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Longitudinal Evaluation of Anhedonia as a Mediator of Fear of Positive Evaluation and Other Depressive Symptoms

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Abstract

Fear of positive evaluation (FPE) is experiencing dread during real or potential praise. FPE is associated with social anxiety, but its relation to depressive symptoms is unclear. Anhedonia is a core symptom of depression related to symptoms of anxiety in cross-sectional research. The current study investigated the indirect effect of FPE on depressive symptoms via anhedonia over time. One-hundred ninety-six participants completed three waves of questionnaires over a total timespan of approximately four months via Amazon's Mechanical Turk, including measures of FPE, depressive symptoms, and anticipatory and consummatory anhedonia. Findings indicated that anticipatory anhedonia at Time 2 mediated the relationship between FPE at Time 1 and depressive symptoms at Time 3. Consummatory anhedonia, however, did not. Each model was contextualized by accounting for prospective covarying relationships, such as depressive symptoms predicting the same symptoms at later waves. The constellation of findings is considered within a reward devaluation framework.

Keywords

fear of positive evaluation; depression; anticipatory anhedonia; consummatory anhedonia; longitudinal

Introduction

Fear of positive evaluation is a cognitive construct related to social anxiety that pertains to the sense of dread associated with being evaluated favorably and publicly (Weeks, Heimberg, Rodebaugh, Goldin, & Gross, 2012). Fear of positive evaluation may develop in socially anxious individuals due to concerns that performing well will draw social attention and set a precedent that is too high to continuously reach (Weeks, Heimberg, & Rodebaugh, 2008).

Fear of positive evaluation may be a unique and discriminant component of social anxiety that only relates to depression because of the frequent co-occurrence of depressive and social anxiety disorders (Fergus et al., 2009; Weeks, Heimberg, & Rodebaugh, 2008; Weeks, Rodebaugh, Heimberg, Norton, & Jakatdar, 2008). Indeed, some evidence suggests that fear

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of positive evaluation is more predictive of social interaction anxiety than of symptoms of depression (Wang, Hsu, Chiu, & Liang, 2012).

These results are somewhat unsurprising, however, when considering differences in heterogeneity between the constructs of depression and social anxiety (Fried & Nesse, 2015; Morrison & Heimberg, 2013). For example, depression contains disparate symptoms such as sleep difficulties or weight changes, and either end of these continua (e.g., insomnia, hypersomnia, weight gain, or weight loss) justifies diagnosis (American Psychiatric Association, 2013). Social anxiety disorder, on the other hand, has central symptoms that all involve threat of negative evaluation in social situations (American Psychiatric Association, 2013). Thus, fear of positive evaluation may impart risk for future depression through mechanisms that are relatively unrelated to a diagnosis of social anxiety disorder.

Anhedonia, the loss of pleasure or interest in people or things, may be a bridge depressive symptom linking fear of positive evaluation to other depressive symptoms. People may come to fear positive evaluations, develop a loss of interest in things they used to enjoy but now cannot due to the fearful prospect of positivity, and ultimately begin devaluing reward and developing other symptoms of depression (Winer & Salem, 2016). However, the precise operationalization of anhedonia (Treadway & Zald, 2011; Winer, Nadorff, et al., 2014; Winer, Veilleux, & Ginger, 2014) may be key to uncovering this relationship, given that anhedonia, like depression, is also a heterogeneous construct. For example, two relatively distinct aspects of anhedonia are tendencies (1) to not look forward to pleasurable events (i.e., anticipatory anhedonia) and (2) to not derive pleasure from in-the-moment experiences (i.e., consummatory anhedonia; Gard, Gard, Kring, & John, 2006).

Anticipatory, but not consummatory, anhedonia is associated with reduced willingness to obtain reward (e.g., Liu et al., 2011; Sherdell, Waugh, & Gotlib, 2012), prospective emotional discomfort, poorer interpersonal relationships, attenuated engagement with positive word stimuli (Liu, Wang, Zhao, Ning, & Chan, 2012), and increased experience of distress (Buck & Lysaker, 2013). The latter finding may explain why anticipatory rather than consummatory anhedonia would be more related to fear of positive evaluation. If one is experiencing distress at the prospect of being evaluated favorably and publicly, that distress relates to potential anticipatory events, not consummatory experiences related to in-the-moment satiation or resolution of desire (Gard et al., 2006). This potential discriminant relationship between fear of positive evaluation and anhedonia remains an empirical question, however.

