Northumbria Research Link

The Effects of Anhedonia in Social Context

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Abstract

Purpose of Review Anhedonia is a transdiagnostic symptom comprising reduced subjective reward or pleasure. Anhedonia influences subjective anticipation and in-the-moment experiences. This review draws together affective learning and engagement evidence for anhedonia affecting subjective experiences of social environments.

Recent Findings While social engagement is diminished consistently, subjective appraisals of social contexts vary across different mental health disorders. Low positive affect during social experiences or stimuli is reported in PTSD, mood, schizophrenia, and anxiety disorders. Diminished neural reward networks underpin the anticipation of social experiences in ADHD, schizophrenia spectrum, and autistic spectrum disorders. Multiple theories exist to explain how anhedonia might interfere with social environments.

Summary Anhedonia is a barrier to engagement, motivation, and enjoyment of social contexts. While many studies characterize experiences during social contexts, learning theories provide the most promise for developing targeted interventions.

Keywords Anhedonia · Social interaction · Social engagement · Positive affect · Motivation

Introduction

Anhedonia is the reduced capacity to experience positive emotions and pleasure in response to events and activities which usually elicit these feelings. Traditionally, anhedonia is core to mood disorders, characterized as a marked decrease in interest or pleasure from activities [1]. In schizophrenia, anhedonia is subsumed under negative symptoms, although diminished emotional expression and asociality could also indicate anhedonia [1, 2]. Anhedonia might also explain the clinical overlap between anxiety and depression [3], although anhedonia contributes to anxiety disorders independently of depression [4]. Increasingly, anhedonia is considered a central symptom in post-traumatic stress disorder (PTSD), where maladaptive coping (such as avoidance) and PTSD symptoms create the conditions for reduced reward and pleasure [5, 6]. Limited research considers anhedonia in people with disordered eating [7], with an emerging literature for understanding social anhedonia, social functioning, and disordered eating [8, 9].

There are differences between mental health disorders and self-report measures, according to whether anhedonia is characterized as stable and unremitting (trait), or a symptom of current mental health state (state) (see Table 1). For instance, in depression, PTSD, and anxiety, diagnostic criteria emphasize changes from "normal functioning" [1]. However, anhedonia can indicate illness severity: those with depression who display anhedonia tend to report more severe symptomatology [10, 11]. Furthermore, both state and trait anhedonia are associated with suicidality [12••, 13•]. Anhedonia appears to be, independent of depression, and trait-like in people with anorexia [14]. In patients with schizophrenia, anhedonia has both state and trait elements, trait anhedonia being stable over extended follow-up (i.e., 13 years; [15]) and in ultra-high-risk young people over shorter timeframes (i.e., 1 year; [16]).

Anhedonia shapes subjective experience of day-to-day activities and has deleterious effects on functioning [17]. The social environment surrounding an individual can provide rich support and be beneficial for psychological, emotional, and physical well-being. Individuals denied subjective reward and pleasure from social circumstances are vulnerable to aversive outcomes such as loneliness. A more nuanced understanding of how anhedonia influences the subjective experience of social environments would

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Table 1 Self-report measures of anhedonia and pleasure where social context items are included

Scale	Reference	State/trait	Participant groups considered						Elements of anhedonia considered		
			Mood/anxiety	Psychotic	Substance use	Stress	Suicidality	Healthy volunteers	Motivation /engagement	Positive affect	Learning
Revised Social Anhedonia Scale (RSAS)	Chapman et al. [19]	Trait	✓	✓	✗	✓	✗	✓	✓	✓	✗
Fawcett-Clark Pleasure Scale (FCPS)	Fawcett et al. [20]	State	✓	✓	✓	✗	✗	✓	✗	✓	✗
Snaith-Hamilton Pleasure Scale (SHAPS)*	Snaith et al. [21]	State	✓	✓	✓	✗	✓	✓	✓	✓	✗
Temporal Experiences of Pleasure Scale (TEPS)	Gard et al. [22••]	Trait	✓	✓	✓	✗	✓	✗	✓	✗	✗
Motivation and Pleasure Scale-Self-Report (MAP-SR)	Llerena et al. [23]	State	✗	✓	✗	✗	✗	✗	✓	✓	✓
Anticipatory and Consummatory Interpersonal Pleasure Scale (ACIPS-A)	Gooding, Pflum [24]	State	✗	✓	✗	✗	✓	✓	✗	✓	✓
Specific Loss of Interest and Pleasure Scale (SLIPS)	Winer et al. [25]	State	✓	✗	✗	✗	✓	✓	✓	✓	✓
Beliefs about Pleasure Scale (BAPS)**	Yang et al. [26]	Trait	✗	✓	✗	✗	✗	✓	✗	✗	✓
Positive Valence Systems Scale (PVSS)	Khazanov et al. [27]	State	✓	✗	✗	✗	✗	✓	✓	✓	✓

* Also used in patients with personality disorders.

