**Wanting and Liking: Testing the Factor Structure of The Temporal Experience of Pleasure Scale in
Major Depression and Community Samples**

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Abstract

The Temporal Experience of Pleasure Scale (TEPS) is a multidimensional self-report measure that has been used to improve understanding of anticipation (“wanting”) and consummation (“liking”) of reward. The TEPS has been used to assess anhedonia in clinical depression, but its factor structure has not yet been confirmed in this population. This seems important given mixed findings on the model fit and factor structure of the TEPS in clinical and community samples. To remedy this, the current study used confirmatory factor analysis to test models of the TEPS items across three studies: 1) in adults with major depression ($N = 334$), 2) in youth with major depression ($N = 305$), and 3) in a community sample ($N = 320$). In summary, the model fit of the two-factor TEPS scales was adequate in depressed and community Australian samples. Nevertheless, some items may require removal or revision based on cultural preferences for pleasurable experiences. On comparing the clinical and community groups, deficits in the experience of pleasure in depression were replicated, and were more pronounced in anticipatory pleasure/wanting ($d = 1.33$) relative to consummatory pleasure/liking ($d = 0.64$).

Keywords: depression; anticipatory pleasure; consummatory pleasure; temporal experience of pleasure scale; wanting; liking; confirmatory factor analysis

Introduction

Anhedonia refers to a lack of positive emotion in response to experiences that otherwise elicit a subjectively rewarding, pleasurable response. Anhedonia is one of the core criteria of major depression, and a feature of depressive disorders in general (American Psychiatric Association, 2013; World Health Organization, 1993). A number of self-report measures have been developed over time to specifically assess anhedonia and the capacity for reward responses (Leventhal, Chasson, Tapia, Miller, & Pettit, 2006; Leventhal et al., 2015; Rizvi, Pizzagalli, Sproule, & Kennedy, 2016). More recently, measures have been informed by research showing distinctions in reward response based on anticipating (*wanting*) and consuming (*liking*) reward (Berridge & Robinson, 2003). One of these measures, the Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2006) has become widely used in the study of anticipatory and consummatory pleasure. The initial validation of the TEPS indicated that its 18 items were psychometrically valid in the assessment of these two aspects of reward response.

Since its development the TEPS has been used to study reward response in people with depressive disorders, and has been shown to be sensitive to detecting differences between those with and without depression (Hallford & Sharma, 2019). Despite this wide use, no study has assessed the psychometric properties of the TEPS items nor its factor structure in people with clinical depression. Such an investigation is important, given there have been mixed findings regarding model fit in samples with other psychiatric disorders and community samples. If the model fit in samples of depression is poor then the TEPS may be mis-specifying how wanting and liking operates in those with depression. For example, underestimating differences with healthy controls or failing to capture distinct associations between the subscales with related variables, such as motivation, decision-making, or behaviour.

With regard to previous studies in clinical samples, Favrod, Ernst, Giuliani, and Bonsack (2009) indicated that a two-factor model of the TEPS was an excellent fit to responses from a sample of individuals with schizophrenia using confirmatory factor analysis (CFA). Simon et al. (2018) reported an acceptable, but somewhat poorer, fit of a two-factor model in a joint clinical (schizophrenia/schizoaffective disorder) and healthy control sample. In contrast, Garfield, Cotton, and Lubman (2016) reported poor fit for a two-factor model of a state version of the TEPS in a sample of individuals with opiate dependence. This fit was improved

by removing two items and correlating some residuals.