To our knowledge, only one study has examined fear of positive evaluation longitudinally (Rodebaugh, Weeks, Gordon, Langer, & Heimberg, 2012), and this study focused on the relationship between fear of positive and fear of negative evaluation. Other studies more germane to the current research question have implemented cross-sectional methodologies (e.g., Weeks et al., 2012; Weeks & Howell, 2012; Weeks et al., 2008). Within this group of studies, an atemporal (Winer et al., 2016) mediational analysis suggested that greater fear of positive evaluation was associated with greater tendencies to disqualify positive social outcomes, and subsequently with heightened depressogenic thoughts (Weeks & Howell, 2012). This provides preliminary evidence of an unfolding process of reward devaluation as

we outlined above (Winer & Salem, 2016). However, as noted by the authors and many other theorists, cross-sectional results cannot confirm causality no matter what analyses reveal (Judd, Kenny, & McClelland, 2001; MacKinnon, Fairchild, & Fritz, 2007; Weeks & Howell, 2012; Winer et al., 2016). Thus, a longitudinal study examining the relationship between fear of positive evaluation, specific aspects of anhedonia, and subsequent depressive processes is needed to establish temporal precedence and move meaningfully toward evidence of causality.

Thus, the current study seeks to better understand the relationship between fear of positive evaluation and anhedonia, and then to subsequently evaluate whether anticipatory anhedonia is predictive of depression over time. Specifically, this study seeks to examine these relationships over three separate time points, spread approximately one to three months apart (i.e., Time 1, Time 2, and Time 3). To discriminate between various types of anhedonia, we operationalized anhedonia in three ways: (1) as anticipatory anhedonia, measured via the Temporal Experience of Pleasure Scale (TEPS; Gard et al., 2006); (2) as consummatory anhedonia, also measured via the TEPS (Gard et al., 2006); and (3) as loss of interest during the past seven days, measured via the Quick Inventory of Depressive Symptomatology, Self-Report (QIDS-SR; Rush et al., 2003). Examining anticipatory and consummatory anhedonia provided the crucial comparison, and a single-item assessment of recent loss of interest allowed us to secondarily assess whether chronic, trait-like anhedonia (as measured by the TEPS) differed from recent changes in level of interest.

The primary hypotheses of the current study thus were that: (1) anticipatory anhedonia at Time 2 will mediate the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3; and (2) consummatory anhedonia at Time 2 would *not* mediate the relationship between fear of positive evaluation at Time 1 and depressive symptoms at Time 3. The secondary hypothesis was that loss of interest at Time 2 (the single-item assessment) would mediate the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3.

Method

Participant Characteristics

Participants were obtained from a large longitudinal study conducted via Amazon.com's Mechanical Turk (MTurk) consisting of four waves spanning approximately one calendar year. 196 participants (138 females, $M_{\text{age}} = 41.54$ years, age range: 18-75 years) completed the Fear of Positive Evaluation Scale, Temporal Experience of Pleasure Scale, and the Quick Inventory of Depressive Symptomatology, Self-Report scale at Time 1, Time 2, and Time 3. Research has demonstrated that MTurk is a valid method for collecting self-report data, and for producing reliable responses when examining clinical and affective variables (Chandler & Shapiro, 2016; Mason & Suri, 2012; Shapiro, Chandler, & Mueller, 2013). Participants completed Time 2 approximately 1 month after Time 1, and completed Time 3 approximately 1-3 months after Time 2; 706 valid-responding participants completed Time 1, followed by 384 in Time 2, and 294 in Time 3. The current study's analyses included participants who successfully completed the FPES, TEPS, and QIDS-SR in all of the first three waves, resulting in a total number of 196 participants for the analyses.

Procedure

Participants completed a battery of measures, including the FPES, TEPS, and QIDS-SR, online via Amazon's MTurk as part of a large longitudinal study. Participants were paid \$1 for participation in each wave and were required to indicate consent to complete the survey and to be re-contacted for future waves before continuing to the actual measures. Participants were re-contacted using their de-identified MTurk ID via python and R software (Leeper, 2014). Once all data was collected, it was downloaded from Qualtrics to SPSS, verified by multiple researchers, and combined into a single file to be analyzed. One thousand seven participants initially completed the full battery of questionnaires. At the end of the battery for each wave, there was an item ensuring that participants had responded validly. The validity item consisted of a paragraph of emotion-based instruction followed by a sentence instructing participants to ignore the prior instruction, choose the answer “other,” and type, “I’ve read the instructions.” If a participant did not consent to be re-contacted at the initial wave or did not successfully answer the validity question, they were excluded from the study.

