionnaires in the study of schizophrenia and psychosis (Granholm et al., 2020; Harvey et al., 2025; Myin-Germeys et al., 2018; Oorschot et al., 2009). Smartphone based EMA provides the opportunity to survey an individual multiple times each day across multiple days and to capture their current context, behavior and their subjective experiences in each of these moments. This aggregated data holds the promise of providing enhanced ecological validity and the ability to test time-dependent associations between activities and subjective responding.

EMA has been used to examine anhedonia in clinical samples – see meta-analyses (Abel et al., 2023; Beames et al., 2025). Studies have examined EMA-based measurement of negative symptoms with results indicating convergence across EMA, clinician-rated, and self-report measures of MAP deficits (Moran et al., 2017) and convergence between clinician-rated anhedonia and EMA assessed anhedonia and asociality (Luther et al., 2024). In support of the possible role of recall in the accuracy of symptom assessment, Moran (Moran et al., 2017) found that the association between retrospective measures (clinician-rated and questionnaire) and EMA assessed motivation and pleasure was moderated by memory such that better working memory performance was associated with stronger agreement between EMA and retrospective measures. As noted below, the interpretation of EMA findings is dependent on how anhedonia is defined and measured in the EMA survey items and how contextual factors are assessed.

Building on EMA, additional data can be collected from smart phones to track relevant behavior and activity. A recent study (Culbreth et al., 2025a) examined the convergence between clinician-rated anhedonia and motivation deficits with EMA and passive sensing (calls or texts sent/received, global positioning and actigraphy). Results indicated that EMA ratings of interest/enjoyment of activities were significantly related to severity of clinician rated anhedonia and avolition negative symptoms. Passive sensing involving distance traveled and number of calls and number of texts sent/received further improved variance explained (Culbreth et al., 2025a). These findings indicate that augmenting EMA with passive sensing data may provide additional information to understanding anhedonia and motivational deficits in psychosis and other disorders.

2. Factors contributing to anhedonia

2.1. Hedonic responding

A central question regarding anhedonia is whether this symptom reflects a true diminished capacity to experience pleasure or reward. Interviews and questionnaires suggest diminished pleasure but this may relate to opportunities available, behavioral choices, or the recall or anticipation of pleasure, rather than actual experiential deficits. Laboratory studies allow for the use of standardized evocative stimuli to determine individual differences in affective responses. A large literature has developed that has used evocative stimuli such as pictures, films or tasks involving reward (e.g., money) to examine hedonic responses. Contrary to symptom and trait data, at the group level, laboratory studies have demonstrated what appears to be normative hedonic reactions to these stimuli in individuals with schizophrenia spectrum disorders (Cohen and Minor, 2010; Kring and Moran, 2008). Such findings led to the interpretation of a seeming paradox (Pizzagalli, 2010; Strauss and Gold, 2012) that anhedonia, at the group level, is found in schizophrenia using clinical and self-report questionnaires but that

emotional responding to laboratory paradigms indicates normative hedonic responding.

There have been a number of attempts to resolve this apparent paradox. Kring and colleagues (Gard et al., 2007; Kring and Barch, 2014; Kring and Caponigro, 2010) summarize a time course model of hedonic experience that attempts to clarify where deficits may occur in the temporal unfolding of hedonic responses. From this perspective, individuals with schizophrenia are proposed to have deficits in the anticipation of pleasure (wanting) while the in-the-moment experience of pleasure (“liking”) is intact. This framing would appear to account for discrepant findings of clinical and trait measures of anhedonia and normative hedonic responding to laboratory stimuli. This temporal unfolding of hedonics also considers how effort computation (how much effort is required to achieve a reward) influences motivation to engage in that effort (Kring and Barch, 2014). Thus, clinical and questionnaire data may reflect individuals’ diminished reports of pleasurable activities because these individuals do not anticipate the experience of pleasure rather than reflecting true deficits in the ability to experience pleasure.