Subsequent to the initial validation of the TEPS, studies have reported mixed findings on the factor structure. Chan et al. (2012) found an inadequate fit for the two-factor model in a sample of Chinese college students, but reported an excellent fit using a four-factor model that further parsed the anticipatory and consummatory subscales into abstract (e.g., *When something is coming up in my life, I really look forward to it*; abstract anticipatory) and contextual items (*The sound of crackling wood in the fire is very relaxing*; contextual consummatory). They did note that the abstract and contextual consummatory reward subscales could not be clearly distinguished conceptually. Despite this, subsequent studies by Z. Li et al. (2018) and Zhou et al. (2019) replicated the finding of a clearly superior fit for a four-factor model in Chinese adults. Notably, Li et al.'s study also used an adult sample from the United States, however, in this sample the four-factor model was not superior to the two-factor model. Further, in Zhou et al.'s study, error terms were correlated in order to achieve good fit in the four-factor model. Ho, Cooper, Hall, and Smillie (2015) reported inadequate fit of both the two and four-factor models in samples of adults from the U.K. and Australia. They suggested that this was due to a lack of distinction in the latent variables, and that items may have loaded onto multiple factors. Notably, their test of a one-factor model incorporating all items was a poorer fit to the data than multi-factorial models. Stratta et al. (2001) found that a three-factor model parsing anticipatory pleasure into abstract and contextual subscales was the best solution for the TEPS items in exploratory factor analysis in Italian teenagers. Notably, this model was not confirmed in CFA. In summary, no studies have used CFA to test the factor structure of the TEPS in a clinically-depressed sample, although a reasonable to good model fit has been found in other clinical samples. In contrast, studies in community samples have shown mixed findings on model fit, and some evidence indicates a four-factor model may be superior.

The aim of this study was to examine the model fit of the TEPS in clinically-depressed and community samples. To do this, responses to TEPS items from two clinical samples with a current major depressive episode were examined: one of adults aged 18 years and over, and one of youth aged between 15 and 25 years. In addition, responses from one community sample of adults aged 18 years and over were used. Given the findings of previous research, three models were tested and compared in each sample: the original two-factor model, a four-factor model, and a one factor model. In addition, differences between the clinical and

community samples on anticipatory and consummatory pleasure were tested. Based on previous findings in clinical samples, it was hypothesized that a two-factor model (anticipatory; consummatory) would be the best fit to the data, and that both subscales on the TEPS would be significantly lower in those with a current major depressive episode relative to the community sample.

Study 1 – CFA in Adults with Major Depression

Methods

Participants and Procedure

The sample comprised participants who completed the relevant measures for this study as part of a baseline questionnaire in a separate, repeated measures study (Hallford, Austin, Raes, & Takano, 2019). Of the 502 people that commenced this baseline questionnaire, 168 were excluded for the purpose of this study as they did not complete the TEPS items. This left 334 participants. This provided a good case to item ratio ($> 18:1$: Kline, 1998) and adequate sample size with which to accurately estimate parameters (Gagne & Hancock, 2006). The inclusion criteria for that study were: ≥ 18 years of age, residing in Australia, currently experiencing a Major Depressive Episode (MDE) as determined by the electronic-Psychological Assessment System (e-PASS) (Nguyen, Klein, Meyer, Austin, & Abbott, 2015) and a score of ≥ 10 on the Patient Health Questionnaire-9 (PHQ-9)(Kroenke, Spitzer, Williams, & Lowe, 2010) indicating at least moderate depression. The mean score in the current sample was 17.4 ($SD = 3.3$), indicating moderately-severe depressive symptoms.

The sample was on average middle-aged, with a mean age of 46.9 ($SD = 12.7$; range 18-82). The sample comprised 84.7% women and 14.1% men, with 1.2% reporting their gender identity as “other”. The vast majority identified as Caucasian/White European (94.3%), while 1.2% identified as Asian, and the remaining 4.5% was distributed among other ethnicities. Regarding highest education level attained, 0.3% of participants endorsed primary school, 21.3% high school, 25.1% diplomas/certificates, 39.2% bachelor degrees, and 14.1% postgraduate degrees. Over half of the participants were in paid work (60.1%). Most of the sample reported being on antidepressant medication (86.8%).

Ethics approval was obtained from the University Human Research Ethics Committee prior to data collection commencing. The participants were recruited through advertising on social media platforms (e.g. Facebook, Instagram), and online groups and forums based in Australia. Participants responded to

advertisements by following a link to an online survey which contained a plain language statement. Informed consent was provided by participants indicating their agreement through clicking on the continue button after the plain language statement. They then answered questions regarding eligibility and proceeded to complete the larger questionnaire of which the TEPS was part. No incentive for participation was offered.

Materials

Temporal Experience of Pleasure Scale (Gard et al., 2006). The TEPS consists of 18 self-report questions that assess for trait anticipatory pleasure (10 items) and consummatory pleasure (8 items). Responses are given on a 6-point scale (1 = Very false for me to 6 = Very true for me), and items are averaged in each subscale so that higher scores indicate a stronger tendency to anticipate or experience pleasure.

