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Kaitlin Hanley
Colby College

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Running head: PLEASURE DEFICITS IN DEPRESSION

Anhedonia and Depression: Anticipatory, Consummatory, and Recall Deficits

Kaitlin Hanley

Colby College

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Abstract

Current conceptions of anhedonia as a key symptom of depression do not consider the importance of anticipatory, consummatory, and recall deficits involved in anhedonia. Sixty-one depressed and non-depressed, college-student participants provided reports of anticipated pleasure to tasting chocolates, tasted chocolates and rated their experience of pleasure, and provided recalled reports of pleasure to the experience one day later. Results demonstrated a deficit in the ability to anticipate experiencing pleasure for depressed participants when compared to non-depressed controls, however, their reports of consummatory pleasure and recalled pleasure did not differ significantly from non-depressed control participants. This study suggests that actual experiential deficits may not drive anhedonia, but instead cognitive deficits may be involved. Future studies need to focus more on the nature of this deficit, particularly in a clinical population.

Anhedonia and Depression: Anticipatory, Consummatory, and Recall Deficits

Anhedonia, or the inability to experience pleasure when exposed to normally pleasurable stimuli, has long been accepted as a key symptom of disorders such as depression and schizophrenia. Studies have focused on a number of specific aspects of this deficit, such as differences between social and physical types of anhedonia (Chapman, Chapman, & Raulin, 1976) and state or trait characteristics of anhedonia (Klein, 1987; Chapman, Edell, & Chapman, 1980; Meehl, 1975). However, the role of anhedonia in depression and their effects on actual pleasure are not entirely understood. Some attempts have been made to isolate the anticipatory, consummatory, and recall deficits of anhedonia in relation to depression, but without decisive results (Klein, 1987; Dunbar & Lishman, 1984; Fawcett, Clark, Scheftner, & Gibbons, 1983). In order to understand anhedonia in relation to depression, it is necessary to consider these aspects of the cognitive and experiential deficits associated with anhedonia with more detail.

Anhedonia: A History

The French psychologist Ribot first introduced the term “anhedonia” in 1897, stating that this important concept had been largely understudied, as psychologists and philosophers at the time focused more on grief and other negative emotions than pleasure. His notion of anhedonia referred to a deficit across emotional responding and pleasure in particular, but differentiated between a lack of pain, or “analgesia”, and a lack of pleasure. William James (1906) recognized anhedonia as a part of what at the time was called “melancholy”, though currently understood as depression, but differentiated anhedonia from “neurotic melancholy”, which occurs after object loss, and “religious melancholy”, where the affect is blunted by guilt and intellectualization. Freud (1963)

also seized on the idea of anhedonia, associating it with the effects of repression in a neurotic conflict where anhedonia results from a lack of free libidinal energy in relation to repressed energy. These early proposals formed the theoretical basis for the more sophisticated, and empirically supported, theories that would follow.

Meehl's Conception of Anhedonia

Later in the twentieth century, more detailed models surfaced for the general structure of anhedonia and its role in psychological disorders such as depression. Meehl's (1975) influential article on hedonic capacity has since been widely cited and supported in various empirical studies (i.e. Dworkin & Saczynski, 1984; Peterson & Knudson, 1983). He was the first to conceive of the hedonic capacity model of anhedonia, which suggests that pleasure serves to attenuate negative emotions. Meehl proposed that the capacity to experience pleasure differs among individuals, and that some people simply have a lower capacity for pleasure than others, or "are born three drinks behind" (p. 298). According to the hedonic capacity model, the anhedonic patient experiences deficits in the subjective effectiveness of positive reinforcers, similar to the Ferster and Skinner theory of reinforcement schedules (1957). Thus, the anhedonic patient lives in a hypothetical Skinner box with quantitatively fewer or weaker positive reinforcers that can be used to soothe negative states, with implications such as a higher vulnerability for developing depression.