This anticipatory-consummatory model and parsing of components of hedonics has been richly informative in guiding clinical and experimental research. Empirical findings are promising but also mixed. Initial support for the temporal distinction was, in part, based on a questionnaire used to assess temporal experiences of pleasure (Gard et al., 2007) with individuals with schizophrenia reporting diminished (questionnaire-based) anticipatory pleasure compared to controls and negative symptom correlates of anticipatory pleasure but not consummatory pleasure. However, results of subsequent meta-analyses of questionnaire-assessed temporal experiences of pleasure have found small group effects with schizophrenia showing decreases in *both* anticipatory and consummatory pleasure (Krzyzanowski et al., 2022; Visser et al., 2020). Additionally, clinical ratings of MAP deficits have also been found to be correlated with question-based assessment of *both* anticipatory and consummatory pleasure (Kring et al., 2013) failing to replicate the initial finding that negative symptoms were uniquely related to anticipatory questionnaire pleasure scores (Gard et al., 2007). In all, these questionnaire-based findings do not align with the hypothesis that schizophrenia spectrum disorders are characterized by differential deficits in temporal aspects of anhedonia.

A further inconsistency in the wanting-liking paradox is found in laboratory research. First, a recent large scale meta-analysis of laboratory studies of emotion experience in schizophrenia and individuals at risk for psychosis found that pleasant stimuli were in fact experienced as less positive (Riehle et al., 2024). Thus, reduced consummatory pleasure can be observed in schizophrenia (though with small effect). Importantly, anhedonia and MAP deficits are dimensional individual differences and even in individuals with schizophrenia and other psychosis spectrum diagnoses there is a range of severity in these domains. Thus, simple group diagnostic comparisons miss the possible role of trait or symptom differences in anhedonia or MAP and hedonic responding. Thus, rather than examining diagnostic group differences, it is important to examine if individual differences in anhedonia or MAP (however assessed) are related to diminished hedonic responding. In the meta-analysis of Riehle et al. (Riehle et al., 2024) more severe total negative symptoms (not separated by facet) were found to be related to a larger deficit in positive emotions in response to laboratory stimuli.

EMA research also yields findings that are not entirely consistent with the proposal of intact consummatory pleasure. An earlier meta-analysis of EMA studies (Cho et al., 2017) found that individuals with schizophrenia reported less positive emotion than healthy controls. This was a broad assessment of positive affective experience and was not intended to examine anhedonia specifically nor did this meta-analysis distinguish between anticipatory and consummatory pleasure. Some EMA studies have found support for MAP symptoms to be associated with real-world anticipatory but not consummatory pleasure (Merchant et al., 2022). In a more recent meta-analysis focused on EMA assessment of anhedonia (Beames et al., 2025), results indicated that momentary

anticipatory anhedonia was evident in schizophrenia but was also found in other clinical disorders (e.g., depression, bipolar, anxiety). Although there was evidence of consummatory anhedonia in schizophrenia and other disorders, this finding varied based on the measurement approach and context (Beames et al., 2025). A further consideration in variable findings across studies is that depression also contributes to anticipatory and consummatory pleasure deficits (Merchant et al., 2022) and studies should carefully consider the role of depressive symptoms in pleasure deficits associated with MAP.

Given the importance of social anhedonia, other EMA studies have focused specifically on social pleasure in schizophrenia (Abel and Minor, 2023; Abel et al., 2023). EMA results indicate that individuals with schizophrenia report a moderate deficit in consummatory social pleasure but that this result varies depending on how social pleasure is assessed (Abel and Minor, 2023). Individuals with schizophrenia did not differ from controls on measures of positive affect but compared to controls did show diminished experience on what the authors described as indirect measures of social pleasure (“I like this company”, “I find being with these people pleasant”, “I’d rather be alone”). Negative symptom severity was not found to moderate associations with social pleasure (Abel and Minor, 2023) but this result was based on overall negative symptoms and may have been underpowered due to only half of the included studies including a measure of negative symptoms. This work highlights the importance of considering how anhedonia is defined and measured in considering the interpretation of EMA findings – a point made in a recent review that found considerable variation in how anhedonia was defined and measured in survey items across studies (Beames et al., 2025).

As noted by Beames et al. (2025), EMA findings indicate the importance of linking hedonic experience to timing, context and behavior to better understand the nature of anhedonia (Beames et al., 2025). Individuals with schizophrenia spectrum disorders have lower rates of employment and lower income that are associated with EMA-measured daily activities including social interactions and productive behaviors (Perez et al., 2022). With regard to context, Kasanova et al. (Kasanova et al., 2018) conducted an EMA study with individuals with psychotic disorders and healthy controls to examine the contribution of lifestyle or contextual factors to anhedonia and asociality. Findings indicated that, compared to controls, clinical participants were more likely not to have vocational activities and spent a smaller proportion of their time in structured social contexts (but the groups were comparable with regard to proportion of time in unstructured contexts). Similar to experimental studies, there were no group differences in positive affect experienced across social settings. However, within the patient group more severe MAP symptoms (labeled avolition by the authors) were associated with a smaller proportion of time spent in both structured and unstructured social contexts and more severe MAP symptoms in the patient group were associated with lower positive affect in unstructured social contexts (Kasanova et al., 2018). Contextual factors including consideration of the nature of social interactions remain understudied in investigations of anhedonia and MAP.