** Items reflect beliefs about pleasure which would be relevant to social contexts rather than directly asking about social aspects of behavior.

assist development of targeted interventions. The focus of the current review is anhedonia in a social context. Studies will be summarized which consider different elements of anhedonia: motivation and engagement for social interactions, positive affect during social situations, and learning as relevant to social context. Other reviews have considered social anhedonia transdiagnostically [18]; here, the focus concerns the wider construct of anhedonia. References are included for disorders where anhedonia, and its underlying mechanisms, are considered specifically in relation to social context. Therefore, the aim of this narrative review is to draw together research concerning the effects of anhedonia and socially relevant outcomes in mental health disorders.

Anhedonia as Avoidance

Avoidance of social context is a behavioral consequence of anhedonia. Social networks, social environment, and brain structures are proposed to shape one another during adolescence [28]. In adults, connections to others and social engagement require a balance between cognitive representations of self and others, activating brain areas involved in social cognition representation including the medial prefrontal cortex and cingulate cortex [29]. For instance, when asked to think about a close friend, patterns of activation in the medial prefrontal cortex are reported [30•]. Many studies document avoidance of and withdrawal from social situations, or a preference to be alone in those with mental health disorders. Patients with schizophrenia experience more social isolation [31] and, when with others, report a preference to be alone [32•]. Individuals with depressive symptoms are more likely to feel lonely [33], spend time alone [34], or around individuals with similar levels of depression, or with one other person, rather than a group [35]. Fewer social interactions increase anhedonia and contribute to binge-eating in people with disordered eating [36]. Furthermore, difficulty describing feelings, social anxiety, and social avoidance characterize adolescent females with eating disorders [37].

Alternatively, there may also be preferences for interactions with specific social spheres within someone's networks. For instance, feelings of social safeness are linked to past memories and current attitudes towards eating in those vulnerable to eating disorders [38]. People with social phobia interact more with family members [39] or partners [40] than those outside of their homes. Furthermore, the interactions of those with social anxiety may include fewer personal disclosure, with social anxiety symptoms relating to personal disclosures [41]. Consequently, those with social anxiety disorder have unfulfilled relatedness needs [42]. Consideration of the content of social interactions needs investigating in other mental health disorders. Instances of social withdrawal are reported in most literature concerned with mental

health disorders. Positive social support and engagement is seen as part of successful recovery and feelings of social separateness can exacerbate existing symptoms. Avoidance of social situations and more time spent alone could reflect a behavioral outcome from anhedonia; however, less time in social contexts also increases anhedonia. This establishes a spiral of withdrawal and exacerbation which escalates social disconnect. Creating circumstances which sow the seeds of loneliness in emotional conditions that reduce reward could establish conditions for mental health symptoms to become entrenched. While social withdrawal reflects a behavioral outcome from anhedonia, there is a need to understand what drives this need to separate oneself from the social world. To these ends, the rest of this review will consider the mechanisms which potentially underpin social avoidance and withdrawal.

Anhedonia as Low Positive Affect

Some believe, rather than high negative affect, low positive affect is indicative of anhedonia [43]. Low positive affect in a social context reflects the "liking" or consummatory phase of the pleasure cycle and is underpinned by opioid and GABA receptors [44]. Low positive affect may also be important for in-the-moment experience of social situations in young adults. For instance, socially anxious young adults use alcohol to increase positive affect during social situations [45]. Dysregulated positive affect also plays a role in both extremes of disordered eating, with social interactions contributing to this association [36, 38] Although positive affect does not consistently predict social experiences [46], subjective social competence appears to be associated with positive affect in a reciprocal direction. This means that maintaining high positive affect could be challenging for people with mental health symptoms that compromise social skills, either subjectively or objectively.

What Is the Adolescent Context of Low Positive Affect During Social Contexts?