Response to Positive Stimuli in Depression

Limited research has been conducted in the area of actual response differences to pleasurable stimuli in depressed individuals compared to the healthy population. However, some other studies of response to more generally positive and/or rewarding

stimuli have demonstrated differences in responding between depressed participants and healthy controls. Pizzagalli and his colleagues (2005) based their method on the assumption that rewards provide positive reinforcement, and tested whether depressed and anhedonic participants responded less than normal participants to a positively reinforcing reward (money) in a response modulation task. As hypothesized, participants exhibiting higher depression scores and self-reported anhedonia failed to modulate their responses, suggesting lowered reward responsiveness. In addition, low reward responsiveness predicted higher levels of anhedonic symptoms when participants were retested one month later.

Berenbaum and Connelly (1993) acknowledged that stress contributes to major depressive disorder (MDD) and that MDD is associated with lowered hedonic capacity, so they tested whether stress leads to a lowered hedonic capacity and if this is more pronounced in people with a high predisposition to developing MDD, such as people with a family history of the disorder. A sample of ROTC students completed a highly physically and emotionally stressful training day, while a control group did not, and then both groups watched disgusting and happy films, providing self-reports of happiness and disgust after the viewing. Participants with a family history of MDD (a diathesis for major depression) reported less enjoyment of the films after a stressful training day, suggesting that stress can lead to lowered hedonic capacity especially in people with a predisposition to developing MDD.

Berlin, Givry-Steiner, Lecrubier, and Puech (1998) found that depressed participants showed a higher threshold for sweet taste perception than healthy participants, meaning that water and sucrose solutions needed to be saturated with more

sucrose for depressed participants than healthy controls in order to obtain the same rating of sweetness. However, both participant groups responded with similar levels of reported pleasure to solutions with the same amount of sucrose in them. Therefore, differences appear to exist in the way that depressed people or people predisposed to MDD respond to positive stimuli when compared to responding in healthy people. In addition, these differences are perhaps more subtle than what one would expect based on clinical descriptions, which describe a profound and lasting inability to experience pleasure. More carefully controlled studies of online responding in depressed populations are necessary in order to further understand these differences.

Distinguishing Between Anticipatory, Consummatory, and Recall Deficits

When anhedonia is assessed in clinical settings, it can be difficult to distinguish between anticipatory, consummatory, and recall deficits. For example, when a depressed individual is asked how much they would like to eat a delicious meal, the person may respond with little enthusiasm. This directly suggests an anticipatory deficit, since the person seems to anticipate deriving little pleasure from an otherwise enjoyable meal. This may additionally be related to a recall deficit, since he or she may recall the last instance involving a delicious meal and not remember experiencing significant pleasure. Therefore, the response may not be a reflection of their actual experience, if they were to eat the delicious meal, but may reflect a cognitive bias against normally pleasurable experiences.

Anticipatory deficits are defined as deficits in the expectation of deriving pleasure from a normally pleasurable activity, and studies based on global self-report measures have shown that anhedonia is associated with anticipatory deficits in depressed

individuals. (Fawcett et al., 1983). Consummatory deficits are characterized as the inability to actually experience pleasure in response to a pleasurable stimulus (Klein, 1987). Finally, recall deficits involve deficits in the capacity to accurately remember the experience of pleasure, such as the finding that depressed individuals tend to remember negative information better than positive, known as the mood-congruency effect (Dunbar & Lishman, 1984).

The theory that depression results in negative cognitive distortions is well-accepted and well-supported. Depression is associated with a negative view of the future (Beck, 1961), as well as a negative bias for the recollection of past events (Beck, 1961; Dunbar & Lishman, 1984). Generally, due to mood congruency effects, a person's current mood affects the ease with which a type of memory can be retrieved, so that negative mood facilitates retrieval of negative memories (Bower, Gilligan, & Monteiro, 1981). In the context of depression, the pervasive negative mood state has been shown to facilitate retrieval of negative material (Dunbar & Lishman, 1984). In addition, negative mood is associated with less accurate recall of pleasurable experiences, perhaps because people with lowered mood tend to interpret more events as negative (Seidlitz & Diener, 1993; also see Gotlib & Neubauer, 2000 for a review).