2.1.1. Social hedonics

In understanding anhedonia and broader MAP negative symptoms, it has been proposed that it is important for laboratory studies to specifically examine social affiliative stimuli or social interactions (Blanchard et al., 2015; Catalano and Green, 2023; Catalano et al., 2022; Lee et al., 2019; McCarthy et al., 2018). Social anhedonia and asociality are central to negative symptoms and robustly related to the social isolation and social impairment that characterize schizophrenia and psychosis spectrum disorders (Blanchard et al., 2011a; Blanchard et al., 2001; Blanchard et al., 1998). The majority of laboratory studies have used evocative stimuli that lack social stimuli beyond pictures of faces (Cohen and Minor, 2010). In using a video paradigm that involves an affiliative social prompt followed by the participant's behavioral response, we (Blanchard et al., 2015) demonstrated that although there were no

group differences in subjective responding, within individuals with schizophrenia greater social anhedonia was related to less positive appraisals of the partner (e.g., lower reports of having liked talking to the partner) and less willingness to interact with the partner. Similarly, more severe clinician-rated MAP negative symptoms were related to less positive appraisals of the partner, less willingness to interact, and less positive affect following the interaction (Blanchard et al., 2015). These results indicate the value of examining affiliative interactions and how deficits in affiliative responses (in-the-moment “liking”) vary within individuals with schizophrenia based on severity of social anhedonia and broader MAP deficits.

We extended the above results in developing and validating an in vivo social interaction paradigm designed to enhance social bonding and affiliation, the Social Affiliation Enhancement Task (SAET) (McCarthy et al., 2018). Results indicated that within individuals with schizophrenia, greater social anhedonia was related to less affiliative responding to the partner including lower reports of interpersonal closeness, less positive appraisals of the partner, less willingness to interact with the partner and less positive affect (McCarthy et al., 2018). Greater clinician-rated MAP negative symptoms were also related to less interpersonal closeness and less willingness to interact with the partner (McCarthy et al., 2018). In a subsequent replication and extension we (Blanchard et al., 2024) utilized the SAET in a large transdiagnostic sample including individuals with psychosis spectrum disorders and again found that social anhedonia, MAP and expressive (e.g., blunted affect, alogia) negative symptoms were related to less positive reactions to the partner and were associated with less positive affect prior to and following the in vivo interaction.

The above findings are consistent with the interpretation that social anhedonia and MAP deficits can interfere with positive reactions to affiliation and diminish the formation of social affiliative bonds in schizophrenia and psychosis spectrum individuals (Blanchard et al., 2015; Blanchard et al., 2024; McCarthy et al., 2018). These findings from in vivo social interactions are inconsistent with explanations of anhedonia as being purely an anticipatory deficit. Additionally, these studies demonstrate the usefulness of going beyond measures of positive affect to include affiliative reactions toward social partners.

2.2. Neural mechanisms

Based on understanding of the neural mechanisms of reward processes (Berridge and Kringelbach, 2015; Kringelbach and Berridge, 2017; Morales and Berridge, 2020) research has examined the role of aberrant reactivity to rewards and positive affect-eliciting stimuli in the ventral striatum in schizophrenia and psychosis spectrum disorders (Dowd and Barch, 2010, 2012; Fulford et al., 2018; Schwarz et al., 2020). In schizophrenia and psychosis spectrum disorders reduced neural activation during monetary reward processing, at the diagnostic-group level, is a replicable finding (Radua et al., 2015; Zeng et al., 2022). However, findings relating symptoms to blunted neural responses to expectancy of monetary reward have been variable with null results for negative symptoms (Schwarz et al., 2022) and null findings for self-reported anhedonia (Daniels et al., 2025).