Electronic Psychological Assessment System (e-PASS; Nguyen et al., 2015). The e-PASS is self-report clinical assessment system designed for online completion. It has eleven items corresponding to a diagnosis of a Major Depressive Episode from the Diagnostic and Statistical Manual of Mental Health Disorders (DSM-5; American Psychological Association, 2013). The questions asked about the frequency of symptoms over the last two weeks using a scale from 0 (*not at all*) to 4 (*every day*), and one item relating to severity using a 0 (*no interference/distress*) to 8 (*extremely significant interference/distress*). An algorithm is used to score the e-PASS in concordance with DSM criteria. If participants endorse at least five symptoms as occurring either *more days than not* or *every day*, at least one of which is disturbance in mood or anhedonia, and score three or more on the interference/distress question, they are categorized as experiencing an MDE. Diagnosis on the e-PASS for MDE has been shown to correspond with diagnoses made using the structured, face-to-face Mini-International Neuropsychiatric Interview (MINI; $\kappa = .57$; Sheehan et al., 1998; Nguyen et al., 2015). To further assess the criterion validity of the e-PASS, a sample of 50 individuals (aged 18 to 65) completed the e-PASS online and the MINI over the telephone as part of a study not otherwise related to this series of studies. The concordance between diagnosis on the E-PASS and the MINI was 94% ($n = 47/50$), indicating the e-PASS had high agreement with a structured interview confirming diagnosis of major depressive disorder.

Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2010). The PHQ-9 comprises nine self-report items referring to DSM criteria for a Major Depressive Episode (American Psychiatric Association, 2013). Items refer to the frequency of the symptoms over the last two weeks on a scale of 0 (*not at all*) to 3

(*nearly every day*), and answers are summed to provide a severity score. The PHQ-9 has shown good psychometric properties for identifying probable depression and assessing the severity of depressive symptoms (Kroenke et al., 2010). The computerized version retains these excellent psychometric properties (Erbe, Eichert, Rietz, & Ebert, 2016). The internal reliability was acceptable in the current study (Cronbach's $\alpha = .82$).

Data Analytic Approach

The CFAs were conducted using the Lavaan package (Rosseel, 2012) in R version 4.0.2 (RStudioTeam, 2020) using a diagonal weighted least square with variance adjusted robust estimator with Pearson correlations to estimate the model. This approach provides less biased estimations of factor loadings in ordinal data compared to maximum likelihood estimation and is robust to non-normality in the distribution of item responses with samples of this size (Li, 2016; Moshagen & Musch, 2014). To assess model fit we used the following indices: The chi-square value (CMIN) and corresponding p -value (set at $p < .05$), the relative chi-square statistic (CMIN/DF; using a conservative guide of < 3.0 for acceptable model fit suggested by Kline (1998), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the comparative fit index (CFI). The latter three fit indices were assessed relative to guidelines provided by Hu and Bentler (1999) of scores that, if approximated, indicate good model fit: $RMSEA \leq .06$, $SRMR \leq .09$, and $CFI \geq .95$. Marsh (2004) contends that such cutoffs should not be used in a hypothesis-testing way, and therefore interpretation of model fit was also guided by criteria that an RMSEA between .06 and .10 and a CFR between .90 and .95 were acceptable, but scores outside of this criteria indicated models were likely to be in need of substantial improvement. McDonald's ω_r was used to assess the internal reliability of scale items. The TEPS subscales were correlated using Pearson correlation coefficients. Other pre-processing analyses were conducted in SPSS 26.0.

The two-factor model loaded items onto the anticipatory and consummatory subscales consistent with those prescribed by Gard et al. (2006). Consistent with Chan et al. (2012), the four-factor model loaded items onto anticipatory abstract, anticipatory contextual, consummatory abstract, and consummatory contextual subscales, and excluded the single reverse-scored item on the TEPS. Table 1 shows the content of each TEPS item and corresponding subscale.