Studies involving memory biases in depression have not differentiated between encoding and retrieval errors, so it is not clear which type of errors may account for these biases (Seidlitz & Diener, 1993). Cued-recall, or presenting a person with a cue (i.e. a photograph, a suggestive word, or the external or internal context from the time of encoding) to facilitate recall of the experience, aids in making the memory more accessible during the retrieval process, producing faster and more accurate memory for

the target incident when compared to free recall (Tulving & Thomson, 1973). If presenting depressed participants with cues while recalling pleasurable events aids in eliminating retrieval errors, this suggests retrieval deficits in recall as opposed to encoding deficits.

Recent literature distinguishes between anticipatory and consummatory responding, with some limited reference to recollection of pleasurable experiences, but with few decisive conclusions. In other clinical samples, such as schizophrenics, primary deficits in the anticipation of a pleasurable stimulus have been demonstrated against the background of similarities in consummatory and recalled pleasure (Horan, Green, Kring, & Nuechterlein, 2006). The current design extends this line of research to the depressed population while studying the three areas of responding (anticipatory, consummatory, and recall) in one design.

Implications for the Present Study

Although anhedonia is a well-accepted and supported component of major depression, its role in the subjectively construed versus actual experience of pleasure is not certain, as demonstrated by inconclusive evidence regarding anticipatory, consummatory, and recall deficits in anhedonia and depression. The present study seeks to understand hedonic deficits in depression by measuring the three proposed areas of the experience of pleasure in one study, which has not yet been done to date. In addition, online, controlled emotional responding was measured, providing a greater understanding of how emotional responding differs between depressed and healthy populations. Finally, the use of photographs as cues in recall provided an initial examination of encoding and retrieval deficits in negative recall biases.

Based on evidence indicating anticipation deficits in the depressed population as compared to normal controls (Fawcett et al., 1983), depressed participants were expected to demonstrate a deficit in their amount of anticipated pleasure, revealed through lower self-reported anticipated pleasure when faced with the idea of encountering usually pleasurable stimuli. In addition, due to research indicating fewer consummatory deficits in depressed individuals (Berlin et al., 1998), self-reported consummatory pleasure should not differ significantly in the depressed sample from the control group. Because of the body of research regarding negative recall biases in depression (Dunbar & Lishman, 1984), depressed participants were expected to demonstrate a recall deficit exhibited in significantly lower reported pleasure in recalling the pleasurable experience.

Due to the lack of literature regarding encoding versus retrieval deficits in the negative recall bias, there could be no single, supported hypothesis on the dominance of encoding or retrieval errors. If the *retrieval* deficit hypothesis was supported, depressed participants would produce more accurate recall for the pleasurable stimulus in response to photograph cues than depressed participants not receiving photograph cues. Conversely, if the *encoding* deficit hypothesis was correct, there would be no significant differences in recalled pleasure for the pleasurable stimulus between depressed participants presented with photograph cues and those not presented with photograph cues, because encoding deficits cannot be aided by presenting retrieval cues.

Method

Participants

The sample of approximately 61 students was drawn from the Colby psychology subject pool and the greater student body with 15 participants in each of the depressed or

control and free-recall or cued-recall cells, except for 16 participants in the control and cued-recall cell. The sample was 75.4% female and 24.6% male, and there were no significant sex differences across experimental cells. Furthermore, the sample was 75.4% European American, 4.9% Latino or Hispanic, 6.6% Asian American, 4.9% reporting biracial heritage, and 8.2% reporting “other” or no response. The entirely student population had a mean age of 19.44 years ($SD = 1.4$ years) and a mean grade point average of 3.4 ($SD = .30$). There was no significant difference in age, grade point average, or ethnic composition across cells. Finally, in response to a question inquiring about medications, two participants (one depressed and one non-depressed control) reported taking antidepressants.

Participants were split into depressed and non-depressed control groups based on their responses on the Beck’s Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), which had an alpha of .89 (a 21-item scale). The BDI is a frequently used, 21-item, self-report method for measuring depressive symptoms that asks participants to indicate their experience of each dimension of depression on a zero to three scale (i.e. (0) I don't cry any more than usual. (1) I cry more now than I used to. (2) I cry all the time now. (3) I used to be able to cry, but now I can't cry even though I want to.). Participants scoring a 10 or higher on the BDI were considered depressed, and those scoring below a 10 were considered non-depressed controls. Ten was the median score for the study, so a median split was performed. Using 10 as a cutoff for depression has been used in many previous depression studies (i.e. Rothschild, Peterson, & Pfeifer, 1989; Hutton, Lyketsos, Zenilman, Thompson, & Erbelding, 2004). The participants

received one hour towards their psychology research participation requirement or \$10 for their participation.

Measures

Participants' scores on the Diagnostic Inventory for Depression (DID; Zimmerman, Sheeran, & Young, 2004) were used to verify that the depressed participants were more likely to report anhedonia than non-depressed participants. The DID is a self-report scale based on the Structural Clinical Interview for the DSM-IV (SCID) for depression that has been extensively tested and shows good reliability, validity, and correlation with clinical diagnosis of major depression. This 38-item measure requires participants to rate their experience of various aspects of depression (i.e. "In the past week, have you been bothered by feelings of guilt?") on a zero to four scale (i.e. (0) No, not at all. (1) Yes, I have occasionally felt a little guilty. (2) Yes, I have often been bothered by feelings of guilt. (3) Yes, I have often been bothered by strong feelings of guilt. (4) Yes, I have been feeling extremely guilty.).

Two measure of anhedonia were administered to participants, including the Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2006) and the Fawcett-Clark Pleasure Capacity Scale (FCPS; Fawcett, Clark, Scheftner, & Gibbons, 1983). The TEPS assesses appetitive and consummatory hedonic capacity and is a 20-item measure that asks participants to rate how true statements are for them (i.e. "I appreciate the beauty of a fresh snowfall") on a one to six scale where one is "very false for me" and six is "very true for me", with an alpha of .76 (a 10-item scale) for appetitive pleasure and an alpha of .68 (a seven-item scale, notably lower in reliability) for consummatory pleasure. The FCPS is a frequently used method for measuring hedonic

capacity, and involves rating, using a one to five scale where one is “no pleasure at all” and five is “extreme and lasting pleasure”, 36 normally pleasurable situations on the intensity and duration of expected pleasure one would experience from each (i.e. “You are listening to beautiful music in peaceful surroundings.”), with an alpha of .91 (a 36-item scale).

Two scales measuring state and trait positive and negative affect were also included. The Positive Affect and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) is a common measure of trait affect that lists 20 emotions (i.e. “Interested”, “Ashamed”, “Enthusiastic”), and asks participants how often they experience the included emotions in general using a one to five scale where one is “very slightly or not at all” and five is “extremely”. The trait negative affect scale had an alpha of .81 (a 10-item scale) and the trait positive affect scale had an alpha of .73 (a 10-item scale). The state PANAS is the same, except that it asks how participants experience the listed emotions at that particular moment, with an alpha of .91 (a 10-item scale) for state negative affect and an alpha of .80 (a 10-item scale) for state positive affect.

In addition, participants filled out the Behavioral Inhibition System/Behavioral Activation System scale (BIS/BAS; Carver & White, 1994), which assesses an individual’s sensitivity to threat cues and inhibition of prepotent behavior (behavior avoidance system) and approach (behavior approach system) systems. It is a 24-item questionnaire that asks participants to rate how much a statement applies to them (i.e. “When I get something I want, I feel excited and energized.”) on a one to four scale where one is “very true for me” and four is “very false for me”. The BAS drive subscale had an alpha of .74 (a four-item scale), BAS fun-seeking had an alpha of .77 (a four-item

scale), BAS reward responsiveness had an alpha of .82 (a five-item scale), and BIS had an alpha of .87 (a seven-item scale). A short demographic questionnaire that asked questions about dieting, smoking, and use of medications was also included.

Apparatus

Remotely controlled video cameras were used to observe and take pictures of participants during the experiment.

Procedure

Upon arriving, the participant was asked to take a seat outside the lab room. The experimenter explained that they would be filling out questionnaires and tasting food samples, and obtained written informed consent. The consent form explicitly stated that participants would be video taped during this experiment. To measure anticipated pleasure, the experimenter asked the participant three questions and recorded their responses. The participant indicated, using a zero to eight scale where zero was not at all, four was moderately, and eight was extremely, how much they thought they would feel pleasure, boredom, and satisfaction during the following activities: solving Sudoku puzzles (a type of logic task), tasting chocolates, and filling out personality questionnaires.