Neural reactivity to social rewards has also been examined more recently (Mow et al., 2020). In the few studies conducted on social reward, findings have again been variable. Some results have indicated aberrant neural sensitivity to social reward in schizophrenia but this neural sensitivity was unrelated to MAP symptoms (Lee et al., 2019). Other findings in a transdiagnostic sample found that more severe social anhedonia and MAP symptoms were associated with diminished ventral striatum reactivity to social reward (Jimenez et al., 2025). Using a transdiagnostic sample including individuals with psychosis spectrum disorders, Shackman et al. (Shackman et al., 2025) applied social and monetary fMRI paradigms to determine if blunted ventral striatum reactivity specifically to social rewards was associated with MAP. The ventral striatum was engaged by both reward types but only diminished

neural reactivity to social rewards was related to more severe MAP symptoms. Results also suggested that this relationship was largely driven by reduced ventral striatum activation during receipt of the social reward (Shackman et al., 2025) – indicating that MAP-related social reward deficits are not limited to the anticipatory phase (at least in a transdiagnostic sample).

In addition to reward mechanisms, individuals benefit from affiliation in that relationships reduce cognitive, affective, and physiological responses to stress – the social regulation of stress responses (Coan and Sbarra, 2015; Morawetz et al., 2021; Zaki and Williams, 2013). Neural circuits associated with the neuroregulatory effects of relationships are separate from those systems described above that respond to reward (Eisenberger, 2013; Morawetz et al., 2021). Coan has demonstrated that holding the hand of an affiliative partner attenuates neural reactivity to uncertain shock in several subcortical and cortical regions (Coan et al., 2017; Coan et al., 2006). Using Coan's fMRI paradigm in a transdiagnostic sample including psychosis spectrum disorders, we (Blanchard et al., 2024) found support for the hypothesis that MAP deficits undermine the neuroregulatory benefits of social affiliation. Specifically, during conditions of threat, individuals with more severe MAP symptoms demonstrated less neural attenuation when holding the hand of an affiliative partner. These results indicate the potential usefulness of examining other (non-reward related) affiliation-related neural processes associated with anhedonia and MAP deficits and again highlight MAP associations with in-the-moment responses.

2.3. Cognitive deficits

Schizophrenia and psychosis spectrum disorders are characterized by impairment across multiple cognitive domains including social cognition (Dickinson et al., 2008; Green et al., 2000; Kern et al., 2011; McCutcheon et al., 2023; Pratt et al., 2026; Sheffield et al., 2018). These cognitive deficits are clinically meaningful as they contribute to functional impairment (Halverson et al., 2019). With regard to associations with anhedonia, a recent meta-analysis found that MAP negative symptoms (and expressive symptoms) were found to have modest but significant associations with most cognitive domains, $r = -0.15$ to $r = -0.25$ (Au-Yeung et al., 2023). Although cognition across multiple domains appears to be related to MAP deficits, impairments in memory have been proposed to play a particularly important role in undermining expectations of pleasure which subsequently leads to reduced approach motivation and fewer experiences of pleasurable events (Kring and Caponigro, 2010; Strauss and Gold, 2012).

Memory impairment may, in part, account for beliefs about diminished pleasure even when pleasurable experiences occur (Strauss and Gold, 2012) – thus accounting for the description of an emotion “paradox”. In this model, clinical ratings and self-report trait scales of anhedonia are reflecting nonconcurrent, retrospective reports of feelings that are reliant on working memory or episodic memory. Deficits in these cognitive domains have been found to be related to more severe trait and clinical symptom ratings of anhedonia (Strauss and Gold, 2012). In addition to the general cognitive correlates of negative symptoms noted above (Au-Yeung et al., 2023), another meta-analysis found that deficits in episodic memory deficits were related to all facets of negative symptom (Pillny et al., 2022).

Beyond general memory correlates, other research has sought to determine if anhedonia and motivation and pleasure symptoms are specifically related to the recall of positively valenced stimuli (Herbener, 2008). Results have been inconsistent with some findings indicating that more severe anhedonia or motivation and pleasure deficits are related to poorer recall of positive stimuli (Jang et al., 2016; Strauss et al., 2025a; Whearty et al., 2024) while other studies have failed to find this association (Hall et al., 2007; Harvey et al., 2009; Horan et al., 2006a). It may be useful to explore not just the broad association with positive valenced stimuli but to examine more specifically the role of memory and the processing of social affiliative stimuli (Dwyer et al., 2020; Orth

et al., 2025).

