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Examining Ethnic Identity as a Form of Appraisal for Latinas in the Lazarus and Folkman Stress and Coping Model

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The current study examined ethnic identity as an appraisal process in the link between stressors and health outcomes for Latina women. Fifty-seven women were given surveys containing measures related to intimate partner violence (IPV), perceived stress, ethnic identity, coping and mental health, which were available in both English and Spanish. The women were recruited via snowballing, personal contacts, and area organizations. Results supported the links of the coping model (Lazarus & Folkman, 1984); higher perception of stress (PSS) was related to poorer mental health. Avoidance coping added unique variance to mental health above perceived stress. However, ethnic identity did not make a unique contribution to mental health.

Key words: Latinas, stress and coping, ethnic identity

To varying degrees, stress is a part of every person's daily life. What an individual considers stressful depends to some extent on how one perceives a situation or an event. The way a person perceives stress has been linked to mental health outcomes and coping choices (Carver, Scheier, & Weintraub, 1989; Folkman, Lazarus, Dunkel-Shetter, & Gruen, 1986; Folkman, Lazarus, Gruen, & Delongis, 1986). In addition, different coping styles have been associated with different health outcomes (Culver, Arena, Antoi, & Carver, 2002), such as avoidance coping, which is linked to poorer mental health (Utsey, Ponterotto, Reynolds, & Cancelli, 2000). This complex relationship between stressors, appraisal, coping and mental health has been studied extensively in Caucasian populations (Carver, Scheier, & Weintraub, 1989; Folkman, Lazarus, Dunkel-Shetter, et al.,1986; Folkman, Lazarus, Gruen, et al., 1986), but much less research has been dedicated to ethnic minorities (Culver, et al. 2002; Klonoff, Landrine, & Ullman, 1999; Utsey, Payne, Jackson, & Jones, 2002).

The 2000 Census found that the Latino/Hispanic population had reached 38.8 million, making Latinos/Hispanics the largest ethnic minority in the U.S. Furthermore, the population is projected to grow to 47.8 million by 2010. With unique stressors such as acculturative stress (Hovey, 2000a, 2000b; Hovey & Magaña, 2002) and discrimination (Pérez, Fortuna & Alegría, 2008), Latinos are in need of research that can lead to more culturally competent mental health services.

This literature review will explore how Latinas perceive and cope with stress in their lives. To examine the relationship between stress and coping, Lazarus and Folkman's (1984) stress and coping model will be utilized. Research has shown that coping can be a moderator between stressors (Calvete, Corral & Estevez, 2007). The research presented here will focus on how ethnic identity might play a role in appraisal and thus be related to consequent coping and mental health.

The Stress and Coping Model

In their book, Lazarus and Folkman (1984) lay the foundation of the stress and coping model used in the current investigation. A depiction of the model is demonstrated in Figure 1 below.

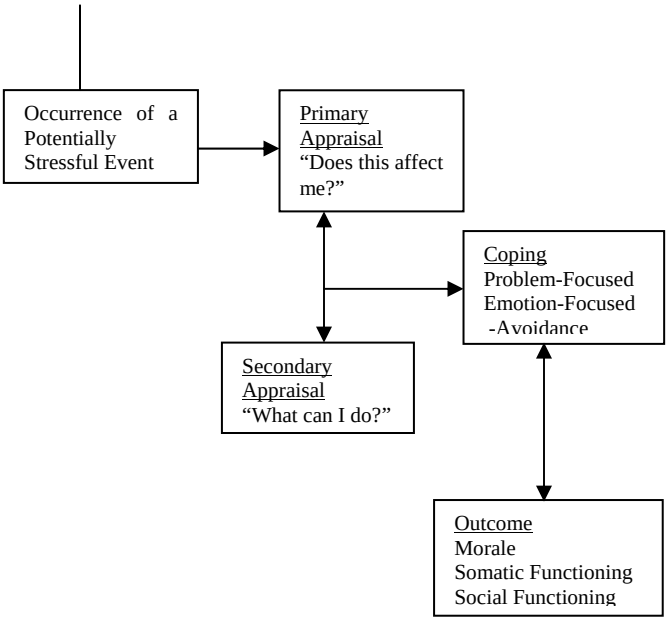

Figure 1. Conceptualization of the Model of the Stress Process (Lazarus & Folkman, 1984)

Their definition of psychological stress is a relationship between the person and the environment that is viewed as wearing on the individual or endangering his or her well-being. Thus, a stressor is an external event or situation cognitively appraised by an individual as having a negative impact. Cognitive appraisal is a process in which the significance of the event is assessed and categorized according to how harmful it might be to the individual. Thus, what is considered a stressor is highly determined by the individual who evaluates the situation

in two forms of cognitive appraisal, called primary appraisal and secondary appraisal.

During primary appraisal a person asks what is at stake in a situation or "Does this event affect me?" To answer this question, the individual categorizes the event into one of three categories: (a) irrelevant, (b) benign-positive or (c) stressful. The current study proposes that IPV is a stressor; however, it is the thought process or appraisal related to the event that leads to differing outcomes. For example, a Latina woman may be insulted by her partner who says to her, "You never can do anything right, and this meal that you made is terrible." To follow the example of primary appraisal, she would then appraise this insult by thinking either (a) "What he said is untrue and means nothing to me" (irrelevant); (b) "An insult can't hurt me, but I will work on becoming a better cook" (benign-positive); or (c) "He is right; my cooking is horrible, and I am terrible wife" (stressful).