Self-Report Measures

Fear of Positive Evaluation Scale (FPES)—The FPES (Weeks, Heimberg, & Rodebaugh, 2008) is a 10-item Likert type scale ranging from 0 (not at all true) to 4-5 (somewhat true) to 9 (very true) assessing fear of positive evaluation, a cognitive construct related to social anxiety. The FPES has demonstrated good internal consistency, test-retest reliability, and convergent validity (Weeks et al., 2008). Higher scores on the FPES indicate the respondent is more fearful of positive evaluation (e.g., in a sample of patients with social anxiety disorder, the mean was 39.60; Weeks et al., 2012). Participants respond to each item as though it is a situation in which others do not know them very well (e.g., “I am uncomfortable exhibiting my talents to others, even if I think my talents will impress them”). Two reverse-scored items (designed to avoid acquiescence response styles) are not utilized in the calculation of the FPES total score (Wang et al., 2012; Weeks et al., 2012). Thus, a participant's score is the sum of eight of ten items that ask about a participant's experience. At Time 1 in the current sample, the mean was 34.39 ($SD = 17$, range: 0-72) with good internal consistency ($\alpha = .88$) comparable to previous studies (Weeks et al., 2008). Therefore, the current sample evidenced somewhat lower but similar scores to those of social anxiety patients (Weeks et al., 2012). This is likely because MTurk workers have somewhat elevated clinical symptoms (Chandler & Shapiro, 2016).

Temporal Experience of Pleasure Scale (TEPS)—The TEPS (Gard et al., 2006) is an 18-item Likert type scale that examines anticipatory anhedonia (i.e., the tendency not to look forward to pleasurable events) and consummatory anhedonia (i.e., a tendency not to derive pleasure from in-the-moment experiences). Response options range from 1 (“very false for me”) to 6 (“very true for me”). Lower scores on the TEPS are indicative of more anhedonic symptoms. Ten items correspond to the anticipatory anhedonia subscale and eight items correspond to the consummatory subscale. In the current sample, the anticipatory and consummatory anhedonia subscales at Time 2 were strongly correlated, $r(194) = .50$, $p < .01$. The TEPS has shown good internal consistency, test-retest reliability, and convergent validity (Gard et al., 2006). At Time 2 in the current sample, the mean was 77.70 ($SD =$

13.67, range: 32-105) with good internal consistency for the anticipatory subscale ($\alpha = .81$) and the consummatory subscale ($\alpha = .76$), consistent with previous research (Gard et al., 2006). One participant's missing value for a TEPS item was mean imputed to create their full-scale score. Previous research examining the TEPS with depressed participants have reported total scores ranging from 66.09 to 77.90 (Liu et al., 2011; Liu et al., 2012).

Quick Inventory of Depressive Symptomatology, Self-Report (QIDS-SR)—The QIDS-SR (Rush et al., 2003) is a 16-item questionnaire measuring the nine symptom domains of major depression: sad mood, concentration difficulties, self-criticism, suicidal ideation, loss of interest, energy and fatigue, sleep disturbances, weight gain or loss, and psychomotor agitation or retardation. The measure is scored on a four-point scale (0-3) with total scores ranging from 0-27, with higher scores indicating more severe depressive symptoms. Cutoff scores for depressive symptom severity are 0-5 (“none”), 6-10 (“mild”), 11-15 (“moderate”), 16-20 (“severe”), and 21-27 (“very severe;” Rush et al., 2003). The QIDS-SR total score is computed via summing the maximum value of items 1-4 (sleep disturbance items), item 5 (sad mood), the maximum value of items 6-9 (increase or decrease in appetite and weight gain or weight loss), item 10 (concentration difficulties), item 11 (self-criticism), item 12 (suicidal ideation), item 13 (loss of interest), item 14 (energy and fatigue), and the maximum value of items 15-16 (psychomotor agitation or retardation). The QIDS-SR has demonstrated good internal consistency in previous research ($\alpha = .86$; Rush et al., 2003).