Results

The results from the CFA (see Table 2 for all fit indices across studies) indicated that the two-factor model was an acceptable fit to the data. The four-factor model had a similar fit to the two-factor model, with indices within acceptable ranges. Notably, the consummatory abstract and consummatory contextual latent variables, and anticipatory context and consummatory context variables had very high standardized covariances ($.93, p < .001$ and $.89, p < .001$, respectively). This indicated that most of the variance in responses was shared, and they could not be clearly discriminated. The one-factor model was then tested and was an inadequate fit to the data on several indices. Given this model was nested within the two-factor model, a chi-square test could be conducted to statistically compare their relative fit. Unsurprisingly, this indicated the one-factor model was a significantly poorer fit than the two-factor model, $\Delta\chi^2(1) = 111.2, p < .001$ ($\Delta RMSEA = .015, \Delta SRMR = .009, \Delta CFI = .044$). I

In summary, the two-factor model was the best fit to the data statistically and its latent variables were more clearly distinguished than the four-factor model which showed evidence for collinearity. Descriptive statistics and item-total correlations for the two-factor model are shown in Table 1. The correlation between the two subscales was significant ($r(334) = .54, p < .001$). The internal reliability was acceptable for the anticipatory ($\omega = .81$) and consummatory subscales ($\omega = .80$). Figure 1 indicates that all items loaded higher than .40 onto their latent variables with the exception of items 7, 9, and 11 which had loadings $< .40$. Item 7 is a reverse-coded item, which typically show weaker correlations with other scale items and poorer loadings with latent variables (Swain, Weathers, & Neidrich, 2008; Van Sonderen, Sanderman & Coyne, 2013; Woods, 2006). The reasons for poor loadings on items 9 and 11 are less clear, although items 11 references anticipation of riding rollercoasters at amusement parks which is likely to be an infrequent event for respondents and could possibly be confounded with feelings of anxiety about this experience. Notably, while these items did not load adequately on their subscales, removing them made the model fit worse on some indices, $CMIN = 292.9 (df = 89, p < .001)$, $CMIN/df = 3.29$, $RMSEA = .083$ (90%CI .073 - .094), $SRMR = .069$, $CFI = 0.907$.

Study 2 – CFA in Youth with Major Depression

Participants and Procedure

The sample of youth also completed the measures as part of a questionnaire in a repeated measures study, separate from that used in Study 1 (Hallford, Carmichael, et al., 2020). Recruitment for that study was still

underway at the time of writing. Based on the same sample size estimates from Study 1, we included the first 300 people that completed the TEPS items ($N = 305$). The recruitment method and inclusion criteria was the same as Study 1, except that participants were required to be 15-25 years old (assessed through self-report), and there was no severity cutoff using the PHQ-9.

The sample had a mean age of 19.3 ($SD = 3.0$; range 15-25). The sample comprised 76.1% women and 15.1% men, 0.7% intersex, and 8.2% reported their gender identity as “other”. The vast majority identified as Caucasian/White European (83.5%), while 6.3% identified as Asian, and the remaining 10.2% was distributed among other ethnicities. Regarding highest education level attained, 4.9% of participants endorsed primary school, 55.7% high school, 17% diplomas/certificates, 20.3% bachelor degrees, and 2% postgraduate degrees. Just under half of the participants were in paid work (46.9%). Most of the sample reported having antidepressant treatment sometime in their past (60.7%).

Results

The results indicated that the two-factor model was an acceptable fit to the data. Again, the four-factor model did not fit the data as well as the two-factor model, and the covariances between abstract and contextual latent variables within anticipatory and consummatory pleasure indicated collinearity (both $.85, p < .001$). The one-factor model was an inadequate fit to the data on several indices. A chi-square test indicated this was a significantly poorer fit than the two-factor model, $\Delta\chi^2(1) = 171.4, p < .001$, and outcomes on the fit indices were notably worse ($\Delta RMSEA = .028, \Delta SRMR = .020, \Delta CFI = .074$).

In summary, the two-factor model was again the best fit to the data. Descriptive statistics and item-total correlations for the two-factor model are shown in Table 1. The correlation between the two subscales was again significant ($r(305) = .48, p < .001$). Most items in the two-factor model loaded higher than $.40$ onto their latent variables (see Figure 2). The exceptions to this were again items 9 and 11, and removing these items resulted in marginally poorer fit on some indices, $CMIN = 238.0$ ($df = 103, p < .001$), $CMIN/df = 2.31$, $RMSEA = .066$ (90%CI $.037 - .061$), $SRMR = .061$, $CFI = 0.934$. The internal reliability was acceptable for the anticipatory pleasure ($\omega = .86$) and consummatory subscales ($\omega = .79$).