If the event is appraised as irrelevant or benign-positive, appraisal stops, but if it is found to be stressful, Lazarus and Folkman (1984) say that secondary appraisal takes place. During secondary appraisal, the individual asks, "What can I do about the event?" and looks at what resources are available for coping and what the expectations are with regards to dealing with the event. Thus, if a Latina woman is hit by her partner and she perceives this event as stressful, she will begin to think through her options of how to react. Maybe she would choose to hit back, call the police, or talk to a trusted friend. In evaluating these options even further to examine expectations, she might realize hitting back may worsen the violence and calling the police may not help since they do not speak her primary language, Spanish. In the end, then, this quick review leads to a particular coping option in that she decides to talk to her cousin privately about the situation. Thus, how one appraises the event, according to Lazarus and Folkman, lends itself to what type of coping is used by the individual.

The Lazarus and Folkman (1984) model emphasizes that coping is process-oriented and contextual as opposed to trait-oriented (Folkman, Lazarus, Dunkel-Shetter, DeLongis & Gruen, 1986). Trait-oriented theories insist coping is based on the traits of the individual, and thus, coping style doesn't change much in different situations. On the other hand, Lazarus and Folkman's (1984) model says that coping is affected by the process of appraisal and thus differs depending on context.

Coping is defined as cognitive and behavioral efforts that are constantly changing to manage a specific stressor that has been appraised as threatening and/or taxing on one's resources (Lazarus & Folkman, 1984). Lazarus and Folkman present two general categories of coping based on their functions, emotion-focused coping and problem-focused coping. These types of coping are the second process between a stressor and the health outcome, according to the model. Problem-focused coping uses problem-solving strategies such as generating alternative solutions and weighing cost and benefits. This coping can be focused internally or at the environment. Strategies aimed at the self may include lowering one's ambition or finding alternative forms of gratification. Strategies aimed outward may aim to change barriers or resources. For example, a woman experiencing IPV might attempt to change the situation by moving out of the house (changing the environment) or seeking help from a counselor (changing oneself) (Lazarus & Folkman, 1984).

Emotion-focused coping, on the other hand, may include both attempts to lessen emotional distress as well as increasing emotion. Lessening emotion can be achieved through such strategies as avoidance, minimization, and distancing that are attempts to ignore the problem or push it away. Another strategy may include reappraisal, which is the process of changing one's perceptions of a situation without changing the situation itself. Common reappraisals can be seen in phrases like, "I decided it could be much worse than it is already" or "There are more important things for me to worry about now anyway" (Lazarus and Folkman, 1984). In addition another form of emotion-focused coping, avoidance coping, which may include drinking, eating, or sleeping, is used to distract oneself from thinking about the stressor. Avoidance coping has been linked to lower life satisfaction and lower self-esteem (Utsey, Ponterotto, Reynolds, & Cancelli, 2000). Other people may need to increase emotion and feel worse before they can feel better. This strategy can include self-blame or some form of self-punishment. A woman experiencing IPV who uses this form of coping may blame herself for the violence and then distance herself from the situation by using food, sleep, or alcohol (Lazarus & Folkman, 1984) to get rid of or lessen the emotion related to the event.

According to the model, coping occurs after one appraises a stressor as taxing or threatening. One study that has found support for the relationship between appraisal and coping assessed 85 young adult to middle aged married couples (Folkman, Lazarus, Dunkel-Shetter, et al., 1986). The population was Caucasian, primarily Protestant or Catholic, with at least an 8th grade education, and an above marginal family income ($18,000 for a family of four in 1981). The couples were interviewed separately five times over a six-month period. Primary appraisal, secondary appraisal, coping, outcome (satisfactory vs. unsatisfactory) and somatic health were assessed in each interview. Primary appraisal was measured by rating a set of stakes that may be involved in a stressful encounter such as, "losing your self-respect" or "appearing unethical." The authors used a coping measure that defined eight types of coping: confrontive, distancing, self-control, seeking social support, accepting responsibility, planful problem-solving and positive reappraisal. A multivariate test

showed that there was a difference in coping related to the type of primary appraisal. Those participants who felt a threat to their self-esteem were more likely to use confrontive coping, self-control coping or regulating one's feelings. They also accepted more responsibility and used more escape-avoidance than when the threat to self-esteem was low. When a loved one's well-being was at stake, more confrontive and escape-avoidance coping was used and less planful problem-solving or distancing (Folkman, Lazarus, Dunkel-Shetter et. al., 1986).

Although the above study was limited to Caucasian couples, it is possible that this model would be applicable to Latinas. Thus, if Latinas are experiencing domestic violence or other stressors, how they appraise a situation may make a difference in the coping style utilized. For example, if a Latina is frequently insulted by her partner (threat to own self-esteem) or is married to a man who is abusive to her children (threat to a loved ones well-being), her choice of coping may range from leaving the relationship to protect her and her children to avoiding the situation by using alcohol.

Folkman, Lazarus, Dunkel-Shetter et al. (1986) also found links between secondary appraisal and coping. Secondary appraisal was measured by the use of four questions examining if the events were viewed as changeable or unchangeable. Encounters perceived as changeable were met with confrontive coping, accepting responsibility, planful problem-solving and positive reappraisal or changing one's view on the negative situation to something positive. Meanwhile, encounters that were perceived as unchangeable (or having to be accepted) most often received distancing or escape-avoidance forms of coping. Hence, those events that were seen as changeable were met with more problem-solving coping, whereas those events that were appraised as unchangeable were met with more emotion-focused coping.