To account for any overlap with anhedonia or loss of interest at Time 2, item 13 (loss of interest) was removed from the scale at Time 3. In the current sample, the mean was 6.44 ($SD = 5.20$, range: 0-22) with good internal consistency ($\alpha = .86$), consistent with previous research (Rush et al., 2003). At Time 2 in the current sample, the mean for the loss of interest item was .59 ($SD = .82$, range: 0-3).

Statistical Analyses

We examined our hypotheses via the mediation model (model 4) of the SPSS (v. 23) PROCESS macro (Hayes, 2013). PROCESS tests for mediation via bootstrapping to estimate direct and indirect effects. In the bootstrapping method, the original sample size (n) is treated as a microcosm of the population originally sampled, and observations within this sample are resampled with replacement.

For each hypothesis, 1,000 bootstrap samples were generated and 95% bias-corrected bootstrap confidence intervals were used to determine the significance of the direct and indirect effects. An indirect effect of zero indicates that the mediating variable did not significantly impact the relationship between the predictor and outcome variable. Therefore, when a confidence interval does not include zero, the indirect effect is considered significant, and we can infer that mediation is occurring over time (Hayes, 2013). In addition to the primary mediation analysis, we also examined prospective covariates in supplemental analyses. For example, we wished to assess whether accounting for depressive symptoms at earlier timepoints attenuated any significant relationships.

Although our sample size was adequately powered for the main analyses for this paper, we also tested the sample for randomness of missing data, as we deleted missing cases using listwise deletion (Allison, 2001; Little, 1992). Following an approach described by Milioni et al. (2015), we ran a set of multivariate analyses of variance (MANOVA) and Box's M tests to account for systematic differences in means and covariance across groups (i.e., those who attrited versus those who completed the next wave). All Box M's were not significant, but the initial MANOVA was significant, so we examined individual ANOVAs for each critical variable at each timepoint. The individual ANOVA analyses indicated that participants who took part in Time 2 and those who attrited did not significantly differ on any variable at Time 1. In addition, participants who attrited at Time 3 did not significantly differ on any variable at Time 2.

Results

Hypothesis 1

We first tested the hypothesis that anticipatory anhedonia at Time 2 would mediate the relationship between fear of positive evaluation at Time 1 and depressive symptoms at Time 3. The predictor and outcome variables were fear of positive evaluation scores at Time 1 and depressive symptoms sans anhedonia at Time 3, respectively. Anticipatory anhedonia (as measured by the anticipatory subscale of the TEPS) served as the mediator variable. Gender was assessed as a covariate but did not change the pattern of results. Thus, the primary model below contains only the variables critical to our hypothesis.

Overall, the model accounted for 22.92% ($F = 10.75$, $p < .01$) of the variance in depressive symptoms. Fear of positive evaluation at Time 1 evidenced a direct effect on depressive symptoms at Time 3 when taking the mediator into account, $b = 0.087$, CI [0.046, 0.126]. Moreover, as hypothesized, there was an indirect effect of fear of positive evaluation at Time 1 on depressive symptoms at Time 3 through anticipatory anhedonia at Time 2, $b = 0.020$, BCa CI [0.006, 0.036]. This represents a medium effect, $\kappa^2 = .067$ (Preacher & Kelley, 2011), 95% BCa CI [.021, .120], indicating that anticipatory anhedonia mediated the relationship between fear of positive evaluation and depression over time (see Figure 1).

Hypothesis 2

We tested the discriminant hypothesis that consummatory anhedonia at Time 2 would *not* mediate the relationship between fear of positive evaluation at Time 1 and depressive symptoms at Time 3. The outcome and predictor variables were the same as in Hypothesis 1, with the exception that consummatory anhedonia (as measured by the consummatory subscale of the TEPS) served as the mediator variable. Gender was also assessed as a covariate but did not change the pattern of results, thus the primary model below contains only the variables critical to our hypothesis.

Overall, the model accounted for 3.46% ($F = .23$, $p = .63$) of the variance in depressive symptoms at Time 3. Fear of positive evaluation at Time 1 evidenced a large direct effect on depressive symptoms at Time 3 when taking the mediator into account, $b = 0.104$, CI [0.064, 0.144], $p < .001$. Most importantly, as hypothesized, there was not a significant indirect

effect through consummatory anhedonia, $b = 0.002$, BCa CI [-0.006, 0.012], indicating that consummatory anhedonia did not mediate the relationship between fear of positive evaluation and depressive symptoms over time. In fact, fear of positive evaluation at Time 1 did not even predict consummatory anhedonia at Time 2, $b = -0.014$, BCa CI [-0.072, 0.044], $p = .63$, thus providing further evidence that fear of positive evaluation is related to anticipatory, as opposed to consummatory, anhedonia (see Figure 2).