Adolescence is a key developmental period for sensitization to social context [47] and represents a vulnerability window where risk trajectories coincide to predict adult psychopathology. There are, unsurprisingly, associations between low positive affect and brain areas underpinning reward in adolescents. In-the-moment experiences of emotional closeness may be most strongly associated with positive affect for adolescents with a reduced (right temporal-parietal junction) neural responsiveness to social reward, while sustained happiness is associated with positive affect in adolescents' sensitivity to social reward [48••]. The right temporal-parietal junction may be a converging point for multiple cognitive processes related to social interactions including

theory of mind and face emotion processing, which could explain its association with social reward responsiveness [49]. Activity in the temporal-parietal junction is also related to social reward value in adults [50], indicating the continued importance of this brain area. Neural responsiveness to social reward might reflect low positive affect during social contexts.

Low positive affect during social contexts is particularly relevant to social anxiety disorder, distinguished from other anxiety disorders by low positive affect [51], particularly in adolescents [52]. The Sensitivity Shift Theory (SST) [53] suggests temperament factors, characterized by increased sensitivity to both positive and negative valence [54], evolve into social anxiety symptoms. Social interactions are highly emotionally laden; consequently, adolescents sensitive to valence engage less socially. Rather than reflecting avoidance, the low social engagement in vulnerable adolescents is underpinned by high inhibition, fewer social approach behaviors, low social skills, and previous dissatisfying social experiences, collectively discouraging social engagement [55]. Therefore, social interactions become both overwhelming and disappointing [40], i.e., stressful rather than rewarding. Repeated aversive social experiences create a learning environment where future experiences are not relished [56] and social withdrawal emerges. Therefore, the experiences of those with social anxiety disorder typify anhedonia, with social withdrawal, reduced positive anticipation of future events, and low reward and pleasure during social engagement. Since these patterns persist into adulthood, it is likely that low positive affect occurs in social circumstances alongside other mechanisms which maintain symptoms.

Subjective Experiences of Social Environments and Low Positive Affect

The SST implies several elements of subjective emotional experiences during social context not only maintain low positive affect, but also underpin the emergence of social anxiety. In other mental health disorders, different subjective emotional experiences are associated with positive affect. For example, subjective emotional appraisals of interactions may be more closely aligned with happiness in patients with schizophrenia than in healthy individuals [57•]. In a review of experience sampling studies, patients with schizophrenia report more in-the-moment positive affect when they were with others, compared to when they were alone, and report similar levels of positive affect to healthy volunteers during social interactions [32•]. Taken together, these studies suggest that patients with schizophrenia may be highly sensitized to their in-the-moment emotional experiences in social situations, similar to those with social anxiety. While other studies suggest patients may be reluctant to engage socially, when they do, their positive affect increases. Similar results

are also reported for individuals with depression using experience sampling [58] and in patients with PTSD while viewing happy faces [59].

Perceptions of social defeat occur through perceived loss or inability to gain subjectively valued external sources and internal or external attacks of a social nature [60] and are linked to longer term well-being [61]. In humans, perceptions of social defeat encompass experiences such as bullying, low social status (e.g., lower standing role in a workplace), lower socio-economic status (reflecting financial status), and isolation or social "separateness." Perceptions of social defeat are transdiagnostic, but are particularly well represented in PTSD, depression, anxiety, and suicidality [62]. The experiences of many individuals with mental health disorders include stigma, difficulty in social situations, reduced financial stability, and affluence. Regardless of pre-existing symptoms, these perceived social defeats are related to low positive affect [63]. While there is limited consideration of low positive affect in social contexts for people with eating disorders, experiences of perceived social defeat could characterize factors considered important. For instance, less favorable social comparison and submissive behaviors are related to the severity of eating disorders [64]. Perceived stigma is also associated with poor outcomes during treatment in those with eating disorders [65], and perceptions of negative social comparison are central to many elements of anorexia [66]. Psychological interventions need to take these perceived social experiences into account when trying to address anhedonia. Feelings of shame and unfavorable social comparison are likely to impair recovery for all mental health disorders. Although reward neural circuits might be the convergence point for perceived social defeat experiences, social defeat represents a complex social cognitive construct which requires consideration independently from reward or anhedonia in social circumstances.