Using a social affective learning paradigm in a transdiagnostic sample including psychosis spectrum disorders, we (Orth et al., 2025) found that greater social anhedonia and MAP symptoms were associated with diminished accuracy in learning from positive behavioral information (but not negative behavioral information). This indicates that anhedonia and MAP are uniquely associated with diminished recall of positive social stimuli as positive. Cognitive impairment, particularly working memory, was also found to be related to poorer learning based on both positive and negative valenced behavioral information. When controlling for cognitive performance, anhedonia and MAP symptoms were no longer related to positive affective learning. These findings align with the hypothesis that encoding and retrieval deficits may help to explain expectations of low pleasure that may be inconsistent with experiences (Strauss and Gold, 2012) and elaborates on this to suggest that the diminished ability to learn the positive affective value of others may contribute to the develop and maintenance of anhedonia in the social domain (Orth et al., 2025).

Cognitive deficits including in working memory may also directly impact abnormalities in effort-based decision making, EBDM (Gold et al., 2013; Horan et al., 2015). As noted above, motivation deficits in schizophrenia and spectrum disorders have been proposed to be related to alterations in how information about the probability and magnitude of rewards are used to determine the effort to expend to obtain rewards (Collins et al., 2017; Culbreth et al., 2025b; Gold et al., 2015a; Gold et al., 2013; Gold et al., 2015b; Green and Horan, 2015; Green et al., 2015; Luther et al., 2026). Findings from laboratory tasks broadly indicate that schizophrenia and psychosis spectrum disorders show less effective use of magnitude and probability of reward to guide behavior and this involves making less effort to achieve rewards (Gold et al., 2015b; McCarthy et al., 2016; Moran et al., 2023). A recent meta-analysis of EBDM research found that reductions in EBDM were most pronounced in schizophrenia spectrum disorders and bipolar disorder but with reductions also occurring in major depression (Pillny et al., 2026).

With regard to EBDM and anhedonia or MAP deficits, findings have been mixed with some studies supporting an association (Gold et al., 2013; Moran et al., 2023) while other studies have failed to find that greater MAP symptoms are related to less effort (Culbreth et al., 2025b; McCarthy et al., 2016). In the meta-analysis by Pillny (Pillny et al., 2026) although positive symptoms were found to be a significant moderator of EBDM performance in schizophrenia spectrum disorders no such moderation was found for negative symptoms.

In a recent large computational modeling study of EBDM (Luther et al., 2026) results indicated that individuals with schizophrenia and first-episode psychosis were best fit by a bias model indicating a failure to use reward magnitude and probability in decision making. Across diagnostic groups the bias phenotype also had lower cognitive performance (global, working memory and processing speed). This finding suggests that cognitive ability is needed to guide EBDM (Luther et al., 2026). Results specific to anhedonia or MAP negative symptoms were somewhat less clear. Using dimensional ratings of negative symptoms, the bias phenotype had greater expressive symptoms (alogia and blunted affect) but not anhedonia, avolition or asociality than other models. An alternative categorical approach (grouping individuals with a moderate or greater elevation on any negative symptom) indicated that a bias profile was associated with elevations in all negative symptoms except asociality. Although results fit with the interpretation that negative symptoms broadly are associated with not using reward magnitude and probability (Luther et al., 2026) the dimensional results raise questions about the specificity to anhedonia and motivation and pleasure deficits. Additional research is needed to clarify which negative symptoms are related to EBDM and the role that cognitive deficits (across domains) play in this possible association.

2.4. Dysfunctional beliefs

Cognitive deficits may give rise to dysfunctional beliefs that contribute to negative symptoms and subsequent functional impairment. In this model (Grant and Beck, 2009) defeatist performance beliefs (e.g., “It is not worth trying because I will only fail”) serve as the link between cognitive deficits and negative symptoms including motivation and pleasure symptoms. Evidence from laboratory and intervention studies provide support for this model (Couture et al., 2011; Grant and Beck, 2009; Green et al., 2012). An earlier meta-analysis (Campellone et al., 2016) found significant but modest associations between dysfunctional beliefs and total negative symptoms ($r = -0.29$) and for MAP symptoms ($r = 0.19$). A more recent meta-analysis (Saperia et al., 2025) examined a range of beliefs including defeatist performance beliefs, asocial beliefs (e.g., “I prefer to be alone”), low expectancies for success, low expectancies for pleasure, and internalized stigma. This meta-analysis again found modest but significant associations between defeatist performance beliefs and overall negative symptoms as well as similar results (though smaller in magnitude) for the subdomains of MAP and expressive negative symptoms. Asocial beliefs were related to both overall negative symptoms and the MAP (but not expressive) subdomain. Finally, low expectancies for success were related to overall negative symptoms and a larger association with subdomain of MAP (Saperia et al., 2025). These results confirm the relationship between MAP deficits and dysfunctional performance beliefs and indicate the possible value of assessing other beliefs.