Secondary Analyses

In addition to our primary models, we also examined the mediating effect of anticipatory anhedonia at Time 2 with various covariates. For example, we found that anticipatory anhedonia at Time 2 no longer significantly mediated the relationship between fear of positive evaluation at Time 1 and depressive symptoms at Time 3 when adding depressive symptoms from earlier time points (e.g., the QIDS-SR scale at Time 1 and Time 2). However, this could be due to a number of potentially confounded factors, including the lack of power afforded by the number of individuals who completed multiple time point assessments. Thus, we sought to separately account for cognitive and somatic symptoms of depression at Time 1 to better examine the effect of individual depressive symptoms on the mediational pattern uncovered in our initial analyses (Fried & Nesse, 2015).

Previous work has examined potential unidimensional subscales of the Inventory of Depressive Symptomatology, Self-Report (IDS-SR; Wardenaar et al., 2010), from which the QIDS-SR is an adapted, shortened measure. Via confirmatory factor analysis and Rasch analyses, which aim to investigate the discriminability of a measure, Wardenaar et al. (2010) delineated a mood/cognition subscale from the full IDS-SR scale, including items assessing suicidal ideation and self-criticism, as well as a somatic subscale, including items assessing psychomotor agitation and retardation. As the QIDS-SR has yet to be examined in this manner (i.e., potential subscales from the full measure), we constructed a “mood/cognition” subscale at Time 1 by taking sum scores of items 5 (depressed mood), 10 (concentration difficulties), 11 (feelings of worthlessness) and 12 (suicidal ideation), wherein higher scores on this subscale are indicative of more cognitive symptoms of depression. These items are also present within the full IDS-SR scale and load onto the mood/cognition subscale in Wardenaar et al. (2010). However, given the brevity of the QIDS-SR, we were unable to create a full somatic subscale consistent with Wardenaar et al. (2010), as the QIDS-SR does not contain as many items directly assessing somatic symptoms of depression compared to the IDS-SR (Rush et al., 2003). Therefore, in addition to the mood/cognition subscale, we controlled for the maximum value of items 6/7 (i.e., appetite disturbance) as a single covariate and the maximum value of items 8/9 (i.e., weight disturbance) at Time 1 as a single covariate. This scoring process is consistent with the original IDS-SR scoring, which asks the researcher to score the highest of the two items representing the appetite domain (increased or decreased appetite), as well as the weight domain (increased or decreased weight; Rush et al., 2003).¹ We also controlled for items 15 (psychomotor retardation) 16 (psychomotor agitation), all at Time 1. In sum, five additional models were created, with the

¹Per QIDS-SR instructions, participants are asked to answer either item 6 (“decreased appetite”) or 7 (“increased appetite”), but not both. In addition, participants also answer either item 8 (“decreased weight within the past two weeks”) or item 9 (“increased weight within the past two weeks”), but not both. These items constitute appetite and weight disturbances for this measure, respectively.

mood/cognition subscale serving as a covariate in the first model, appetite disturbance as a covariate in the second model, weight disturbance as a covariate in the third, psychomotor retardation as a covariate in the fourth, and psychomotor agitation as a covariate in the final, fifth model. In each additional model, the corresponding variable being controlled for was removed from the dependent variable (e.g., the symptoms comprising the cognitive subscale at Time 1 were removed from the QIDS-SR at Time 3).

We predicted that with the mood/cognition subscale added as a covariate, anticipatory anhedonia at Time 2 would no longer evidence a significant indirect effect. Conversely, we predicted that even when each individual somatic item was accounted for, anticipatory anhedonia at Time 2 would still evidence a significant indirect effect. The results of the analyses are in line with our hypotheses. Specifically, anticipatory anhedonia at Time 2 no longer mediated the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3 with the mood/cognition subscale at Time 1 added as a covariate, $b = 0.0004$, BCa CI [-0.002, 0.005] (see Supplemental Figure 1). However, anticipatory anhedonia at Time 2 still mediated the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3 when controlling for appetite disturbance, $b = 0.011$, BCa CI [0.003, 0.025] (see Supplemental Figure 2) and weight disturbance², $b = 0.011$, BCa CI [0.002, 0.026] (see Supplemental Figure 3). Anticipatory anhedonia at Time 2 still evidenced a significant indirect effect when controlling for psychomotor retardation, $b = 0.011$, BCa CI [0.004, 0.023] (see Supplemental Figure 4), and psychomotor agitation, $b = 0.012$, BCa CI [0.003, 0.025] (see Supplemental Figure 5) as well.