In summarizing the experiences of low positive affect during social situations, research has considered people with social anxiety, schizophrenia, depression, eating disorders, and PTSD. The neural systems underpinning social reward may be particularly sensitized during adolescence; however, they continue to be an important convergence point for many social experiences throughout adulthood. Low positive affect during social contexts may be an indicator of multiple subjective social-emotional experiences, including subjectively low social ability, disappointing social encounters, perceived social defeat, or misalignment between expectations and actual experiences. This highlights the complex nature of social situations. Perhaps people with mental health disorders are more vulnerable to low positive affect following ambiguous social encounters. Given that the focus of this line of research is subjective experiences, studies employ self-report [63, 64] or experience sampling methodologies [54, 58]; of note is the study by Flores et al. [48••], which

combined functional imaging and experience sampling. Experience sampling methodologies provide an in-the-moment rating of emotions within a social context; this can be particularly important for mental health disorders where offline processing or recall of emotions is likely influenced by cognitive biases. Further investigation of subjective emotional experiences during social interactions may provide clues for clinicians to understand why individuals may be reluctant to engage socially. The in-the-moment experiences of social situations have implications for the learning that underpins the cognitive components of anhedonia.

Anhedonia as Reduced Wanting

Reduced drive, motivation, or effort expended for social interactions indicates the wanting element of the pleasure cycle [67]. This component of the cycle reflects the interaction between cognitive and emotional elements of social experiences. Past social experiences interact with cognitive constructs to shape the likelihood of engagement in future social experiences. Anticipation of future rewards is a key driver for human motivation [68]. Level of responsiveness to reward anticipation in the ventral striatum (during an incentive delay task with monetary and social reward) is associated with self-report social functioning transdiagnostically, in patients with schizophrenia, autistics spectrum, bipolar, and mood disorders [69]. Therefore, unsurprisingly, the ventral striatum appears to have transdiagnostic relevance for anticipation of rewards, common to social and other types of reward [70].

Reduced motivation for social rewards is reported in people with attention deficit hyperactivity disorder (ADHD) [71], although they have intact striatal response to social rewards, when compared to healthy controls [72]. Adults with autistic spectrum disorders, when compared to controls, also report lower anticipated pleasure for social interactions [73], although responsiveness to non-social rewards remains intact [74]. While behavioral results for autistic spectrum disorders are inconsistent [75], the diminished neural response for anticipation of social reward is replicated across studies [76, 77]. For patients with PTSD, male Vietnam veterans display both reduced motivation and effort to maintain the presence of social stimuli (attractive faces) [78]. A group of patients with heightened sensitivity to both anticipation and gaining of rewards are people with bipolar disorder. However, heightened reward anticipation is not specific to social circumstances; rather, it reflects a generally sensitized reward system [79, 80].

When asked to imagine different social scenarios, patients with schizophrenia, with negative symptoms, anticipate more intense negative emotions when compared to controls; however, in response to social inclusion scenarios, patients also anticipate less intense positive emotions than controls

[81]. In addition to diminished anticipation of future positive social events, when compared to controls, patients with schizophrenia are less motivated to increase the chances of a future positive social interaction or avoid a future negative social event [82]. In considering the putative risk trait schizotypy, those scoring highly on schizotypy are less incentivized to engage socially [83•]. Therefore, the reduced positive anticipation of future social interactions precedes the onset of a diagnosable clinical psychotic disorder.

A recent synthesis and meta-analysis concluded that evidence for reduced anticipation of social reward was most consistent for ADHD, autistic, and schizophrenia spectrum disorders [84•]. This certainly seems to be a representative conclusion for the state of the current literature. Reduced wanting is reflected in lower levels of motivation, fewer approach behaviors, decreased positive anticipation of future occurrences, diminished anticipation of rewards, and lower effort exerted. It could be that multiple avenues underpin reductions in wanting, or these constructs could all reflect outcomes of a similar underlying process. Methodologies differ across the studies cited here. Experimental methods include the incentive delay task (with social and monetary reward) [71, 76, 79, 80], social and monetary incentivized go/no go tasks [72, 74, 75], and implicit learning tasks [77]. These tasks provide controlled methods to assess mechanisms underpinning motivation and reward, often using faces as rewards, which may not be processed in the same manner across all disorders. Elman et al. [78] used button presses to keep attractive faces on the screen as an analog for approach behaviors. Attempts to provide the ecological validity missing from experimental tasks are provided by Minor et al. [83•]'s recording of audio snippets in the flow of daily life, capturing social moments in real time over two days. Experimental designs where participants need to engage in some form of interaction, simulated [81] or real [82], are likely to provide more nuanced information about emotional and cognitive biases related to social environments. Within the idealized conditions of most experimental tasks, "cold" cognitions often override the more real-world subjective experiences. Further studies need to be conducted across all mental health disorders, such as PTSD and eating disorders, to gain a transdiagnostic perspective of some of the excellent paradigms currently being used to investigate autism and schizophrenia. In addition, while characterizing the presence of reduced wanting is important, what drives the decreases in motivation, lower approach behaviors etc., need to be teased apart.