Beyond cross-sectional studies, EMA has been used to understand how dysfunctional performance beliefs manifest in daily experiences including anhedonia and other negative symptoms. Defeatist performance beliefs of overvaluing success and failure have been found to be related to less momentary consummatory and anticipatory pleasure - with particularly strong associations between overvaluing failure and reduced pleasure in early psychosis individuals (Chau et al., 2025). In another EMA study involving individuals at clinical high risk for psychosis (Luther et al., 2025a), defeatist performance beliefs were concurrently related to all facets of momentary negative symptoms (anhedonia, asociality, and avolition) and prospectively predicted the severity of subsequent negative symptoms. These results indicate that dysfunctional beliefs may vary over time and may lead to momentary anhedonia and increases in other facets of negative symptoms.

A more recent recovery model perspective (Grant et al., 2026) has proposed the additional value of considering positive beliefs (e.g., “Getting as much as I can out of life is important to me”, “I have the motivation to do things”, “Getting together with other people makes me feel good”). Findings indicate that positive beliefs predict lower negative symptoms and better functioning (Grant et al., 2026). A question to be addressed is whether these proposed positive beliefs are truly independent predictors of negative symptoms (and specifically anhedonia or MAP symptoms) or simply reflect self-report assessments of anhedonia (e.g., “Getting together with other people makes me feel good”) and motivation (e.g., “I have the motivation to do things”, “I am interested in learning new things”).

2.5. Behavior

Building on the social defeat hypothesis (Selten et al., 2013), negative symptoms have been proposed to arise due to the experience of being excluded from the majority group (ostracism) that then leads to an erosion in goal-directed behavior (Jaya et al., 2022). Social defeat can result from repeated negative social experiences including being rejected and excluded and MAP symptoms have been shown to be related to chronicity of social exclusion (Weittenhiller and Kring, 2026). Behavior associated with negative symptoms may contribute to social exclusion and social defeat. The initiation and maintenance of successful social interactions is in part dependent on relevant behavioral skills (Liberman, 1982; McFall, 1982). Greater negative symptoms, including

anhedonia and MAP, have been found to be associated with poorer social skill (Blanchard et al., 2015; Mueser et al., 1990; Patterson et al., 2001). Importantly, negative symptoms and related social skills deficits in schizophrenia and psychosis spectrum disorders can give rise to social rejection and social stigma (Penn et al., 2000; Savage et al., 2024).

In a transdiagnostic sample including psychosis spectrum disorders, Savage et al. (Savage et al., 2024) found that greater negative symptoms (both MAP and expressive symptoms) were associated with greater social rejection and this relationship was mediated in part by poorer overall social skill. Thus, the behavior of individuals high in anhedonia and MAP symptoms may evoke less rewarding and more rejecting social environments that may ultimately confirm beliefs and expectations about non-rewarding social outcomes leading to lower motivation to engage in social interactions. These findings indicate that an important consideration for future research is how individual differences in anhedonia or MAP deficits manifest in interpersonal behavior and how that behavior is perceived by, and responded to, by others in their social environment.

2.6. Sleep

A novel and more recent consideration is the possible role of sleep health (Buysse, 2014) in anhedonia and MAP symptoms. Poor sleep health is considered a transdiagnostic mental health issue (Harvey et al., 2011) with implications for understanding symptoms in schizophrenia and psychosis spectrum disorders (Freeman et al., 2020; Freeman and Waite, 2025; Reeve et al., 2018; Reeve et al., 2015; Reeve et al., 2019). Sleep problems in schizophrenia and psychosis spectrum disorders include insomnia, hypersomnia, difficulties initiating sleep, early morning awakenings, reduced sleep efficiency, sleepiness, and irregular sleep patterns (Cederlof et al., 2022; Davies et al., 2017; Freeman and Waite, 2025). Rates of sleep disturbances in psychosis spectrum disorders have been variable depending on characteristics of the sample and nature of sleep assessments, but a recent meta-analysis found poor sleep quality in 63.4% of individuals with schizophrenia (Chen et al., 2024). Sleep problems are associated with poorer psychosocial functioning in serious mental illness (Stafford et al., 2024) and sleep disturbance and sleep-related impairment have been shown to be related to a range of social functioning measures even after controlling for symptoms and cognitive impairment (Blanchard et al., 2020b).