We also sought to examine the indirect effect of a single-item from the QIDS-SR (item 13, “General Interest”) as a comparison to the primary discriminatory analyses of anticipatory and consummatory anhedonia. The predictor and outcome variables were the same as in Hypothesis 1 and 2, with loss of interest (QIDS-SR item 13 at Time 2) serving as the mediating variable. We found a significant indirect effect of fear of positive evaluation at Time 1 on depressive symptoms at Time 3 through loss of interest at Time 2 $b = 0.490$, BCa CI [0.025, 0.074]. This represents a relatively large effect $\kappa^2 = .171$ (Preacher & Kelley, 2011), 95% BCa CI [.091, .248], suggesting that loss of interest mediated the relationship between fear of positive evaluation and depressive symptoms over time (see Figure 3).

Loss of interest as a mediator was examined with several covariates. Interestingly, with fear of positive evaluation at Time 2 entered as a covariate, loss of interest at Time 2 still mediated the relationship between fear of positive evaluation at Time 1 and depressive symptoms at Time 3 (see Supplemental Figure 6).

However, for the present sample, participants were allowed to provide responses for items 6, 7, 8, and 9. Therefore, we took the maximum value of items 6/7 and items 8/9 to best reflect the “appetite disturbance” and “weight disturbance” variables.

²When controlling for items 6, 7, 8, and 9 each as their own covariate in separate models, the pattern of findings were similar; neither increased or decreased appetite, nor did decreased or increased weight within the past two weeks diminish the significant indirect effect of anticipatory anhedonia.

Discussion

The current findings suggest that fear of positive evaluation prospectively predicts anticipatory anhedonia, which in turn predicts the development of broader depressive symptoms. Conversely, findings suggest that consummatory anhedonia may not be an important factor in linking fear of positive evaluation with depressive symptoms. Taken together, these results delineate a specific relationship between fear of positive evaluation, anticipatory anhedonia, and depressive symptoms over time.

Fear of positive evaluation has previously been conceptualized as a specific facet of social anxiety (e.g., Wang et al., 2012; Weeks, et al. 2008), whereas the current study suggests that there is also an important relationship between fear of positive evaluation, anhedonia, and depressive symptoms. Our findings also suggest that the specific operationalization of anhedonia may lead to further understanding of how and when anhedonia devolves into more virulent depressive symptoms, and how fear of positivity may help to predict this unfolding relationship.

Anticipatory anhedonia (i.e., a tendency not to look forward to prospectively pleasurable events) is linked to a lack of reward motivation in depressed (Liu et al., 2011; Sherdell et al., 2012; Treadway, Buckholtz, Schwartzman, Lambert, & Zald, 2009), dysphoric (Brinkmann, Franzen, Rossier, & Gendolla, 2014; Franzen & Brinkmann, 2015), and non-depressed (Geaney, Treadway, & Smillie, 2015) individuals. Consummatory anhedonia (i.e., a tendency not to derive pleasure from in-the-moment experiences), on the other hand, is not related to this lack of reward motivation, and anticipatory and consummatory anhedonia may even have different underlying biological mechanisms (Gard et al., 2006; Treadway & Zald, 2011).

The relationship between anticipatory anhedonia and fear of positive evaluation may be best explained from within the reward devaluation theoretical framework (Winer & Salem, 2016). The main tenet of the reward devaluation framework is that some depressed individuals automatically avoid positive material, and such avoidance is not only due to a lack of valuing positive information (e.g., Gotlib, McLachlan, & Katz, 1988; Kashdan, 2007) but also to an active process of inhibition of rewarding stimuli (Winer & Salem, 2016). This process is hypothesized to underlie reward reactivity via automatically associating initial positivity with ultimate negative outcomes due to experience of longitudinal associations in that temporal direction (i.e., hope leads to disappointment; Winer & Salem, 2016).