Study 3 – CFA in a Community Sample of Adults and Group Comparisons

Participants and Procedure

The participants in this study ($N = 320$) were recruited through advertising on social media platforms (e.g. Facebook, Instagram) and completed the TEPS along with other measures that were part of a broader cross-sectional study. The sample size estimates from Study 1 and 2 were used again. The inclusion criteria were: ≥ 18 years of age and residing in Australia. The procedure for online recruitment was otherwise consistent with Study 1 and 2. The mean age of the sample was 32.4 ($SD = 11.6$; range 18-84). The sample comprised 62.5% women and 37.2% men, with 0.3% reporting their gender identity as “other”. The vast majority identified as Caucasian/White European (66.2%), while 20.8% identified as Asian, and the remaining 12.9% was distributed among other ethnicities. Regarding highest education level attained, 14.5% endorsed high school, 19.5% diplomas/certificates, 44% bachelor degrees, and 22.1% postgraduate degrees. Most were in paid work (85.3%).

Materials

The TEPS and e-PASS were used again in this study.

Data Analytic Strategy

The analytic strategy was replicated from Study 1 and 2. To assess differences in means scores on the TEPS between clinical and community samples, the samples from Study 1 and 2 were combined and a 2 x 2 repeated measures ANOVA was conducted using group (clinical sample; community sample) as a between-groups factor and the two TEPS subscales (anticipatory; consummatory) as a within-groups factor.

Results

The results indicated that the two-factor model was an acceptable fit to the data. Once again, the four-factor model did not fit the data as well as the two-factor model on some indices and collinearity was indicated between several latent variables, including consummatory abstract and consummatory contextual ($.89, p < .001$). The one-factor model was again an inadequate fit to the data. A chi-square test indicated this was a significantly poorer fit than the two-factor model, $\Delta\chi^2(1) = 194.6, p < .001$, and outcomes on the fit indices were notably worse ($\Delta RMSEA = .026, \Delta SRMR = .017, \Delta CFI = .062$).

Descriptive statistics and item-total correlations for the two-factor model are shown in Table 1. The correlation between the two subscales was significant ($r(320) = .54, p < .001$). As indicated in Figure 3, again most items loaded higher than .40 onto their latent variables, with the exception of items 7 and 11. and removing these items resulted in approximately the same fit with marginally higher or lower scores on some

indices, $\text{CMIN} = 305.8$ ($df = 103$, $p < .001$), $\text{CMIN}/df = 2.96$, $\text{RMSEA} = .079$ (90%CI .068 - .089), $\text{SRMR} = .068$, $\text{CFI} = 0.932$. The internal reliability was acceptable for the anticipatory pleasure ($\omega = .84$) and consummatory subscales ($\omega = .83$).

Comparison between Clinical and Community Samples

The results of the repeated measures ANOVA showed a main effect for group on TEPS scores, $F(1, 957) = 259.7$, $p < .001$, partial eta square = .213, and a main effect for TEPS subscale, $F(1, 957) = 278.3$, $p < .001$, partial eta square = .225, qualified by a group by TEPS subscale interaction effect, $F(1, 957) = 92.7$, $p < .001$, partial eta square = .088. Follow-up independent samples t -tests indicated that there was a large effect on anticipatory pleasure, with the clinical group reporting lower scores relative to the community group ($M = 3.1$, $SD = 0.93$ vs. $M = 4.3$, $SD = 0.86$, 95%CI of difference: 1.0, 1.3, $t[957] = 19.0$, $p < .001$, $d = 1.33$) and a moderate to large effect in the same direction on consummatory pleasure ($M = 3.9$, $SD = 0.96$ vs. $M = 4.5$, $SD = 0.89$, 95%CI of difference: 0.4, 0.7, $t[957] = 9.2$, $p < .001$, $d = .64$). Notably, the non-overlapping confidence intervals indicated this difference was statistically larger for anticipatory pleasure. Within-group paired samples t -tests indicated that anticipatory pleasure was lower than consummatory pleasure in both groups, but this difference was larger in the clinical group ($M = 4.3$, $SD = 0.86$ vs. $M = 4.5$, $SD = 0.89$, 95%CI of difference: 0.1, 0.3, $t[319] = 4.6$, $p < .001$, $d_z = .85$) relative to the community group ($M = 3.1$, $SD = 0.93$ vs. $M = 3.9$, $SD = 0.96$, 95%CI of difference: 0.7, 0.8, $t[638] = 22.0$, $p < .001$, $d_z = .23$).