Although much of the research on sleep in schizophrenia and psychosis spectrum disorders has focused on positive symptoms (Brown et al., 2024; Mulligan et al., 2016; Reeve et al., 2019), we have noted several reasons for considering sleep's contribution to anhedonia, MAP and other negative symptoms (Blanchard et al., 2020a). First, research from nonclinical populations indicates that all forms of sleep loss are associated with robust reductions in positive affect (Palmer et al., 2024) with implications for understanding anhedonia and reward processing (Boland et al., 2020; Wieman et al., 2022). Second, sleep disturbances can lead to self-initiated social withdrawal and reduction in the motivation to affiliate (Ben Simon et al., 2022; Ben Simon and Walker, 2018; Holding et al., 2020; Palmer et al., 2023). Third, from a neural perspective sleep insufficiency can result in increased amygdala activity and decreased functional connectivity of reward circuits (Ben Simon et al., 2020; Holm et al., 2009; Zhang et al., 2021) that contribute to increased perceptions of threat, increased negative affect, anhedonia, diminished social motivation and increased desire for social withdrawal.

Research has indicated that in schizophrenia and psychosis spectrum disorders, sleep problems are associated with more severe MAP, expressive, and overall negative symptoms (Blanchard et al., 2020a; de Crom et al., 2021). However, this relation between negative symptoms and sleep has not been consistent across studies (Ritsner et al., 2004) possibly owing to the wide range of samples and methods used to assess both sleep problems and symptomatology. In any case, the evidence indicates the potential importance of considering the role of sleep health in the development and maintenance of anhedonia, MAP and other

negative symptoms.

2.7. Environment

Adverse environments have long been considered in the development of psychosis-spectrum disorders and associated symptoms (Anglin et al., 2021; Karcher et al., 2021; Petti et al., 2025; van Os et al., 2010; Werner et al., 2007). Neighborhood characteristics such as area-level crime (Vargas et al., 2020; Wilson et al., 2016) and neighborhood deprivation, reflecting a lack of physical, social and economic resources (Becares et al., 2018; Hastings et al., 2020; James et al., 2025), have been found to be associated with psychotic disorders and associated symptoms. Until recently environmental factors have been less frequently considered for their possible role in negative symptoms (Solmi et al., 2020; Strauss, 2021).

Strauss (Strauss, 2021) has proposed a bioecosystem theory of negative symptoms that posits that environmental factors may contribute to difficulties in accessing resources necessary to achieve goal-directed activities and lead to negative symptoms. In support of this theory, research has indicated that greater area deprivation is associated with MAP severity, but not specifically with the anhedonia domain, as well as greater avolition and alogia (Strauss et al., 2025b). EMA reports of greater anhedonia, avolition and asociality were also related to time spent in areas with higher deprivation based on location at the time of the EMA prompt. Finally, poorer performance on reward processing measures has also been found to be associated with greater area deprivation (Strauss et al., 2025b). Another study found that reduced environmental resources within the home were associated with greater negative symptoms including anhedonia (Luther et al., 2025b).

Findings relating environmental factors to negative symptoms have not been consistent. In a recent study examining multiple symptom domains, adverse neighborhood characteristics (including neighborhood adversity, geo-coded crime, and self-reports of perceived neighborhood violence) were unrelated to negative symptoms in a transdiagnostic sample of individuals with psychosis spectrum disorders (Todd et al., 2025). Another study of first episode psychosis found no association between area deprivation and negative symptoms and greater neighborhood inequality was found to be associated with *less* negative symptom severity (Tibber et al., 2019).

One challenge in examining the association of negative symptoms with neighborhood adversity or other indices of available resources concerns reverse causality – negative symptoms and their sequelae may be a cause rather than a consequence of living in adverse settings or the lack of resources. As previously summarized, anhedonia, MAP and other negative symptoms are related to factors including lower rates of marriage, cognitive impairment, lower educational achievement, and poorer occupational functioning (Rosenheck et al., 2006) and each of these can have an adverse impact on income and housing (Dickerson et al., 1999; Hofer et al., 2005; Palmer et al., 2002). Future studies will need to carefully disentangle these various individual-level and system-level environmental factors to better understand how anhedonia and MAP may relate to the environment.