Thus, the reward devaluation framework provides a theoretical link between fear of positive evaluation, anticipatory anhedonia, and depression. First, underlying fear of positive evaluation is the assumption that such positive evaluation will yield future negative appraisal. By definition, individuals who fear positive evaluation come to associate this positive appraisal as threatening, as it may lead one to believe that he or she will not have the capabilities to perform at a high level that is worthy of positive appraisal (Weeks et al., 2008). Second, to elicit anticipatory pleasure and subsequently approach-motivated behavior, cues associated with the reward must first take on positive associations (Sherdell et al., 2012), which would be limited during a devaluative process and produce a mediational

effect as was found in the current study. Finally, this resulting decrease in anticipatory pleasure would lead to the development of subsequent depressive symptoms, such as sadness and a lack of hope due to the lack of coherent motivation toward reward, consistent with our outcome in the current study.

There are potentially important clinical implications stemming from these findings. For example, depressed individuals predict that positive events are less likely to happen to them and anticipate experiencing less pleasure in response to positive events than do others (Dunn, 2012), and reduced response to positivity is a predictor of poor psychological (Spijker, Bijl, De Graaf, & Nolen, 2001; Winer, Nadorff, et al., 2014) and psychopharmacological (McCabe, Mishor, Cowen, & Harmer, 2010; Price, Cole, & Goodwin, 2009) treatment response. Thus, assessing for fear of positive evaluation may be helpful to determine the extent to which these reward predictions are indeed inaccurate or if they are due to differential value of future reward because of its prospective negative implications.

Indeed, although it is important to consider the negative processing biases and elevated negative emotional experiences that characterize depression, the present study is in line with recent research emphasizing the importance of reduced positive affect and experience of pleasurable events in individuals with elevated symptoms of depression (Liu et al., 2011; Yang et al., 2014), individuals in the remitted stage of depression (Yang et al., 2014), and even first-degree relatives of individuals with depression (Liu et al., 2016).

Strengths and Limitations

Although a link between fear of positive evaluation, anticipatory anhedonia, and depressive symptoms was found in our sample, our mean score of depression in our multiple time point study fell within the mild range of depression symptom severity, as indicated by the measure's cutoffs (Rush et al., 2003). This level of variability is near-ideal for examining differential relationships among candidate symptoms, and one that is elevated from a student sample (Chandler & Shapiro, 2016), but future research examining fear of positive evaluation and the mediating processes of loss of interest and anticipatory anhedonia in a sample of clinically depressed individuals is also needed to further outline which elements of depression result from these predictive variables.

Also, the mediating effect of anticipatory anhedonia was absent when accounting for depressive symptoms from earlier time points. One possible interpretation of this finding taken out of context would be that anticipatory anhedonia does not provide further explanatory value overall. However, this interpretation would ignore our main set of findings that lead to alternative and more plausible explanations. First, and most importantly, the main findings from this study resulted from the comparative analysis between anticipatory and consummatory anhedonia; this indicates that the specific operationalization of anhedonia is key to uncovering the relationship between fear of positive evaluation and other symptoms of depression; were there no differential mediational relationship, both anticipatory and consummatory anhedonia should have yielded similar findings. This was not the case; in fact, the beta weights differed by 0.018, with anticipatory anhedonia evidencing a medium effect and consummatory anhedonia yielding no explanatory value.

Therefore, once this clearly discriminant finding emerged, we included different symptoms of depression at Time 1 in the anticipatory anhedonia mediational model as exploratory covariates in a supplemental analysis; despite there being limited available power, we believe that this exploratory analysis provides future direction regarding which depressive symptoms relate to this mediational process.

Furthermore, as opposed to assessing a full set of depressive symptoms as a potential covariate, we also sought to break down individual items (e.g., somatic symptoms) for further specificity. We found that hallmark somatic symptoms of depression, such as appetite and weight disturbances, as well as psychomotor agitation and retardation, did not alter the relationship between fear of positive evaluation, anticipatory anhedonia, and other symptoms of depression over time. Conversely, it appeared that cognitive symptoms of depression (e.g., depressed mood and suicidal ideation) resulted in a diminished mediating effect of anticipatory anhedonia on fear of positive evaluation and other symptoms of depression over time. Whereas these results support our hypotheses and may further provide insight into the relationship between fear of positive evaluation and anticipatory anhedonia, we continue to emphasize concerns with power regarding the addition of other predictor variables (i.e., covariates). However, studies building off of the novel findings outlined herein may benefit from examining additional covariates over time with increased power to further understanding of the relationship between fear of positive evaluation and depression, as well as potential moderating variables that may influence the strength of this relationship.