Discussion

This study provided evidence of adequate fit of the original two-factor model of the Temporal Experience of Pleasure Scale within clinical samples with major depression and a community sample. The two-factor model appeared adequate for adults with major depression (Study 1) and for youth with major depression (Study 2). The one-factor model was not an adequate fit, and comparatively poorer than the two-factor model. This indicates that the TEPS items can be clearly statistically distinguished into a better fitting model when anticipatory and consummatory items are loaded onto separate latent variables. The four-factor model, although an adequate statistical fit in all three studies, did not effectively distinguish between the subscales, with high covariance between the latent variables in all three studies. Further, the mixture of anticipatory and consummatory pleasure items between the subscales obscures their conceptual distinction. As Chan et al. (2012)

suggests, it appears necessary to define what is being experienced for consummatory pleasure and it may not be definable in an abstract sense using the TEPS items. Further, the adequate fit of the four-factor model here, and in previous studies (Chan et al., 2012; Z. Li et al., 2018; Zhou et al., 2019), may be a statistical artefact that improves fit.

Although the two-factor model was an adequate fit, across the three studies three items were found to load poorly onto their latent variables in all three studies. Although removing these items did not appear to improve the model, in the interest of reducing participant burden, these items could be removed in future use of the TEPS. The reverse-scored item 7 could be removed or reworded positively to potentially improve its loading onto the anticipatory subscale (i.e., “I look forward to things like eating out in restaurants”). The remaining two problematic items (items 9 and 11) could be replaced with items that might be more culturally appropriate or have relevance for a larger number of respondents. In the case of item 9, which was also found to be problematic in a previous community sample (Ho et al., 2015), we would suggest replacement. For example, referring to liking the feeling of warm water against one’s skin during bathing. In the case of item 11, riding rollercoasters may also be replaced with another item, for example, excitement about seeing one’s favorite music played live (e.g., classical, jazz, rock, or doom metal). In future studies, relevant culturally-appropriate items could be included in the regular bank of TEPS items and could be used if they appeared more psychometrically sound (e.g., stronger correlations with other subscale items).

Notably, no item error terms were correlated in any of the models in this study, although modification indices did indicate that model fit would be improved by doing so. These indices were not interpreted as suggestive of measurement problems *per se*, but that the items and latent variables shared common aspects of positive emotion or behavior that would give rise to shared variance. Given we had no *a priori* notions about which items should be correlated or whether cross-loadings should be modelled, we sought to avoid doing this just to improve model fit and the items were instead left as independent predictors which still resulted in an adequate fit.

Those with major depression scored significantly lower on both TEPS subscales, and this effect was markedly larger for anticipating pleasure (wanting) in comparison to pleasure from consuming reward (liking). This is consistent with previous studies showing deficits in both TEPS subscales in depression (Li et al., 2015;

Wu et al., 2017; Yang et al., 2017). It extends on this by showing that the anticipatory/wanting and consummatory/liking aspects of the TEPS can discriminate different types of impairments in experiencing pleasure in depression. Although it is outside of the scope of this study to test the reasons for these impairments, several factors have been identified including impaired ability to imagine detail, and use of mental imagery for positive future events in depression (Hallford, Austin, Takano & Raes, 2018; Hallford et al., 2020).