3. Treatment

Because of their persistence and minimal response to treatment, negative symptoms have been described as an unmet therapeutic need (Aleman et al., 2017; Correll and Schooler, 2020). Research on medications for the broader treatment of negative symptoms is vast and nuanced and other reviews have addressed this literature (Howes et al., 2023; Howes et al., 2024). A recent meta-analysis concluded that few subcategories of interventions met threshold for clinically meaningful improvement in negative symptoms (Damiani et al., 2026). However, xanomeline/trospium chloride (Cobenfy) is a new muscarinic receptor agonist that has demonstrated efficacy in treating positive and negative symptoms and this drug was recently approved by the FDA for the

treatment of schizophrenia in adults (de Almeida et al., 2025; Horan et al., 2024b; Kaul et al., 2026a; Kaul et al., 2026b). In a novel EMA examination of Cobenfy's impact on negative symptom-related behavior and affect, Harvey et al. found that this treatment was associated with decreased time spent alone, less time spent at home, increased productive activities and increased positive affect (Harvey et al., 2025). In addition to medication, noninvasive brain stimulation such as transcranial magnetic stimulation (TMS) has been tested as a means of addressing abnormal functional connectivity involving the dorsolateral prefrontal cortex and other brain regions implicated in schizophrenia and negative symptoms. Results have been variable with some findings suggesting the potential for improving negative symptoms (Lorentzen et al., 2022; Tseng et al., 2022) including anhedonia (Li et al., 2025).

Even with these promising advancements in pharmacology and brain stimulation, psychosocial interventions will continue to be needed as one component of comprehensive care. Psychosocial interventions (combining cognitive-behavioral therapy, CBT; cognitive remediation; motivational interviewing; and family therapy) were recently found to be the only category of intervention that reached a threshold of clinically meaningful improvement in negative symptoms – with the qualification that psychosocial intervention studies also had the lowest ratings for data quality (Damiani et al., 2026). Some of the most widely used psychosocial interventions include social skills training (Mueser et al., 2024), CBT for negative symptoms (Beck et al., 2009), and combined approaches incorporating social skills training and CBT (Granholm et al., 2018). Findings provide generally encouraging outcomes for these treatments; however, results often indicate modest effect sizes (Granholm et al., 2018; Solmi et al., 2023; Turner et al., 2018; Velthorst et al., 2015). Other approaches have sought to combine CBT, social skills and other elements such behavioral activation to further improve negative symptom outcomes with limited success (Bennett et al., 2023).

Recent developments include a focus on positive emotion regulation training to treat negative symptoms (Favrod et al., 2015; Favrod et al., 2019; Nguyen et al., 2022; Nguyen et al., 2016) and borrowing from psychosocial interventions for depression and anxiety that have targeted anhedonia by enhancing positive affect (Craske et al., 2023; Craske et al., 2019). Positive affect treatment shows improvement in clinical status for individuals with depression or anxiety including improved reward anticipation-motivation and improved response to reward attainment (Craske et al., 2023). Applying positive affect interventions to treat MAP deficits in schizophrenia requires further study (Catalano et al., 2026). Finally, given the association between sleep disturbances and negative symptoms (Blanchard et al., 2020a) the potential role of validated sleep interventions (Harvey and Sarfan, 2024) to improve anhedonia and MAP may hold promise.

4. Conclusion

Anhedonia and MAP deficits are enduring in schizophrenia and psychosis spectrum disorders and represent significant contributors to functional impairment in these disorders. Research reviewed indicates that anhedonia and MAP are likely multiply determined and thus their understanding will require multiple methods spanning affect, cognition, behavior, sleep and the environment. Research will benefit from approaches that bring social relations into the lab as well as real-world assessments that capture individuals' daily momentary experiences to inform how social and environmental context impact anhedonia and MAP. Treatments remain limited but recent research holds promise for emerging interventions.

CRedit authorship contribution statement

Jack J. Blanchard: Writing – original draft, Supervision, Project administration, Investigation, Funding acquisition, Conceptualization.
Brittany L. Davis: Writing – review & editing, Project administration,

Investigation, Conceptualization. **Kasey E. Schuchardt:** Writing – review & editing, Project administration, Investigation, Conceptualization.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Jack Blanchard reports a relationship with Click Therapeutics Inc. that includes: consulting or advisory. Jack Blanchard reports a relationship with IQVIA Solutions UK Ltd. that includes: consulting or advisory. Jack Blanchard has patent Motivation and Pleasure - Self Report (MAP-SR) scale licensed to Jack Blanchard. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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