Anhedonia as Faulty Learning and Failure in Emotional Connection

The final element of the pleasure cycle is learning: linking past experiences to the appropriate emotional tag to ensure
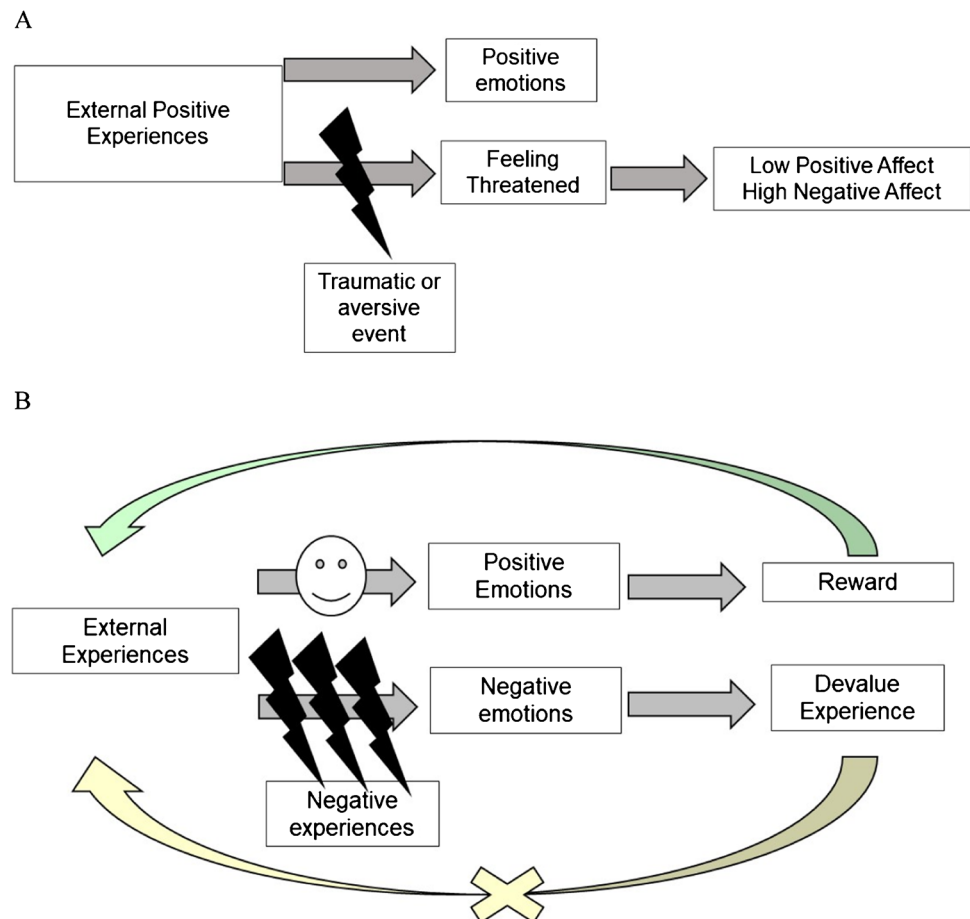
future social experiences are sought out [67]. Appraisals of social experiences feed into this component, which means disorder-specific cognitive biases influence outcomes. Learning is complex; it involves the appropriate and effective confluence of emotional and cognitive processes. While it is proposed that alterations to the pleasure cycle can be temporary [85], alterations to learning will be more difficult to ameliorate. These points mean that disorder-specific models have been developed rather than transdiagnostic frameworks. However, there are learning models which specifically consider social contexts; these will be outlined here.

How Might Negative Affect Influence the Social Experiences?