Strengths of this study include being the first to assess this measure of anhedonia in major depression and the use of two large samples incorporating adults and youth. Limitations included having primarily well-educated Caucasian/White Europeans in the clinical samples, and therefore there is some uncertainty about how the findings will generalize to people that identify otherwise. Further, the community sample was not assessed for major depression, and therefore this group may have also contained some participants with clinically-significant depressive symptoms. Nevertheless, the clear group differences suggest that the likely effect of excluding individuals with depression from the community sample would have been to increase the group differences on anticipatory and consummatory pleasures. Other factors known to be associated with anhedonia, but not assessed in this study, included substance use (e.g. Garfield et al., 2016) and schizophrenia (APA, 2013). Therefore, the influence of such factors or comorbidities remains unknown.

In conclusion, these findings support the TEPS two-factor model as adequate for use in those with major depression and community samples, albeit with some items not operating adequately. Future studies may develop and test more culturally appropriate items dependent on context. The findings on TEPS responses also replicated previous studies showing that deficits in hedonic responses are impaired in major depression, and indicates these deficits are stronger for anticipatory pleasure relative to consummatory pleasure.

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Figure 1. Two-factor model of the Temporal Experience of Pleasures Scale in Adults with Major Depression showing standardized factor loadngs and error terms

Figure 2. Two-factor model of the Temporal Experience of Pleasures Scale in Youth with Major Depression showing standardized factor loadngs and error terms

Figure 3. Two-factor model of the Temporal Experience of Pleasures Scale in a Community Sample showing standardized factor loadngs and error terms

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Table 1.

Descriptive Statistics for the Two-Factor Temporal Experience of Pleasure Scale Across the Three Studies

TEPS items and Which Latent Factor They Predict in the Models (Two-Factor)(Four-Factor)	Sample 1 - Adults with MDD (N = 334)				Sample 2 - Youth with MDD (N = 305)				Sample 3 – Community Sample (N = 320)			
	Mean (SD)	Item- total <i>r</i> within subscale	Skewnes <i>s</i> (SE=0.1 3)	Kurtosis (SE=0.2 6)	Mean (SD)	Item- total <i>r</i> within subscale	Skewnes <i>s</i> (SE=0.1 4)	Kurtosis (SE=0.2 7)	Mean (SD)	Item- total <i>r</i> within subscale	Skewnes <i>s</i> (SE=0.1 3)	Kurtosis (SE=0.2 7)
1. When something exciting is coming up in my life, I really look forward to it (A)(AA)	3.5 (1.4)	.62	0.2	-0.8	3.5 (1.3)	.57	-0.05	-0.9	5.0 (1.1)	.57	-1.3	1.8
2. The sound of crackling wood in the fireplace is very relaxing (C)(CC)	4.3 (1.5)	.60	-0.6	-0.7	4.4 (1.5)	.64	-0.7	-0.5	4.8 (1.2)	.63	-1.0	0.4
3. When I think about eating my favourite food, I can almost taste how good it is (A)(CC)	3.6 (1.6)	.62	.02	-1.2	3.6 (1.7)	.74	-0.03	-1.3	4.8 (1.1)	.62	-0.9	0.4
4. I love the sound of rain on the windows when I'm lying on my warm bed (C)(CA)	4.8 (1.4)	.53	-1.1	0.1	4.9 (1.4)	.60	-1.2	0.5	5.1 (1.1)	.62	-1.4	1.7
5. The smell of freshly cut grass is enjoyable to me (C)(CA)	3.7 (1.6)	.67	-.01	-1.1	3.2 (1.6)	.54	0.2	-1.1	4.2 (1.5)	.63	-0.5	-0.7
6. I enjoy taking a deep breath of fresh air when I walk outside (C)(CA)	4.0 (1.5)	.65	-0.3	-0.9	3.9 (1.5)	.65	-0.2	-1.0	4.9 (1.2)	.65	-1.0	0.5
7. I don't look forward to things like eating out at restaurants (R)(A)	3.3 (1.6)	.47	0.05	-1.1	3.5 (1.7)	.49	-.09	-1.2	3.9 (1.8)	.38	-0.4	-1.3
8. A hot cup of coffee or tea on a cold morning is very satisfying to me (C)(CA)	4.3 (1.6)	.57	-0.6	-.07	4.0 (1.6)	.53	-0.4	-0.9	4.4 (1.6)	.56	-0.9	-0.2
9. I love it when people play with my hair (C)(AC)	3.3 (1.9)	.48	0.1	-1.5	4.2(1.7)	.43	-0.6	-1.2	3.9 (1.8)	.55	-0.3	-1.2
10. I really enjoy the feeling of a good yawn (C)(CC)	3.0 (1.5)	.55	0.3	-0.8	3.1 (1.8)	.62	-0.3	-0.9	4.1 (1.4)	.64	-0.4	-0.9
11. When I'm on the way to an amusement park, I can hardly wait to ride the roller coaster (A)(AC)	1.8 (1.3)	.31	1.7	2.2	3.1 (1.8)	.46	0.3	-1.2	3.5 (1.8)	.53	-0.08	-1.3
12. I get so excited the night before a major holiday I can hardly sleep (A)(AC)	2.8 (1.6)	.58	0.5	-0.9	3.1 (1.7)	.66	0.2	-1.2	4.1 (1.7)	.67	-0.5	-0.9
13. I appreciate the beauty of a fresh snowfall (C)(CA)	3.5 (1.8)	.59	-.07	-1.3	3.7 (1.8)	.58	-0.2	-1.3	4.6 (1.4)	.64	-0.9	0.00
14. When I think of something tasty, like a chocolate chip cookie, I have to have one (A)(AC)	3.4 (1.6)	.50	0.1	-1.1	3.4 (1.6)	.54	.07	-1.2	4.0 (1.6)	.59	-0.4	-0.9
15. Looking forward to a pleasurable experience is in itself pleasurable (A)(AA)	3.2 (1.4)	.68	0.2	-0.8	3.3 (1.5)	.66	0.1	-0.8	4.6 (1.2)	.66	-0.8	0.08
16. I look forward to a lot of things in my life (A)(AA)	2.3 (1.1)	.58	0.9	1.0	2.6 (1.4)	.68	0.7	-0.1	4.6 (1.2)	.63	-0.7	-0.1