Another limitation is that we did not assess social anxiety and depression concurrently in this longitudinal sample. However, a direct comparison of the relationships between fear of positive evaluation and social anxiety and the relationship between fear of positive evaluation and depression was unnecessary given the focus of this study on identifying and delineating the relationship between anhedonia and fear of positive evaluation and evaluating the relation between those two variables and depression. As noted earlier, fear of positive evaluation has already been shown to be closely related to social anxiety empirically, and may in fact amount to an element of social anxiety theoretically (i.e., it is not a predictor but instead a facet of the construct). For example, diagnostic criteria for Social Anxiety Disorder (SAD) in the DSM-5 include “Marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others” (Diagnostic Criterion A; American Psychiatric Association, p. 202) and “The social situations are avoided or endured with intense fear or anxiety” (Diagnostic Criterion D; American Psychiatric Association, p. 202). Items from the Fear of Positive Evaluation Scale include “I am uncomfortable exhibiting my talents to others, even if I think my talents will impress them” and “I try to choose clothes that will give people little impression of what I am like” (Weeks et al., 2008, p. 47). This overlap is of course understandable considering the similarity between fear of positive and fear of negative evaluation. However, statistically accounting for social anxiety in our models may have resulted in Type II error.

A last limitation was that we chose to assess anticipatory and consummatory anhedonia via subscales of the same overarching scale (i.e., the TEPS). This limitation could result in similar response patterns that were due more to the parameters of the questionnaire than to underlying constructs. Although we cannot rule out this limitation in the current study, it

would actually lead to findings running contrary to our differential hypotheses about anhedonia. Because we did in fact find differential relationships based on the two subscales, it is unlikely that this limitation can explain our corpus of findings.

Finally, a great strength of the current study is its longitudinal design. Participants with a wide range of depressive symptoms responded at multiple points over time. Although there are notable caveats whenever attempting to infer causality, the longitudinal method allows for prospective causal inferences between variables, and is particularly important to be able to logically match mediational hypotheses and mediational analyses (Winer et al., 2016). Thus, the current findings not only provide initial evidence of the mediational relationship between fear of positive evaluation, anticipatory anhedonia, and other depressive symptoms, they also map out temporally how that process may unfold and how potential confounding variables may affect this relationship. Therefore, it is important to consider these aspects in future research investigating the relationship between fear of positive evaluation and depressive symptoms. However, one limitation is the length between the three time points in our current sample. On average, the length between Time 1 and Time 2 was one month, whereas the length between Time 2 and Time 3 was approximately one to three months. Relationships between fear of positive evaluation, anticipatory anhedonia, and other depressive symptoms likely take longer to develop than four months. Therefore, future research examining these constructs over a longer period is necessary to better establish an argument for causality.

In summary, the present results provide an account of a mediational relationship between fear of positive evaluation, anticipatory anhedonia, and other depressive symptoms via a longitudinal sample. Evidence emerged suggesting that fearing positive evaluation leads to an inability to look forward to positive events, which in turn leads to the development of other symptoms of depressive symptoms. These findings emphasize the potential importance of the longitudinal association between fear of positive evaluation and ultimate depressive symptoms, which is also an association predicted by the reward devaluation framework (e.g., Winer & Salem, 2016). Our supplemental analyses also suggest that this pattern develops independent of somatic symptoms of depression such as weight and appetite, but that the development of fearing positive evaluation leading to anhedonia may incorporate cognitive symptoms contemporaneously. This work is the first to our knowledge to examine these constructs over time in an online community sample. Future work utilizing big data can further investigate these relationships by examining the dynamic interaction of anhedonia, other symptoms of depression, and the development of fear of positive evaluation over time.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Mediation model for Hypothesis 1, indicating that anticipatory anhedonia at Time 2 mediates the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3.

Figure 2. Mediation model for Hypothesis 2, indicating that consummatory anhedonia at Time 2 does not mediate the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3.

Figure 3.

Mediation model for the secondary hypothesis, indicating that loss of interest at Time 2 mediates the relationship between fear of positive evaluation at Time 1 and other depressive symptoms at Time 3.