The experimenter then led the participant into the lab room, where seven numerically labeled neutral and pleasurable food samples were presented on a table with a cup of water and a paper towel. The first, third, fourth, fifth, and seventh samples were small (about the size of a nickel) pieces of different milk chocolates (Lindt Extra Creamy[®], Lindt Classic[®], Dove[®], Hershey Cacao Reserve[®], and Hannaford[®] generic brand), the second sample was a piece of a rice cake, and the sixth sample was a matzo

cracker. Before beginning the tasting, each participant sat in a chair behind the table and carefully filled out the first set of questionnaires, while the experimenter waited in the next room.

Upon reentering the lab room, the experimenter took the questionnaires from the participant and gave them the rating sheet (See Appendix). The experimenter gave the participant the instructions: "Savor each sample in your mouth for a few moments. After each sample, use the rating sheet to rate your experience of the sample on each of the dimensions using the 0 to 8 scale from before" (sweet, bitter, pleasant, bland, unpleasant, satisfying, and smooth). The participants were encouraged to only eat as much of the sample as they wanted to and that would provide a sufficient taste, so as not to reach satiety. In addition, the participants drank some water between each sample to cleanse their palate before the next sample. While the participant was tasting and rating, the experimenter used the cameras to take pictures and observe behavior from another room.

Then, the experimenter gave the participant the next set of questionnaires and asked them to take their time to fill them out carefully.

Finally, the experimenter explained that the study was about taste perception and speed of information processing so that the participant would not guess the true nature of the experiment before the recall procedure. They were told to look for an e-mail the next day with further questions about their participation and that they would be further debriefed about the nature of the study after replying to the e-mail.

The next day, the experimenter sent the participant an e-mail asking them to rate their experience of the following emotions while tasting chocolates the day before: anxiety, stimulation, boredom, calm, contentment, excitement, happiness, interest,

pleasure, sadness, satisfaction, and tranquility, using the same zero to eight scale. Participants in the cued-recall condition received two photographs of them tasting chocolates in the lab attached to the e-mail with instructions to view the photographs to aid in recall, while participants in the free-recall conditions did not receive any pictures. Upon receiving a response to the follow-up email, the experimenter replied with a debriefing e-mail and a video consent form, asking the participant to indicate the ways in which they approved the use of the recorded tape of their study session.

Results

A two-factor ANOVA: [Sex (male; female); Depression (depressed; non-depressed)] was used to analyze the results. An additional analysis was performed to verify that the diagnosis of depression, as defined by the BDI score, corresponded well with items on the DID, especially those assessing anhedonia. After creating DID subscales for anhedonia based on overall level of pleasure experienced daily, level of interest in daily activities, and duration of lack of interest, the percentage of depressed and non-depressed participants reporting each of these symptoms was calculated. This analysis provided evidence for the effectiveness of using the BDI score, with a depression cutoff of 10 and above, to delineate between participants who were depressed and non-depressed controls. Table 1 displays the percentages of participants determined to be depressed or non-depressed according to their BDI scores who reported experiencing and not experiencing the anhedonia symptoms on the DID. In addition, all analyses described in the following sections were repeated using only depressed participants reporting anhedonia and non-depressed participants reporting no anhedonia, and all findings remained the same.

Anticipation of Pleasure

This analysis demonstrated a main effect for depression ($F(1, 57) = 3.86, p = .05$), where depressed participants reported anticipating less pleasure from tasting chocolates ($M = 5.95; SD = 1.32$) than non-depressed control participants ($M = 6.47; SD = 1.24$), as shown in Figure 1. In addition, there was a main effect for sex ($F(1, 57) = 6.081, p < .05$), showing that female participants anticipated experiencing more pleasure ($M = 6.41; SD = 1.36$) than male participants ($M = 5.6; SD = .89$). There was no interaction between depression and sex.

Consummatory Experience of Pleasure

The mean consummatory self-report, or average pleasure ratings to the chocolate samples, did not differ significantly between depressed and non-depressed control participants. However, there was a main effect for sex ($F(1, 56) = 8.036, p < .01$), where female participants rated experiencing more pleasure while tasting the chocolates ($M = 5.24; SD = .99$) than male participants ($M = 4.36; SD = .95$). The results of the analysis indicated no main effect for depression in the peak chocolate experience, or the highest rated pleasure to the chocolate samples, though, again, there was a main effect for sex ($F(1, 56) = 13.635, p < .01$) where female participants reported a higher peak pleasure experience ($M = 6.51; SD = .87$) than male participants ($M = 5.46; SD = 1.01$). There was no interaction between depression and sex. Finally, there was no difference between the range of reported pleasure for depressed and non-depressed participants, with no main effect for sex and no interaction.

Recollection of Pleasure

The analysis showed no main effect for depression or for sex and no interaction between depression and sex in the self-report of recalled pleasure from the chocolate samples. In addition, there was no main effect for the cued- versus free-recall conditions, suggesting that the addition of a picture cue did not aid in recall of the chocolate tasting, or affect recall significantly in any other way. Recalled pleasure for all participants correlated negatively with their average consummatory report ($r(61) = -.467, p < .01$, two-tailed), demonstrating that participants recalled experiencing less pleasure during the chocolate tasting ($M = 4.67; SD = 1.26$) than they reported during the actual exposure ($M = 5.04; SD = 1.04$).

Predictors of Recollection

Step-wise multiple regressions were used to determine which factors could account for the recalled experience of pleasure among both depressed and non-depressed participants. The variables entered in the regressions included the average rated pleasure to the chocolates, the peak chocolate rating, the rating of the first chocolate, the rating of the last chocolate, the range of reported pleasure to the chocolates, responses to the BIS/BAS questionnaires, BDI scores, and reports of trait consummatory anhedonia calculated from the TEPS questionnaire. This analysis showed that, of all these factors, self-reported recall of pleasure in depressed participants was driven by their reported consummatory anhedonia ($R^2 = .14; B = .73; SE = .31; \beta = .41; F(1, 28) = 5.67, p < .05$), which participants indicated in the TEPS and measured how much consummatory pleasure they reported enjoying in general in their lives. For non-depressed control participants, self-reported recall for pleasure was driven by their rating of pleasure to the last chocolate sample of the seven-sample series ($R^2 = .17; B = .40; SE = .15; \beta = .45; F(1,$

28) = 6.94, $p < .05$). Therefore, though there were no differences in recalled pleasure between depressed and non-depressed participants, depression did affect the recall heuristics involved in recollection of the experience.

Discussion

The results of this study supported some of the primary hypotheses, though not all. Depressed participants were expected to show a deficit in the anticipation of pleasure, demonstrated by lower ratings of anticipated pleasure for tasting chocolates than non-depressed control participants, and a deficit in the recollection of pleasure, demonstrated by lower ratings of recalled pleasure for tasting the chocolate samples than non-depressed control participants. However, reports of the actual experience of pleasure while consuming the chocolate samples were not expected to differ between the groups, indicating more cognitive than actual experiential deficits. In addition, two alternate hypotheses regarding the effect of cued- versus free-recall conditions suggested that if cuing participants aided in retrieval of the memory of the pleasurable event then the recall deficit would involve a retrieval error, but if cuing participants did not aid in retrieval then this would indicate an encoding error.

The results support the hypotheses regarding anticipation of pleasure and actual consummatory experiences of pleasure. This suggests that cognitive deficits may drive anhedonia more than the actual inability to experience moment-to-moment pleasure, though this cognitive deficit only appears to apply to the anticipation of pleasure. These results are similar to those found in schizophrenics by Horan and colleagues (2006).

Though the expected recall deficit did not emerge during analysis of the results, depressed and non-depressed participants did differ significantly in how they derived

their ratings of recalled pleasure. Depressed participants' reliance on their trait ratings of consummatory anhedonia instead of any actual aspect of the chocolate tasting itself implies some inability to base recall on the encoded experience. In contrast, non-depressed control participants demonstrated some evidence of using the peak-end heuristic, a frequently demonstrated heuristic for recollection of an experience that involves basing recall on either the peak (most intense) or end (last) part of the overall experience (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). In accordance with this heuristic, control participants' ratings of the last chocolate sample drove their recollection of the overall experience one day later. Though control participants did not base their recollection on their overall average experience of pleasure during the chocolate tasting, their recollection was nonetheless driven by some aspect of the experience they were recalling, while depressed participants did not demonstrate this reliance on an aspect of the actual experience for their recollection.

The results for the free- vs. cued-recall conditions probably reflect the lack of any difference between depressed and non-depressed participants in their recollection of tasting chocolates. Although the results appear to support the encoding error hypothesis because viewing pictures of the experience did not affect recollection of pleasure experienced, it is also possible that the photograph cue was not effective in aiding in retrieval of the memory. The encoding specificity principle stipulates that, in order to effectively cue a memory for accurate recall, it is necessary for the retrieval cue to relate to the memory in the same way that it was originally encoded (Tulving & Thomson, 1973). Though depressed and non-depressed control participants did not differ in their overall recollection of the experience, they all recalled experiencing less pleasure than

reported during the chocolate tasting, and the recall heuristics used by depressed participants suggests some separation from the actual experience in depressed participants during recall. These results indicate that recall may be affected by depression in some way, so future research needs to focus on the recall of pleasurable experiences in depressed participants in order to better understand their differences from the healthy population.

In addition, though beyond the main premise of this study, the significant results regarding sex differences in the anticipation of and actual experience of tasting chocolates are fascinating as well, and reinforce popular conceptions of how males and females differ in their appreciation for chocolate. However, these results may reflect the high number of female participants involved in this study.

Limitations and Future Directions

The main limitation of this study is its non-clinical sample, and future projects should replicate this design in a more severely depressed, clinical sample to see whether the cognitive deficits are amplified and if the actual experience of pleasure remains the same. The results for recall may be clearer in such a sample, and the implications for clinical usage would become even more important. Considering the significant results found with the current, non-clinical and therefore potentially more sub-syndromal sample, it is likely that the results would become even stronger with a clinical population.

Further concern for the sample employed in this study involves issues with drawing exclusively from a college population. Though many studies use this readily available population, replication of the design in a non-college sample would be useful in

order to show how representative of the general population the results and conclusions may be.

Another weakness of the current research design is the limited nature of the self-report method, especially in measuring consummatory experience. Although self-reported experience is important to take into account, future replications of the design should consider coding facial expressions and obtaining physiological data (i.e. heart rate and skin conductance) during the chocolate tasting to compare with self-reported pleasure ratings. In addition, though self-report measures should continue to be used, measuring subjective report continuously may also aid in obtaining a more complete view of consummatory experience.

Finally, some adjustments in the recall procedure may yield clearer results in future studies. Unfortunately, due to the nature of the participants and setting, it was not feasible to require participants to return to the laboratory the next day in order to provide recall reports. The e-mail method worked fairly well, with most participants responding within the one-day goal ($M = 1.23$, $SD = .46$), but this method lacks some control over time lapsed between the chocolate tasting and the time of recall. In addition, it would be helpful to have more control over the external conditions at recall, such as by placing participants in a quiet room without distractions, and to know more about the participants' states at recall, such as by administering a PANAS questionnaire.

Implications and Conclusions

The results of this study have clear clinical implications, especially involving assessments for depression. In these assessments, clinicians ask patients to indicate how much pleasure they derive from normally pleasurable activities. This study shows,

however, that their responses may not represent their actual moment-to-moment experience of pleasure, but may instead reflect cognitive deficits, such as an inability to anticipate experiencing future pleasure.

In summary, the findings of this study indicate that future research must focus more on the symptom of anhedonia in depression. Despite its common acknowledgement as a key symptom of depression, very little is understood about the actual nature of the deficit. Future research needs to focus on the possible cognitive deficits involved in this seemingly consummatory deficit. Even the very definition of anhedonia in the context of depression may need to be reconsidered, because anhedonia may involve much more than the inability to actually *experience* pleasure.

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Table 1

Percentage of Depressed and Non-Depressed Participants According to BDI Score

Reporting DID Anhedonia Symptoms

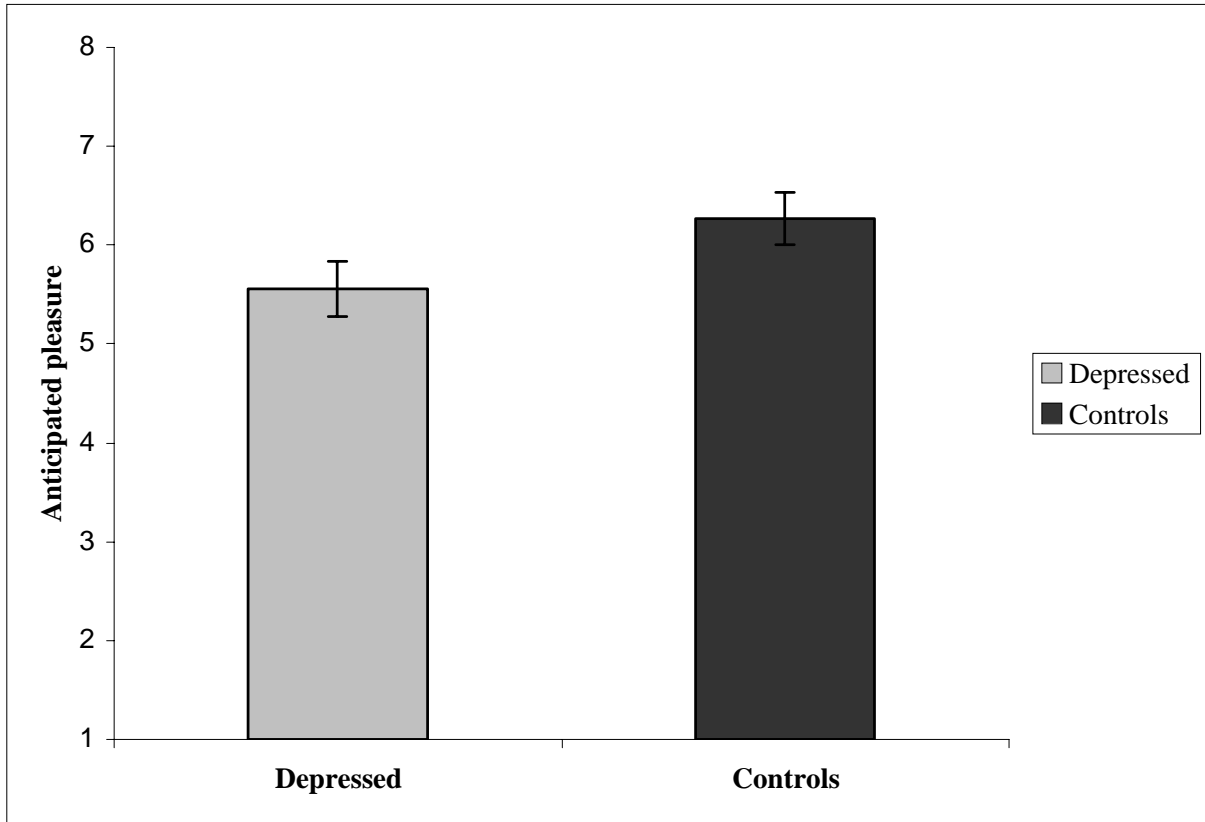
DID Symptom		Depressed	Non-Depressed
Lack of Pleasure*	Present	93.1%	51.9%
Lack of Interest*	Present	86.2%	48.1%
Lack of Interest Duration*	Present	93.1%	59.3%

* = Significant, $p < .01$

Figure Captions

Figure 1. Self-reported anticipation of pleasure when tasting chocolates for depressed and non-depressed control participants.

Figure 1



Appendix: Rating Sheet

Please rate each sample on the following characteristics. Use the scale to indicate how accurately the characteristic describes the sample.

- 0 not at all
- 1
- 2
- 3
- 4 moderately
- 5
- 6
- 7
- 8 extremely

	#1	#2	#3	#4	#5	#6	#7
Sweet							
Bitter							
Pleasant							
Bland							
Unpleasant							
Satisfying							
Smooth							