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17. When ordering something off the menu, I imagine how good it will taste (A)(CC)	3.1 (1.4)	.68	0.1	-1.0	3.1 (1.6)	.72	0.2	-1.1	4.4 (1.3)	.67	-0.7	-0.3
18. When I hear about a new movie starring my favourite actor, I can't wait to see it (A)(AC)	2.7 (1.4)	.56	0.6	-0.4	3.1 (1.6)	.56	0.3	-1.0	4.0 (1.5)	.58	-0.4	-0.7
TEPS A Total	3.0 (0.8)	/	0.1	-0.4	3.3 (0.9)	/	.05	-0.4	4.3 (0.8)	/	-0.5	-0.05
TEPS C Total	3.9 (0.9)	/	0.1	-0.4	4.0 (0.9)	/	-0.3	-0.2	4.5 (0.8)	/	-0.4	-0.1

Note: All statistics correspond to the original two-factor model. Labels for items on the four-factor model are provided purely to indicate which subscale they corresponded to in analyses. (A) = Anticipatory subscale, (C) = Consummatory subscale. (AA) = Anticipatory Abstract, (AC) = Anticipatory Contextual, (CA) = Consummatory Abstract, (CC) = Consummatory Contextual, (R) = Reverse-scored item. All item-total correlations are significant at the $p < .001$ level.

Table 2.

Fit Indices for Confirmatory Factor Analyses

Model	CMI N	df	CMIN/DF	p	RMSEA	RMSEA CI90%	SRMR	CFI
<i>Study 1</i>								
Two-Factor Model	374.1	134	2.79	< .001	.073	.065, .082	.069	.903
Four-Factor Model	338.1	113	2.99	< .001	.077	.068, .087	.068	.906
One-Factor Model	485.3	135	3.59	< .001	.088	.080, .097	.078	.859
<i>Study 2</i>								
Two-Factor Model	284.5	134	2.12	< .001	.061	.051, .071	.061	.934
Four-Factor Model	337.9	113	2.99	< .001	.081	.071, .091	.072	.895
One-Factor Model	455.9	135	3.37	< .001	.088	.080, .097	.081	.860
<i>Study 3</i>								
Two-Factor Model	362.9	134	2.70	< .001	.073	.064, .082	.069	.927
Four-Factor Model	341.7	113	3.02	< .001	.080	.070, .089	.066	.925
One-Factor Model	557.5	135	4.12	< .001	.099	.091, .108	.086	.865