Two complementary theories provide an explanation for how negative affect might become a chronic barrier to enjoyment of social occasions: the Negative Affective Interference theory (NAIT) [86] and the Reward Devaluation Theory (RDT) [87] (see Fig. 1). The NAIT was devised specifically for patients with PTSD, who experience trauma within a social context, for example, abuse or domestic violence. Due to their traumatic experiences, positive external social experiences are perceived as threatening, reduced positive and increased negative affect mark subjective emotions subsequently marring subsequent social experiences. NAI predicts PTSD symptoms over and above depressive symptoms and explains why patients endorse lower positive valence in response to social images [86]. Anhedonic responses, while processing social contexts, activate the medial prefrontal cortex and right temporoparietal junction [88], suggesting functional brain changes underlie emotional alterations. Furthermore, future PTSD symptoms are predicted by brain areas involved in cognitive (cognitive control: Stroop task [89] and memory [90]) rather than emotional processing. Therefore, interfering effects of negative affect for social contexts may be cognitively mediated rather than emotionally driven. Similar to PTSD, in patients with depression, higher symptoms are related to increased connectivity between dorsal anterior cingulate cortex (cognitive control) and posterior cingulate cortex (internal attention) during a Stroop task; again emphasizing affective interference driven by cognitive mechanisms [91]. NAIT needs testing in other disorders where trauma is present, since trauma exposure alone does not explain reduced reward in people with PTSD [5].

Fig. 1 Two theories account for the emergence of negative affect during social experiences following negative experiences. **A** The Negative Affective Interference Model: trauma or an aversive experience mean that otherwise positive experiences are "tagged" as threatening and they then become associated with negative affect. **B** Reward Devaluation Theory: a series of aversive experiences following external events ensure negative emotions arise, making it more likely those experiences will be devalued and less likely to be repeated

While the NAIT accounts for changes in in-the-moment emotional experience, it does not explain decreases in social approach behaviors. Instead, the RDT suggests people come to devalue rewarding experiences following repeated negative and disappointing outcomes. These negative experiences do not need to rise to the level of trauma; rather, attrition after repeated undesired experiences or outcomes from social contexts is sufficient. Therefore, RDT suggests negative emotions arise from the repeated disappointments, which lead, otherwise positive experiences, to be devalued and less likely repeated in the future. Correlates of RDT have been related to current [92•] and future [93] depressive symptoms. Although many studies testing RDT take a cognitive rather than social context, a recent study by Taylor et al. [94•] provides indirect evidence: lower positive valence and higher negative temperament were associated with reduced social connection in people seeking treatment for depression and anxiety.

NAIT is a learning theory since it pairs the association of experience and outcomes, while RDT takes this one step further and the feedback loop of devaluation decreases future social approach behaviors. These models are important for understanding anhedonia in a social context since NAIT and RDT provide complementary explanations for how a serious event, or numerous smaller negative occurrences, can impinge upon the subjective positive emotional gains from social contexts. While both emphasize how negative affect might arise in social contexts, only the RDT explains why social withdrawal might arise from repeated social letdowns or aversive experiences. Both models co-exist with one (NAIT) providing an explanation for what might arise following trauma and the other (RDT) reflecting evolution from repeated experiences, perhaps common to those with depression, anxiety, or even eating disorders.

Predicting Future Emotions

While the RDT provides one explanation for how negative experiences might shape future approach behaviors, the ability of affective forecasting is highly relevant to processing future social experiences. Future subjective emotional appraisals for similar or new experiences are predicted on the basis of past experience [95]. Given social context is represented cognitively [96], affective forecasting is highly germane to anhedonia. While affective forecasting has not been considered in relation to anhedonia generally, there are two recent studies concerned with social anhedonia (SA) which will be briefly mentioned [97•, 98]. Moore et al. [98] reported there were no differences for positive affect; however, those with high SA anticipated and experienced higher negative affect and predicted negative affect more accurately. Zhang et al. [97•] reported anticipated valence in social (but not non-social) conditions were associated with connectivity

between the retrosplenial cortex and insula, and the hippocampus and parahippocampus. Those with higher SA had stronger and reduced connectivity, respectively, between these areas. Furthermore, people with SA anticipated less pleasure and had less visceral descriptions of anticipated events. These studies require replication with anhedonia, and affective forecasting deserves further consideration in psychopathology. Existing studies suggest people expressing SA are poor at positively representing future social events, and this impacts their capacity to look forward to and enjoy these experiences when they occur.

Learning Theories Summarized and Future Directions

The learning theories concerned with social contexts tend to be cognitively and experimentally driven, and often highlight the relative importance of cognitive over emotional processing. The theories tend to be driven by an interest in particular mental health disorders; however, the specificity of these models is yet to be tested and wider inclusion of different patient groups is needed in future studies. The reciprocal and transactional nature of social contexts is often missing from the paradigms used to test these models. However, one recent interesting task which appears to possess high ecological validity is the ultimatum game (see Fig. 2). There is an increasing and interesting literature on this task; a few examples of findings will be given here for illustrative purposes. In the game people are proposers or responders to financial deals; the deals vary in their fairness; similarly, the status of the "players" can vary. The game can be played dynamically with multiple responders and cooperation may be necessary for longer term success. Patients with depression [99], schizophrenia [100, 101], and bipolar [102] are more sensitive than controls to unfairness either subjectively or offers they accept, while low prosocial behaviors are predicted by fewer recent social contacts [103] or autistic spectrum disorder status [104]. This task is worthy of future inclusion given its high ecological validity and need for online decision making.

Unlike other studies summarized so far, learning models propose a mechanism which can be targeted with an intervention to lead to longer lasting changes for emotions experienced during social contexts. While the learning element is perhaps the most complex for understanding anhedonia in a social context, in many respects, it is the most important. It provides evidence of what may be underpinning experiences of low positive affect or reduced motivation rather than merely characterizing experiences. The learning models capture in a more nuanced fashion the interactions between cognitive and emotional processes which are relevant for anhedonia in a social context. With increasingly complex paradigms, such as the ultimatum game, experimental studies are becoming more sensitized to the transactional and online nature of social contexts.
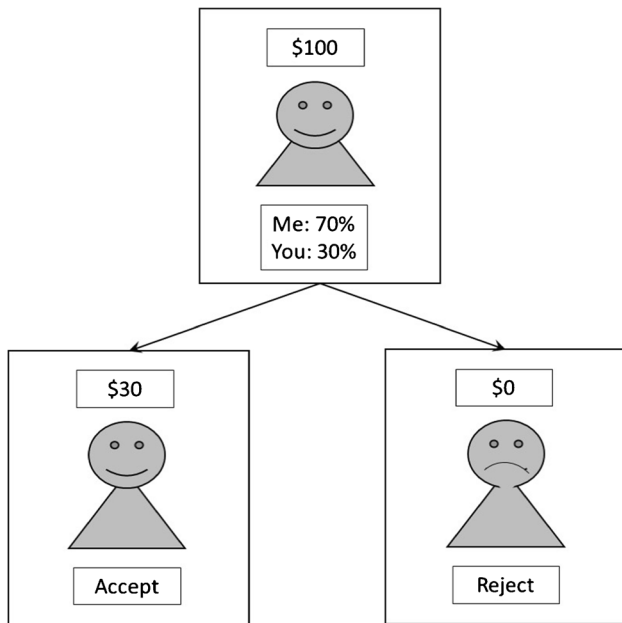
Fig. 2 The Ultimatum Game combines both cognitive and emotional elements to decision making. This creates conditions similar to day-to-day decisions. The game involves at least two characters; one character is a proposer and the other is a responder; in some versions of the task, there are multiple responders. The object of the game is to accrue as much money as possible. The proposer will put forward a division of the available money between themselves and the responder. The proposer always needs to offer the responder a share of the money available. The responder then decides whether to accept the division. If they accept, both parties receive their funds; if they reject, neither party will receive the money. Rejection of a proposal is thought to reflect punishment. Social influences on decision making drive responder's rejections of offers perceived to be unfair; the closer to a fair division of funds, the more likely it is that a responder will accept the proposal. There is no consensus on what is considered an unfair offer, although 40% and above to the responder is often used as the start of fair divisions in many studies. Proposers also tend to be inclined to offer fair division rather than a purely self-interested division (i.e., a significant proportion to themselves). This pattern of proposing and accepting is at odds with classical economy theory, where it is assumed that the proposer would offer the least possible amount to the responder, and the responder would view any funds as a gain. The proposer can be another participant or a simulated character. In some versions of the task, the proposer is aware of the responder's emotional assessment (fairness) of the proposal, while in other versions, the proposer is blind to this and is only aware of the decision to accept or reject

All future studies concerned with the learning mechanisms underpinning anhedonia in social contexts need to be mindful of the ecological validity of their scenarios and stimuli.

Recommendations for Future Research

This review has been by no means exhaustive in its inclusion of references; rather, attempts have been made to provide a representative selection of studies within each section for

patients with mental health disorders where research has been performed. Certainly, past literature has emphasized anhedonia in social settings varyingly across diagnostic groups, usually aligned to the importance highlighted through diagnostic criteria. For instance, while there has been much work concerned with motivation and learning in eating disorders in relation to food, only more recently has social functioning and anhedonia in social settings received attention. Within PTSD, research emphasizes the intrusive nature of symptoms, while for depression, schizophrenia, and autism, there is a wider spread of self-report, experimental, and clinical research concerned with anhedonia in social contexts. Therefore, one key recommendation for future work is for transdiagnostic approaches within studies so theories and experimental paradigms can be applied to more than one mental health disorder simultaneously, and the mechanisms common, and unique, to different disorders better understood. From a self-report perspective, capturing of subjective ratings in the moment using experience sampling methodology needs to become more widely used, particularly in combination with experimental or imaging paradigms to begin to appreciate how experimental task performance relates to real-world subjective experiences.

Although reward has been extensively investigated, one element which appears unconsidered is the scope, range, or window of reward for each individual. Two examples may help clarify: first, in substance abuse, reward scope is narrowed to such an extent the substance becomes the only option for reward; the wanting of the drug of choice becomes the focus of reward at the expense of other more adaptive pleasurable experiences [85]. Second, vulnerability to developing callous and unemotional traits occurs when the learning environment provides a backdrop for an interaction between low reward from social connection and reduced perceived social threat [105]. Under these circumstances, the sensitized window for reward anticipation both shifts and reflects less prosocial behavior [106]. Future research needs to develop an understanding of individual differences in the value, pleasure, and reward attached to various social contexts. Some studies in the current review highlight that those with depression and social anxiety have preferences for their social circumstances [35, 39, 40]; it may be that those with mental health disorders have strong preferences for aligning their needs and their social environment.

There is also room for clarification for how anhedonia in the social context might overlap other physical and emotional concepts. Some definitions of anhedonia include low energy [107] and weariness and fatigue [108, 109]. Fatigue and anhedonia may have both shared and distinct underlying mechanisms [110]. Neurobiologically, inflammation [111, 112] and dopamine [113] may represent common pathways for both fatigue and anhedonia, while serotonin might be more specific to fatigue [113]. The overwhelming nature

of symptoms in mental health disorders suggests fatigue is likely and reduces pleasure capacity. For example, consider anxiety disorders [114] and PTSD [115], heightened levels of anxiety, hypervigilance, and intrusive symptoms readily create physically taxing experiences in social circumstances. Future studies need to consider fatigue in those with mental health disorders in social contexts to distinguish its consequences from anhedonia.

Labeling of emotions is also complex, with low ability to label emotions [116] and the cultural context of social-emotional experiences being largely ignored to date. Culture shapes the language available for people to use as well as acceptable behaviors and permitted expectations. Affect is regulated by strategies that reflect socially bound and culturally derived values [117]. For example, having higher positive affect while preserving social harmony was important for health outcomes in Japanese adults, while social connectedness was not related to health outcomes in adults from the USA [118]. Interestingly, in the same study, the association between positive affect and health outcomes was significant for adults from the USA but not for those from Japan. Therefore, while clinicians consider cultural context in diagnostic matters, researchers now need to acknowledge the relevance of culture in theories and cross-study comparison.

Conclusions

It is becoming increasingly recognized that anhedonia is not exclusive to mood disorders. However, interest in anhedonia and its influence on experiences of social contexts needs to extend equally across all disorders, regardless of the emphasis placed by diagnostic categories. A consensus needs to be reached for a unified transdiagnostic definition of what is encompassed by anhedonia; this will be useful to clinicians in assisting patients with their experiences as well as researchers in framing their implications. Social contexts contain many factors which thwart and preserve mental well-being. The processes underpinning anhedonia shape the anticipation and in-the-moment experiences during social interactions. Preferences for social environments are considered a healthy reflection of individual differences in the general population, these now need extending to people with mental health disorders. Anhedonia is likely to heighten underlying temperament factors that shape social preferences.

Future theory development needs to reflect that anhedonia is a transdiagnostic symptom; therefore, explanations need to go beyond reward processing to provide cognitive, social, and emotional processes that are applicable to universal human experience. With increased understanding of the detrimental effects of low social connectedness or loneliness for mental and physical health, any factors which threaten opportunities for meaningful social connections need to be ameliorated. An understanding of how anhedonia shapes subjective experiences in social settings will not only move forward interventions for mental health disorders but also transient experiences of low social rewards in the general healthy population. Understanding the nature of social reward is paramount for the development of targeted, evidence-based interventions which promote psychological health and recovery from mental health disorders. Therefore, increased knowledge on how anhedonia interferes with the experience of social contexts should be a priority for clinicians, researchers, and social policymakers in reducing the individual and economic burden of mental ill-health.

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●● Of major importance

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