Carver, Scheier, & Weintraub (1989) found similar results related to secondary appraisal with a sample of college students. The researchers developed a COPE measure consisting of 14 different coping scales. The authors conducted three studies to develop and test this measure. In the third study, secondary appraisal was assessed when participants rated the situation as either changeable or a situation that must be accepted.

Controllability, as a form of secondary appraisal, made a difference in coping styles. Higher levels of active coping were used if the event was perceived as controllable. In addition, controllable situations also brought about more planning, suppression of competing activities to focus on the stressful situation, and seeking out social support in order to find sympathy and discuss the problem (Carver, Scheier, & Weintraub, 1989). Secondary appraisal or the evaluations of one's resources may also be an important factor in how Latinas cope. Hence, if a Latina is suffering from IPV and has strong ethnic pride (secondary appraisal), she may seek out Hispanic resources in her community or family members and friends for support. On the other hand, if a woman is ashamed of her ethnicity she may not have the confidence to seek services or even be aware of them. Furthermore, she might not even tell her family or friends since she may assess the violence as being uncontrollable or acceptable because of cultural values such as *machismo*, the belief that the man should be strong and provide for the family and *marianismo*, which stresses the submissive role of the woman (Gloria & Peregoy, 1995). In addition, the Spanish language is known to be fatalistic, emphasizing the idea of luck (*la suerte*) and destiny in the Latino culture (Moreno, 2007). Thus, ethnic identity may be an important factor influencing the appraisal and subsequent forms of coping exhibited by Latina women.

The last step in the Lazarus and Folkman (1984) model is health outcome. Stress and health outcome are linked, but Lazarus and Folkman discussed how the process of appraisal and coping can change the relationship between stressors and mental health. To support this idea, Folkman, Lazarus, Gruen, and DeLongis (1986) conducted a study on 85 middle aged, Caucasian couples to evaluate to what extent people are stable in their primary and secondary appraisal and coping process across different situations, and how these factors affect health outcomes apart from personality characteristics. Coping was assessed with a coping checklist. Primary appraisal was evaluated by using a stress questionnaire that asked participants to choose what kind of stakes each situation presented, such as "harm to loved one's health, safety or physical well-being" or "losing self-respect". Secondary appraisal was taken into account by having subjects rate to what extent they had the ability to change the situation. Psychological symptoms and somatic health were also measured.

Correlations indicated that those situations appraised as more stressful were related to both psychological and somatic health. For example, a threat to one's own self-esteem was related to worse psychological symptoms ($r = .38$, $p < .001$) as well as worse somatic health ($r = -.20$, $p < .01$) (Positive correlations with psychological symptoms equal a decrease in mental health and negative correlations with somatic health equal a decrease in somatic health). Similarly, a concern for a loved one related positively to more psychological symptoms ($r = .15$, $p < .05$) and poorer somatic health ($r = -.14$, $p < .05$). The researchers also found through a regression analysis using psychological symptoms as the dependent variable, that coping variables accounted for 20% of the variance beyond that accounted for by the personality variable. Primary appraisal variables accounted for an additional 5% of the variance (Folkman, Lazarus, Gruen et al., 1986). The authors suggested that the more the

subjects perceived they had at stake, or how stressful the situation was, the poorer their health. In addition, the more they had at stake, the more they coped. Thus, confrontive coping, $r = .47$, $p < .001$, and escape-avoidance, $r = .51$, $p < .01$, correlated strongly with poorer mental health outcomes, because participants tended to use these types of coping when their mental health was suffering from high perceived stress.

Although the above model (Lazarus and Folkman, 1984) was based on Caucasians, research has also been done with marginalized populations, and it also supports the link between stressors and psychological health (Klonoff, et al., 1999; Utsey, et al., 2002). Both Klonoff et al. (1999) and Utsey et. al. (2002) studied the stressor of perceived racism and how it affects mental health. Utsey et al. (2002) studied a group of elderly African Americans and found through a multiple regression analyses that institutional racism or structural racism accounted for 18.2% of the mental health score (($F(1, 20) = 4.46$, $p < .05$)). Similarly, Klonoff et al. (1999) found that the stress of racism accounted for an additional 6%-10% of the variance in psychological symptoms above and beyond generic stressors in a sample of 520 Black adults.

Consistent with the model, research has also been conducted in marginalized populations that examines coping as a moderator of the relationship between stressors and mental health. Culver et al. (2002) studied how African American, Hispanic, and non-Hispanic White women coped with early stage breast cancer treatment. Interviews were conducted pre-surgery, 7-10 weeks post-surgery, and then 3, 6, and 12 months post surgery. Coping was assessed using a measure that defined 11 different forms of coping: acceptance, active coping, substance use, behavioral disengagement, denial, humor, planning, cognitive reframing, self-distraction, use of religion, and venting. Distress was measured with a participant's rating how much they had experienced a series of mood-descriptive adjectives such as "tense" and "anxious". Depressive symptoms were evaluated by the Center for Epidemiological Studies Depression scale (CESD; Radloff, 1977).

Overall, reports of denial based coping, or refusing to accept the situation, related positively to distress at every measurement period. Self-distraction coping, or using other activities or thoughts to avoid thinking about the stressor, related positively to distress at all measurements except for pre-surgery, and venting was also related positively to distress at all measurements except 3 months. Overall, there was no one form of coping that significantly predicted distress over all time periods, although avoidance coping was most likely to lead to poorer mental health. More specifically, behavioral disengagement at 3 months, predicted more distress at 6 months and acceptance at 3 months predicted less distress at 6 months (Culver et. al., 2002). Thus, this research found that the type of coping moderates the relationship between stressors and mental health in white women and women of color.

It is important to note that overall there were few differences found in coping styles between groups. Women of all backgrounds use similar coping. A few differences included that both minority groups (Hispanic and African American) reported higher levels of religious coping than non-Hispanic Whites. Hispanics used the most venting and self-distraction; African Americans reported low levels of venting, and non-Hispanic Whites reported turning to humor. These coping preferences may reflect culturally appropriate ways to handle stress (Culver et. al., 2002). Thus, Latinas might use coping that is found most acceptable in their ethnic group (such as religious coping), depending on how strongly they relate to that part of their identity.

Lazarus and Folkman (1984) have laid out the framework of a process oriented coping model that begins with an outside event and then two cognitive processes: primary appraisal and then secondary appraisal. Primary appraisal assesses how threatening (or non-threatening) the stressor may be, and secondary appraisal looks at the resources an individual possesses to handle the situation. Once the resources are examined coping takes place. Both appraisal and coping moderate the relationship between the stressor and the health outcome.

Stressors have been shown to negatively relate to mental health (Klonoff et al., 1999; Utsey et al., 2002). In addition, the way one appraises a situation and chooses to cope can affect health (Culver et. al., 2002; Folkman, Lazarus, Dunkel-Shetter et al., 1986). This circular pattern of stress, appraisal, coping, and health outcome can be seen across multicultural populations and women of color (Culver et. al., 2002; Klonoff, et al., 1999; Utsey et al., 2002). Thus, the use of the Lazarus and Folkman (1984) model of stress and coping can help examine the complexity of the relationship between stressors and health outcome for Latina women.

Latina Women, Stress and Health Outcomes

Previous research has shown that stressors negatively affect mental health in people of color (Klonoff et al., 1999; Utsey et al., 2002). All people face daily life stressors from being late to work to cooking a meal for their family, but Latinos face a wide range of unique stressors that are associated with acculturative stress (Hovey, 2000a, 2000b; Hovey & Magaña, 2002) and discrimination (Pérez, Fortuna & Alegría, 2008). Acculturation is the change that a group of individuals go through when they come into contact with another culture. Acculturative stress is the stress directly related to this process of acculturation (Williams & Berry, 1991) and may include severing ties with family and friends in their country of origin, learning a new language, and finding a job in a new country that does not share your same customs or values (Hovey, 2000). These stressors

may lead to mental health issues such as depression, anxiety, and suicidal ideation (Hovey, 2000a; Hovey & Magaña, 2002). Some of these stressors may also be applicable to following generations of Latino Americans, who may be caught in between the culture and language of their home and that of the larger society (Sanderson, Coker, Roberts, Tortolero, & Reininger, 2004; Torres & Magolda, 2004). For example, second generation Latinos may still face language barriers, may struggle with defining their ethnic identity, and face discrimination that may affect their interactions at school and in the workplace. Thus, the link between stressors and mental health that is described in the Lazarus and Folkman model (1984) can also be applied to the Latino population.

One such study that demonstrates how stressors are related to Latino mental health was a survey of 114 immigrants of Mexican descent that explored the connection between acculturative stress, depression, and suicidal ideation (Hovey, 2000). Acculturation, acculturative stress, depression, and suicidal ideation were all assessed as well as other variables. A stepwise multiple regression analysis was done to examine how acculturative stress as well as other variables predicted depression. The strongest predictor of depression was acculturative stress, which accounted for 29% of the variance. A significant correlation of $r = .26$, $p < .01$ also revealed a relationship between acculturative stress and suicidal ideation. Thus, we can clearly see how stressors, particularly the stressors of acculturation, can predict negative mental health outcomes in Latinos.

In a similar study by Hovey and Magaña (2002), a sample of 45, Mexican migrant farm workers were surveyed in order to better understand the link between stress, anxiety, and depression. Self-esteem, acculturative stress, anxiety, and depression were all taken into account as well as several other variables. Acculturative stress was significantly correlated with anxiety ($r = .64$, $p < .001$) and depression ($r = .57$, $p < .001$). A multiple regression of anxiety also revealed that acculturative stress accounted for 35% of the variance. Similarly, acculturative stress accounted for 33.7% of the variance of depression. Once again, just like Hovey (2000), stressors were related to poorer mental health in Latinos. Yet, Lazarus and Folkman (1984) also focus on the importance of coping and appraisal. In other words, the link between stressors and mental health is not as simplistic as shown these studies. For example, some immigrants may appraise acculturation as an opportunity not a stressor, and thus their mental health may not suffer. In addition, since this research only focuses on immigrants, it may not be generalizable to the broader Latino population in the U.S. More specifically, Latina women may face unique stressors that Latino men do not encounter.

One specific stressor that Latina women may endure is IPV. The National Survey of Violence Against Women (NVAW; Tjaden & Thoennes, 2000) reported that 51.9% of the women surveyed had experienced some sort of physical assault and 22.1% particularly reported IPV. Although the survey did not find significant differences in violence experienced by Hispanic and Non-Hispanic White women, the survey did show a trend for Hispanic women to report less incidences of rape. A lack of reporting may be related to acculturation since a lack of culturally appropriate resources for Latinas, language barriers, as well as fear of deportation if they are undocumented may discourage women from reporting the violence. Nevertheless, research has shown the negative relationship IPV has on a Latina woman's physical and mental health (Edelson, Hokoda, & Ramos-Lira, 2007; Hazen, Connely, Soriano, & Landsverk, 2006; Lown & Vega, 2001; Torres & Han, 2000).

One such study by Torres and Han (2000) examined the connection between psychological distress and abuse in both Non-Hispanic White and Hispanic women. Three types of abuse, physical, nonphysical, and sexual, were measured along with life changes and symptoms of post-traumatic stress, depression, and anxiety. Sixty-two White and sixty-two Hispanic women participated. For the Hispanic women, sexual abuse was the only variable significantly correlated with PTSD symptoms. However, the findings of this study may have been limited by the lack of assessment of appraisal and coping that is key to the Lazarus and Folkman (1984) model. The researchers did not assess if the women appraised IPV as stressful or how they chose to cope. For example, one's ethnicity of being Latina may change how these women perceive violence and what they even consider to be violent behavior in a relationship. Latinas who are more acculturated tend to report violence more, seeming to suggest there is something about going through a cultural change that may change how Latinas perceive violence (Sanderson et al., 2004). For instance, more traditional gender roles are related to less reported violence by Latinas (Harris, Fireston, & Vega, 2005). Thus, as Latinas adopt what is considered more modern gender roles, as seen in the U.S., their ideas about the appropriateness of IPV may change.

In another study on the link between IPV and psychological functioning, different results were found. Hazen et al. (2006) assessed 282 Latina women. The women were interviewed and split into three groups based on ethnicity, U.S. born, immigrant or migrant women, and this status was used as one of the predictor variables. Types of abuse were also predictor variables and included physical abuse, sexual coercion, dominance-isolation and psychological abuse. Psychological symptoms including anxiety, depression, hostility, phobic anxiety, somatization and self-esteem were used as criterion variables. The authors ran a multiple regression entering all the independent variables in simultaneously. Certain types of abuse were found to significantly contribute to different psychological

symptoms. Physical abuse significantly contributed to depressive symptoms and hostility. Emotional abuse was a significant predictor of hostility and somatization. Dominance-isolation also contributed depressive symptoms. None of the types of abuse were significant predictors of anxiety or self-esteem. Overall, the research shows how IPV can be used as a predictor of mental health.

Although the results vary, it is clear that IPV is negatively related to a Latina woman's health in some way. One limitation to the research discussed above is a lack of the assessment of primary or secondary appraisal or coping. Torres and Han (2000) found that only the worst physical abuse was linked to psychological symptoms, while Hazen, et al. (2006) found verbal abuse contributed to somatic symptoms. This inconsistency may be accounted for the fact that these women were not asked how they perceive the abuse and if they felt it to be stressful. In addition, the participants weren't asked about how they assessed what they could do about the IPV (secondary appraisal) or how they coped with it. As previously explored in the Lazarus and Folkman (1984) model, appraisal and coping can be important moderators between stressors and health outcomes, and thus these elements should be evaluated when looking at how Latinas handle stressors.

Ethnic Identity and Coping

One's worldview may be related to what a person perceives as stressful. The most salient parts of one's identity may affect how one views the world and thus how one might appraise a situation and decide to cope. For example, someone who is a devote Catholic may see one of their coping options as prayer or talking to a priest; or someone who values family might perceive coping options as talking to a brother or sister. Both religion and family are valued in the Latino culture, and if one feels strongly about their ethnicity as a Latina, her appraisal and coping choices may be related to how she perceives the world through the lens of ethnic identity.

Ethnic identity could be one important construct used in appraisal by Latinas, and it has been suggested that ethnicity should be taken into account when examining the coping models with minorities (Slavin, Rainer, McCreary, & Gowda, 1991). Ethnic identity is one form of identity development that has come out of the identity research of Erickson (1968) and Marcia (1966) and the social identity theory of Tajfel and Turner (2004) (1981). For Erikson and Marcia, identity development is a process of exploration and commitment to different identity domains, such as vocational, sexual, or religious domains, within their broader sense of self. Individuals explore these different aspects of their identity and come to a positive or negative resolution that they then internalize (Erikson, 1968). Unlike Erikson, Tajfel and Turner (2004) examines the process of defining oneself as a group member in a broader social context and using this membership to also create a coherent sense of self. One's self-esteem, in this theory, is closely related to positive group membership.

One group people may define themselves in is an ethnic group, or a group of people who have a common descent and shared history. Ethnic groups also may share cultural traits such as dress, art, music, food, literature, and language. Therefore, ethnic identity formation is the process in which one comes to understand themselves in relation to their ethnicity (Phinney, 1989; Umaña-Taylor, Yazedjian, & Bámaca-Gómez, 2004). This process of ethnic identity formation may change a person's worldview and thus can be a form of appraisal.

Phinney (1989) developed a model of ethnic identity by using Marcia's operationalization of Erikson's model (1968). Marcia's model has four stages: diffusion, no exploration or commitment to an identity; foreclosure, a commitment to an identity without exploration; moratorium, exploration but no commitment; and achieved, exploration and commitment. Since Phinney (1989) was unable to distinguish between adolescents who were diffused or foreclosed she combined the two and created a category called "unexamined". Thus, her three-stage model began with the unexamined stage during which an individual has either adopted the dominant culture's concept of his or her ethnic group or has never been exposed to different ethnicities other than his or her own. For example, Maria has been raised in Latino neighborhood, attends a Latino church, and also goes to school with people who share her Latino heritage and culture. Her ethnicity remains unexamined because she has never had to compare it to the dominant "American" culture. The second stage, moratorium, is a period of exploration of what an individual's ethnicity means to him or her. They may discuss their ethnicity with family and friends, read books, or attend events that help them gain knowledge and think critically about their ethnicity. Maria goes to college and is quickly exposed to cultures that are not her own. Some of her values such as her strong relationship with her family are not valued by all of her peers. At the same time she is taking a Spanish literature class and begins to see her culture as being an important part of a larger society.

Finally, "achievement" is the stage in which individuals resolve their feelings about their ethnic identity and internalize the meaning of their ethnicity. Maria's exploration caused her to have great pride for her ethnicity, and she joins the Latino-Hispanic Alliance group at her school. Although Phinney's (1989) model does not assume positive or negative commitment, her measurement, The Multigroup Ethnic Identity Measure (MEIM), only assesses positive achievement. Umaña-Taylor, et. al. (2004) argued that it is important to define a difference between "positive achievement" and

"negative achievement" since Erikson's (1968) theory describes the possibility of both outcomes. In addition, the MEIM uses a composite score, instead of a score from each stage, to designate a developmental stage to each participant. This limits the amount of analysis that can be done on each ethnic development component (unexamined, moratorium, and achievement).

To address these issues, Umaña-Taylor, Yazedjian, and Bámaca-Gómez (2004) developed the Ethnic Identity Scale that measured three categories in order to identify if an individual is positively or negatively oriented in the four original stages of diffusion, foreclosure, moratorium, and achievement. The three categories that are assessed are labeled as "resolution", "exploration", and "affirmation". High scores in resolution means individuals feel that they have come to an understanding of what their ethnicity means to them and are committed to conceptualization. Exploration scores assess how much individuals have explored their ethnicity by doing things such as reading books and attending events that teach them about their ethnicity. Affirmation scores are meant to measure if the individuals have positive or negative feelings about their ethnicity.

Ethnic identity may be a particularly appropriate form of secondary appraisal for Latinos, since they are a young population in which ethnicity may be very salient as they try to define themselves in the United States. Thirty-five percent of the Latino population is under 18, and the median age is 25.9 years old, which is lower than the general population (U.S. Census Bureau, 2000). In addition, cultural values such as *machismo* or *familia* may be connected to one's ethnic identity and thus affect appraisal.

Ethnic identity has been shown to have a positive relationship with mental health (Roberts, Phinney, Masse, Chen, Roberts, & Romero, 1999). Roberts et al. (1999) surveyed 5,496 middle school students in order to test the construct validity of Phinney's measure of ethnic identity, the MEIM, and see if ethnic identity was related positively to psychological well-being and negatively to loneliness and depression. Within the sample 253 were Central American, and 755 were Mexican American. Ethnic group membership was determined by self-identification, and the MEIM was used to measure ethnic identity development. Psychological well being was assessed with measures of self-esteem, coping (which consisted of a six item measure to determine whether the participants participated in coping behavior), optimism, mastery ("I can do just about anything I really set my mind to", p. 308), loneliness, and depression. Salience of ethnicity was assessed by having each student rate of how important ethnic background is to them. Salience of ethnicity was linked to the MEIM.

Overall, ethnic identity was positively correlated with coping, mastery, self-esteem and optimism and negatively correlated with loneliness and depression. For Mexican Americans, the positive correlations were found between ethnic identity and coping, mastery, self-esteem, and optimism were all significant. There was also a significant correlation between salience of ethnicity and ethnic identity ($r = 0.40$, $p < .001$). These results relate back to the Lazarus and Folkman (1984) model that argues an individual's appraisal of an event can have a profound affect on how the event affects their mental health. As shown in this study, having a strong sense of ethnic identity seems to positively relate to mental health in the Mexican American sample examined. Unfortunately, this study did not examine what types of coping, such as problem-focused or emotion-focused, were actually utilized. So, it is unknown how ethnic identity might change the relationship between stressors, coping, and mental health. The link found in this study suggests that ethnic identity may be used as a form of secondary appraisal since it is related to coping and mental health, but more in-depth analysis are needed in the future to understand how much ethnic identity adds to the relationship between stress and health outcomes.

Since ethnicity includes shared customs and values, another reason ethnic identity may be important for appraisal is because it may involve Latinas viewing violence from a cultural lens different from the mainstream U.S. culture. Gloria and Peregoy (1995) present several cultural values of Latinos, some of which may be important to how a woman views IPV. Gender roles include *machismo*, or the man as the head of the house, and *maranismo*, the idea that women should admire the Virgin Mary and thus endure suffering inflicted by men. Furthermore, *simpatía* (loosely translated as congenial) is the value of maintaining "pleasant relationships" (p. 121, Gloria & Peregoy, 1995) and may include enduring or tolerating abuse in order to keep relationships. A strong sense of family loyalty also plays a role in Latino culture, and it is important that members of the household do nothing to bring shame on their kin. Finally, most Latinos in the U.S. are Roman Catholic (Goodstein, 2007) and are influenced by the church and their religious beliefs. Past research has shown Latinos use more religious coping than non-Hispanic whites (Culver, et. al., 2002). All of these cultural values may shape a Latina woman's worldview, a worldview that may be altered as they go through the stages of ethnic identity development.

Acculturation is another process that may change a person's worldview. Although acculturation is not the same as ethnic identity, the two constructs are interrelated because they both involve a process of examining one's own cultural values and what they mean to an individual in the context of their own life and their role in a greater society. Acculturation is usually associated with losing one's culture to a dominant culture, while ethnic identity development may or may not involve changing one's cultural behavior, but instead examining and integrating feelings about one's culture

into one's identity. Thus, acculturation research can also demonstrate a link between the importance of ethnicity in appraisal, although the two processes should not be used interchangeably.

One study examined how acculturation and ethnic identity are related to dating violence in Latino ninth-graders (Sanderson, Coker, Roberts, Tortolero, & Reininger, 2004). The 5, 118 participants who responded were 14 or older. Acculturation was evaluated by Latino origin, place of birth for the youth and their parents, language use, salience of ethnicity, and perceived discrimination based on ethnicity. Questions were also asked about dating violence in the past 12 months. Using language as an indicator of acculturation, females who spoke only English at home were 89% more likely to report dating violence victimization in the past 12 months, while those speaking Spanish were 48% less likely to report violence. Females who reported their ethnicity to be very important had a reduced likelihood of 20% of dating violence victimization. On the other hand, those who perceived a great deal of ethnic discrimination were twice as likely to report dating violence. Nevertheless, Sanderson et al. (2004) did not assess mental health or coping, so it is not known how ethnic identity played a role in this relationship, but we can see how ethnicity may change how IPV is perceived. In addition, the ethnic identity stage (i.e. moratorium, diffused, etc) was not examined and may have added to how the females perceived discrimination. Those who had commitment to their identity but haven't explored (diffused), may perceive all discrimination as stressful because they haven't explored how discrimination is part of a bigger system in society and in turn may not have to do with who they are as a person.

Several factors should be considered when interpreting the above findings. In a public opinion survey of Latinos, it was found that Latinas are more likely to favor "modern" or "very modern roles" for women than Latinos. Latinas also tend to make the transition from traditional to modern roles more quickly (Montoya, 1996). Thus, differences in acculturation rate may be one reason Latinas are at greater risk of IPV. High acculturation and differences in acculturation between couples has been related to IPV in previous studies (Caetano, Schafer, Clark, Cunradi & Raspberry, 2000). Acculturated females may also simply have easier access to services because they understand the language and culture. Thus, their reporting of IPV is higher. Nevertheless, how a Latina views her ethnicity and has examined her cultural values, may lead to different appraisals of violence and coping options. The previous literature discussed showed how the perceived changeability of situation may make a difference in if a person uses confrontive coping (changeable) or avoidance (unchangeable) (Folkman, Lazarus, Dunkel-Shetter et al., 1986). So if a Latina has foreclosed ethnic identity, maybe she perceives discrimination as unchangeable and thus uses avoidance coping. Thus, ethnic identity as an appraisal could change an individuals coping.

One study explored how proactive coping with discrimination might be a possible mediator between ethnic identity (appraisal) and self-esteem (health outcome) (Umaña-Taylor, Garcia, & Gonzales-Backen, 2008). The authors hypothesized that identity exploration and resolution would be associated with proactive coping. The longitudinal studies involved assessment of 323 Latino adolescents. Ethnic identity was measured with the Ethnic Identity Scale (EIS, Umaña-Taylor, 2004), along with a measure of proactive coping and self-esteem. Multivariate analysis revealed identity resolution was associated with more proactive coping over time and that more proactive coping was linked to higher self-esteem over time. Exploration was also positively correlated with proactive coping. The authors suggest that those adolescents who have resolved their feeling about their ethnicity may feel more confident in using proactive strategies when they face discrimination. This outcome may also be true for Latinas who face IPV. Latinas who score high in identity affirmation may have positive feelings about their ethnicity, but haven't internalized the meaning of their ethnicity (resolution) and may thus lack the confidence to face problems head on. Instead, they may use avoidance coping that could lead to poorer health outcomes.

Thus, prior research has shown a complex relationship between stressors and health outcomes. How an event is perceived, or appraisal, has been correlated with different coping strategies as well as health outcomes (Carver, Scheier, & Weintraub, 1989; Folkman, Lazarus, Dunkel-Shetter, et al., 1986; Folkman, Lazarus, Gruen, et al., 1986). In addition, coping has been related to health outcomes (Culver et. al., 2002), particularly avoidance being related to poorer mental health (Utsey, Ponterotto, Reynolds, & Cancelli, 2000). Latinos may face unique stressors such as acculturative stress (Hovey, 2000a, 2000b; Hovey & Magaña, 2002) and discrimination (Pérez, Fortuna & Alegría, 2008) that have been associated with poorer mental health. In addition, IPV may be a specific stressor for Latina women and has also been associated with poor health outcomes (Hazen et al., 2006; Torres & Han, 2000). As a young population in the United States, Latinos may still feel closely linked to their ethnicity, and thus ethnic identity may be an important form of appraisal. Strong ethnic identity has been associated with better mental health, such as high self-esteem, and identity resolution and exploration have been linked to proactive coping (Umaña-Taylor, Garcia, & Gonzales-Backen, 2008). In addition, proactive coping is related to higher self-esteem (Umaña-Taylor, Garcia, & Gonzales-Backen, 2008).

Originally, by using the Lazarus and Folkman (1984) model of coping, the current study hoped to assess IPV as a possible stressor and ethnic identity as a possible form of secondary appraisal in a sample of

Latina women. After gathering the data, the author has decided to only focus on general stress, mental health, coping and ethnic identity. This decision was made because not all the women reported IPV and that small section of data may be explored later in a separate report.

Hypotheses

Appraisal has also been linked to mental health (Carver, Scheier, & Weintraub, 1989; Folkman, Lazarus, Dunkel-Shetter, et al., 1986; Folkman, Lazarus, Gruen, et al., 1986) and thus it is expected that 2) Higher perception of stress will be related to poorer mental health.

H1: There is a positive relationship between PSS and anxiety and depression and a negative relationship to vigor.

Coping has also been related to mental health (Culver et. al., 2002; Utsey, Ponterotto, Reynolds, & Cancelli, 2000) and so it expected that 3) coping will be related to mental health in the current study.

H2: Problem-focused coping will be negatively related to depression and depression and positively related to vigor.

H3: Avoidance coping will be positively related to depression and anxiety and negatively related to vigor.

Avoidance coping has been related to poor mental health outcomes (Utsey et al., 2000) so 7) Avoidance coping will add unique variance to health outcomes above and beyond perceived stress.

H4: Avoidance coping will add unique variance to depression, anxiety, and vigor above and beyond PSS.

Finally, identity exploration is hypothesized to be related to higher perceived stress since exploration is a time of instability in one's identity (Erikson, 1986).

H5: Identity exploration will be related to higher perceived stress.

Explorational analyses will be run on the other identity statuses to see how they relate to coping and stress.

Method

Participants

Data was primary collected from organizations and churches in mid-western, western, and central Ohio, as well as via the internet. The sample consisted of 57 women, ages 18-58, with an average age of 38.6 years old. Forty-three percent (43.4%) of the sample self-identified as Puerto Rican, 22.8% were Mexican/Mexican American, 10.5% were Latina/Hispanic, 3.5% were of mixed ethnicity, 3.5% were Columbian, 3.5% were Salvadorian, and 1.8% were Peruvian. The majority of the participants identified as middle class, 50.9%, followed by working class, 40%, lower class, 7.3%, and upper class, 1.8%. Eighty-two percent (82.5%) of the sample said they were bilingual. Most of the participants were born outside of the U.S. (41.1%), while 35.7% were first generation, 14.3% second generation, and 7.2% could not identify an option that applies to them. Out of the 57 participants, 34 reported some form of intimate partner violence. To make the study stronger, all participants were included in analyses and IPV was not analyzed at this time.

Procedure

The survey was available in both English and Spanish in an on-line version via Survey Manager and a paper copy. On-line participants were contacted via snowball emailing and through on-line listservs. Personal contacts were also made across Midwest, West, and Central Ohio. These contacts included churches and organizations that serve Latino populations.

Informed consent was given in written form at the beginning of the survey, and consent was given by participant's voluntary completion of the survey. At the end of the survey participants were either given a $5 Wal-Mart gift card or entered into a raffle for one of two $25 Wal-Mart gift cards.

Materials

The measures below were used in the survey in the following order in order to follow the flow of the Lazarus and Folkman coping model (1984). Participants were asked to think about IPV or another stressful event as they answered the coping and mental health measures. All measures were available in both English and Spanish translations except for the demographics form and PSS. A professional translator translated these forms.

Demographics

Participants were asked about their age, personal history in terms of place of birth (first, second generation, etc), language use and preference, and social class. Other questions focused on acculturation by inquiring about the typical food they ate and how they agree with certain cultural sayings or "*dichos*" such as: "*La ropa sucia se lava en la casa*" (The dirty clothes are washed in the house).

Adapted Woman Abuse Scale (WAS)

The WAS is a modified version of the Conflict Tactic Scale (CTS; Straus, 1979) made by Saunders (1992) and adapted with the suggestions of Edelson, Hokoda and Ramos-Lira (2007). The measure consists of a 26-item checklist of psychological, physical and life threatening forms of abuse (e.g. he insulted or swore at

you; he physically forced sex on you; he threatened you with a knife or gun). The original WAS (Saunders, 1992) asked participants to check yes or no for each item and then estimate the frequency of the abuse over the past 12 months by picking a category that ranged from once to over 157 times. The adapted WAS was changed by using the suggestions of Edelson, Hokoda & Ramos-Lira (2007) to have participants estimate the frequency and write it in themselves. The women were asked to estimate the frequency over the past three months. The internal consistency reliability of the original CTS ranged from .70 to .88 on all scales and for a sample of men and women (Straus, 1979). Since its conception, the CTS has been used extensively with studies focusing on IPV and has also been used cross-culturally (Straus, 2004). In the current study, the scale was split into psychological and physical abuse. Frequencies could not be analyzed because not all the participants filled in this section. The current sample showed internal consistency of .815 for the psychological abuse scale and .794 for the physical abuse scale.

Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983)

The Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983) is a 14-item measure of the degree to which one appraises situations in life to be stressful. The PSS is designed to measure to what degree the participants find their lives unpredictable, uncontrollable, and overloaded. These three issues have been found to be central to experiences of stress. