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ORIGINAL ARTICLE

Attenuated positive psychotic symptoms and the experience of anhedonia

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Background: Deficits in anticipatory pleasure have been consistently shown among chronic, first-episode, and clinical high risk for psychosis populations, but much less attention has been given to non-clinical individuals experiencing attenuated positive psychotic symptoms (APPS).

Methods: Young adults (N = 1839) were administered the Temporal Experience of Pleasure Scale, which measures anticipatory and consummatory pleasure, and the Prodromal Questionnaire, which measures APPS. Analyses examined (1) total APPS endorsed and (2) comparisons of groups experiencing APPS that were endorsed as distressing (distressing APPS = D-APPS; experiencing more D-APPS = high-D-APPS, a potentially more clinically meaningful group; experiencing fewer D-APPS = low-D-APPS).

Results: Results indicated that anticipatory, but not consummatory, pleasure deficits were associated with elevated APPS. Additionally, the high-D-APPS group exhibited significantly less anticipatory pleasure compared with the low-D-APPS group, but did not differ in consummatory pleasure.

Conclusion: Our results mirror findings in schizophrenia samples and suggest that anticipatory pleasure deficits occur along the entire continuum of psychotic experiences.

KEYWORDS

anhedonia, anticipatory pleasure, consummatory pleasure, psychosis, schizophrenia

1 | INTRODUCTION

Anhedonia, which is the diminished experience of pleasure, is commonly experienced by individuals with schizophrenia. Anhedonia has been implicated in a number of adverse outcomes in schizophrenia, including increased stress and decreased subjective well-being (Blanchard, Mueser, & Bellack, 1998), poor self-efficacy and low self-esteem (Ritsner, 2014), poorer premorbid functioning (Chapman, Chapman, & Raulin, 1976; Garnet, Glick, & Edell, 1993), low social functioning and less social support (Ritsner, 2014) and increased emotional distress compared with schizophrenia patients without anhedonia (Myin-Germeys, 2001). Kring and Elis (2013) have argued for the importance of distinguishing anticipatory and consummatory pleasure, noting that anhedonic deficits in schizophrenia are most often observed in anticipatory, but not consummatory pleasure. Indeed, research across multiple methods has consistently shown that anticipatory pleasure is diminished in people with schizophrenia and in those with recent onset of psychosis, while consummatory pleasure remains unaffected (Gard, Germans Gard, Kring & John, 2006; Gard, Kring, Germans Gard, Horan, & Green, 2007; Kring, Germans Gard, & Gard, 2011; Mote, Minzenberg, Carter, & Kring, 2014). Anticipatory pleasure, relative to consummatory pleasure, has also been demonstrated as being more closely related to goal-directed and motivated behaviour, which is also impaired in psychosis and is associated with to functional outcome (Klein, 1984). Similarly, one study has reported deficits in anticipatory pleasure in individuals at clinical high risk (CHR) for developing psychosis, although this study also found consummatory pleasure deficits in their sample (Schlosser et al., 2014).

A wealth of literature demonstrates the separate nature of consummatory and anticipatry pleasures, especially as they apply to schizophrenia and other psychosis populations. That is, deficits have consistently been found in anticipatory pleasure in schizophrenia and first-episode populations, whereas consummatory pleasure has been found to be intact (Cohen & Minor, 2010; Foussias & Remington, 2010; Gard et al., 2007). These differences have been demonstrated in laboratory studies, in self-report questionnaires, and in ecological momentary studies (Cohen & Minor, 2010; Kring & Moran, 2008). Furthermore, anticipatory and consummatory pleasure have been

associated with different neural circuitry, neurotransmitters, and behavioural sequelae (Gard et al., 2007). It is particularly important, therefore, to distinguish between anticipatory and consummatory pleasure deficits in psychosis spectrum studies.

Although there are studies investigating anticipatory and consummatory pleasure in chronic, recent onset, and first-episode groups, little is known about whether anticipatory or consummatory pleasure deficits may precede help-seeking for people with either psychotic or subthreshold level psychotic symptoms. Psychotic symptoms are comprised of a continuum of perceptual abnormalities, paranoia and suspiciousness, disorganization and unusual thinking, though only the most frequent and/or debilitating are considered clinically relevant (van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009). However, constraining psychosis research to symptoms of clinical severity restricts the applicability of findings. Assessing the dimensionality of psychotic symptoms is essential for exploring an extended psychosis phenotype, given that individuals who experience attenuated positive psychotic symptoms (APPS) that do not reach clinical severity are at greater risk for developing a psychotic disorder (van Os & Linscott, 2012). Further, depression (which shares the symptom of anhedonia with schizophrenia) and negative symptoms are frequently seen in the prodrome of psychosis (Demmin, Carrión, Auther, McLaughlin, & Cornblatt, 2013; Piskulic et al., 2012). In fact, among those at CHR for psychosis, inclusion of negative symptoms increases prediction of conversion to a psychotic disorder by 10% for every 1-point increase in negative symptoms on a subscale of the Structured Interview for Psychosis Risk Syndromes (SIPS) (Schlosser et al., 2012). These findings suggest that understanding how anhedonia, and anticipatory pleasure in particular, is associated with subthreshold psychotic symptoms may help us with early intervention and prevention strategies.

As such, the present study sought to assess the relationship between hedonic functioning and APPS in a non-clinical, young adult sample. Specifically, the present study examined anticipatory and consummatory pleasure using the Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006) in those experiencing a range of APPS, including APPS that are experienced as distressing as they may be more clinically relevant. In line with previous research in chronic schizophrenia samples, we hypothesized that anticipatory, but not consummatory, pleasure deficits would predict increases in number of APPS experienced. Although one previous study indicated that those at CHR report consummatory pleasure deficits (Schlosser et al., 2014), our hypotheses were based on the preponderance of findings in psychosis samples. We also hypothesized that diminished anticipatory pleasure would predict those who experience more distressing APPS, and are at potentially higher risk of developing psychosis (high-D-APPS group), compared to those who experience few distressing APPS, and are at presumed lower risk for psychosis (low-D-APPS group) (see "Instruments" for how groups were determined).

2 | METHODS

All methods were approved by the Temple University Institutional Review Board.

2.1 | Participants

Participants (N = 1839) were racially/ethnically and socioeconomically diverse sample of male and female non-help-seeking young adults. Participants were recruited via an online subject recruitment website and received college course credit for their participation. For inclusion, participants were to be between the ages of 18 and 35, which corresponds to the typical age range of individuals developing schizophrenia (American Psychiatric Association, 2013), and fluent in English. See Table 1 for participant characteristics.

2.2 | Procedures

Following informed consent, participants were directed to a laboratory computer terminal at which questionnaires were individually, electronically administered. Demographic characteristics were first collected, followed by the administration of additional questionnaires such as depressive symptoms and substance use, including the Prodromal Questionnaire (PQ; Loewy, Bearden, Johnson, Raine, & Cannon, 2005; Loewy, Johnson, & Cannon, 2007) and the TEPS (Gard et al., 2006).

2.2.1 | Instruments

The PQ (Loewy et al., 2005, 2007) is a 92-item, self-report questionnaire that measures subthreshold psychotic symptoms experienced in the past month in four domains: positive, negative, disorganized, and general. The PQ also requires participants to endorse whether symptoms were experienced as distressing. The PQ has been tested against semi-structured interviews commonly used to identify individuals at risk for psychosis and has been found to be both reliable and valid in comparison (Loewy et al., 2005).

We focused on the positive symptom domain, as this domain has been associated with increased risk for psychosis and has been primarily studied in investigations of attenuated psychotic symptoms in the general population (Cannon et al., 2008; Loewy et al., 2007). In line with previous research, distressing items are an additional focus for the current study, as those who endorse distressing items are at a higher likelihood of developing a psychotic disorder (Hanssen, Bijl, Vollebergh, & van Os, 2003; Loewy et al., 2007). APPS were examined continuously (total number of APPS endorsed), as well as categorically (ie, high-D-APPS = potentially higher risk for psychosis; low-D-APPS = potentially lower risk). Group membership for the categorical variable was determined by endorsement of 8 or more distressing APPS (high-D-APPS, current study n = 219) compared to 3 or fewer distressing APPS and 8 or fewer total APPS (low-D-APPS group; the means of APPS distressing and total APPS symptoms in our larger undergraduate sample, current study n = 1006) (Gibson et al., 2014; Reeves et al., 2014). Endorsing 8 or more positive symptoms has been found to have 90% sensitivity and 49% specificity with individuals identified as CHR using the SIPS in a clinical population, and in an undergraduate sample 2% met this criterion if 8 symptoms were endorsed as distressing (Loewy et al., 2005, 2007).

The TEPS (Gard & Kring, 2009), an 18-item self-report questionnaire, is designed to index trait disposition to experience anticipatory pleasure (ie, pleasure associated with wanting a given reward or

TABLE 1 Participant demographics and characteristics

	Total sample (N = 1839)	High-D-APPS (n = 219)	Low-D-APPS (n = 1006)	*P*-value or χ^2
Gender: F% (M%)	72.4 (27.6)	74.7 (25.3)	73.1 (26.9)	.626
Age: *M* (SD) [range]	20.68 (3.60) [18 to 35]	20.27 (2.76) [18 to 31]	20.67 (2.98) [18 to 35]	.719
Race/ethnicity: N (%)				.880
Caucasian/White	1090 (59.3)	133 (60.2)	622 (61.8)	
African-American/Black	314 (17.1)	35 (16.0)	152 (15.1)	
Asian/Pacific Islander	245 (13.3)	33 (14.9)	133 (13.2)	
Hispanic/Latino	79 (4.3)	8 (3.6)	41 (4.1)	
Other	111 (6.0)	10 (4.6)	58 (5.8)	
APPS: *M* (SD) [range]	8.62 (7.09) [0 to 38]	20.04 (6.66) [8 to 38]	3.69 (2.32) [0 to 8]	<.001***
D-APPS: *M* (SD) [range]	3.10 (4.18) [0 to 33]	12.16 (4.54) [8 to 33]	0.73 (0.98) [0 to 3]	<.001***
TEPS: *M* (SD) [range]				
Anticipatory	47.66 (6.92) [15 to 60]	46.36 (6.88) [24 to 60]	47.94 (6.93) [15 to 60]	.002**
Consummatory	37.13 (6.88) [8 to 48]	37.47 (6.71) [16 to 48]	37.21 (7.01) [8 to 48]	.622
CES-D: *M* (SD) [range]	7.43 (5.11) [0 to 28]	13.38 (5.53) [0 to 28]	5.32 (3.76) [0 to 21]	<.001***
Alcohol use: N (%)	1524 (82.87)	187 (84.60)	816 (81.11)	.176
Cannabis use: N (%)	729 (39.64)	105 (47.95)	354 (35.19)	<.001***
Amphetamine/stimulant use: N (%)	153 (8.32)	35 (15.98)	59 (5.86)	<.001***
Opiate use: N (%)	41 (2.22)	10 (4.57)	17 (1.69)	.009

Abbreviations: APPS, attenuated positive psychotic symptoms; CES-D, Center for Epidemiological Studies-Depression Scale Revised; D-APPS, APPS endorsed as distressing; high-D-APPS, individuals who endorsed 8 or more distressing APPS and may be at higher clinical risk for psychosis; low-D-APPS, individuals who endorsed 3 or fewer distressing APPS, and fewer than 8 total APPS; TEPS, Temporal Experience of Pleasure Scale.

experience) and consummatory pleasure (ie, pleasure associated with liking a given activity or experience in-the-moment). The TEPS includes the 10-item anticipatory pleasure subscale, and the 8-item consummatory pleasure subscale. This questionnaire is widely used to assess pleasure deficits in individuals with a diagnosis of or at risk for schizophrenia and other psychotic disorders (Cohen & Minor, 2010). The TEPS yields high levels of internal consistency (α = .96) (Gard et al., 2006) and is one of the most commonly used self-report measure of hedonic functioning in psychotic disorders.

2.3 | Statistical analytic plan

Participants who did not report their age (n = 2) or were over the age of 35 (n = 1) were removed to ensure that participants from the sample were within the typical age of onset for schizophrenia (18 to 35 years old) (American Psychiatric Association, 2013). Data analyses used the total resultant sample of 1839 participants. Linear regressions were conducted to determine the relationship between anticipatory and consummatory pleasure and APPS. We also conducted a logistic regression with pleasure deficits as the predictor and high- and low-D-APPS status as the outcome. Separate models were conducted for the consummatory and anticipatory pleasure scales.

3 | RESULTS

Our sample was mostly representative of the community from which it was drawn, although there were significantly more females than males. We conducted regression analyses separately for men and women but did not find any significant gender differences. As such, they are not included here for brevity. As Table 1 indicates, there were no differences between high-D-APPS (n = 219) and low-D-APPS (n = 1006) groups on gender, age, or ethnicity. As such, these variables were not controlled for in analyses.

As shown in Table 2, linear regression results indicated that decreases in anticipatory pleasure were significantly associated with increases in APPS, whereas there was no significant association with consummatory pleasure. Similarly, logistic regression results indicated that decreases in anticipatory pleasure were associated with significantly increased odds of being classified as high-D-APPS.

TABLE 2 Regression and logistic regression models examining the relation between anticipatory/consummatory pleasure deficits with APPS and high-D-APPS

	APPS				High-D-APPS		
	β	*B*	*t*-value	*P*-value	OR	95% CI	*P*-value
TEPS anticipatory	−0.082	−0.084	−3.536	<.001***	0.97	0.95 to 0.98	.002**
TEPS consummatory	0.004	0.004	0.168	.867	0.99	0.97 to 1.01	.622

APPS, attenuated positive psychotic symptoms; CI, Confidence Interval; high-D-APPS, individuals who endorsed 8 or more distressing APPS and may be at higher clinical risk for psychosis; OR, Odds Ratio; TEPS, Temporal Experience of Pleasure Scale.

** Significant at the <.01 level; ***significant at the <.001 level.

4 | DISCUSSION

To our knowledge, this is the first study to demonstrate that the pattern of reduced anticipatory pleasure evident across clinical psychosis samples can be extended to individuals experiencing subthreshold psychotic symptoms. In the current study, we found that as anticipatory, but not consummatory, pleasure decreases, APPS increase in a sample of non-clinical young adults. Further, we found that decreases in anticipatory pleasure significantly increased the odds of experiencing more numerous distressing APPS (high-D-APPS group). These data mirror patterns in chronic psychosis, such as schizophrenia, and suggest that people at high-D-APPS may share additional risk factors (e.g., anticipatory pleasure deficits) as those with psychotic disorders. Further, our data provide rationale to explore other factors in those at high-D-APPS that may also indicate risk for psychosis, such as increased impairment and increased suicidality. While the magnitude of our findings are small (i.e., betas and odds ratios), our results are consistent with the larger literature, suggesting that hedonic functioning differences appear to occur along the entire continuum of psychotic experiences.

As expected, we did not find that decreases in consummatory pleasure were related to APPS or high-D-APPS. While these findings are similar to studies of individuals in latter stages of developing psychosis, they are inconsistent with one recent study that found decreased consummatory pleasure among individuals at CHR for psychosis compared to age-matched, non-psychiatric controls and to individuals further along the course of psychosis (Schlosser et al., 2014). It is possible that as subthreshold psychotic symptoms become severe enough to warrant clinical attention, there is an anomalous decrease in consummatory pleasure specific to that developmental period of the emergence of psychosis; however, additional work investigating consummatory pleasure deficits in the earliest stages of developing a psychotic disorder is clearly needed.

This study is particularly notable for its large, diverse sample. Nevertheless, results from this study may not generalize outside of college populations given that the sample consisted of college students, even though the publicly funded university is comprised of students who are quite diverse from a socioeconomic and ethnic/racial standpoint. Additionally, understanding differential anticipatory and consummatory pleasure deficits across the psychotic spectrum has the potential to inform targeted intervention strategies. Specifically, attenuated psychotic symptoms occur in a large portion of the population and co-occur in a number of mental disorders; therefore, our findings suggest that anticipatory pleasure deficits may be important to assess in clinical situations where APPS occurs. Further, considering that consummatory pleasure is intact in our high-D-APPS group, but has been found to be decreased in a CHR group (Schlosser et al., 2014), researchers can refine targeted intervention to when it may be most efficacious. Finally, findings from this study provide additional evidence for an extended psychosis phenotype. The importance of investigating and assessing psychotic experiences dimensionally is underscored by research supporting the existence of an extended psychosis phenotype, whereby APPS experienced by non-help-seeking individuals have been linked to risk for developing a psychotic disorder, and subclinical and clinical psychosis have been found to have overlapping risk factors (van Os & Linscott, 2012; van Os et al., 2009). Specifically, our data further support an extended psychosis phenotype by providing evidence of a previously unexplored shared factor—anticipatory pleasure deficits—between non-help-seeking young adults who experience increased subthreshold psychotic symptoms and anticipatory pleasure deficits in those with psychotic disorders.

This study is not without limitations. Most notably, the cross-sectional design of this study means we do not know which individuals may transition to psychosis. Second, while we ran analyses by gender and found no significant gender results and gender did not differ between high- and low-D-APPS groups, there were significantly fewer men than women in the study. Nonetheless, future research should seek to remediate the gender imbalance when assessing those experiencing APPS. Additionally, the TEPS has limitations in measuring consummatory pleasure; that is, the TEPS specifically measures semantic, but not experiential, knowledge of emotion. Experiential knowledge of emotion is important to truly understand pleasure in consummation. As such, future studies would benefit from using additional measures, such as other self-report tools or through ecological momentary assessment studies, to better capture experiential consummatory emotion. Further, the TEPS focuses on measuring physical, but not social, anhedonia and people at risk for and with psychotic disorders have been found to have deficits in social relationships and may derive less pleasure in social situations (Gard & Kring, 2009). Understanding both physical and social anticipatory and consummatory pleasure deficits is an important future direction for new studies. Finally, with the array of negative outcomes associated with anhedonia in psychotic samples, future studies should seek to assess the relation between anhedonia and associated negative outcomes (e.g., cognitive problems) at earlier stages of developing a psychotic disorder, including those experiencing APPS.

In sum, non-clinical individuals who reported higher levels of anticipatory, but not consummatory, anhedonia also reported experiencing more APPS. Additionally, higher levels of anticipatory anhedonia increased the odds of being at a potentially higher risk for psychosis (high-D-APPS group). Future studies should longitudinally assess anhedonia to determine hedonic functioning differences—and their correlates—in individuals that transition to a psychotic disorder relative to those who do not.

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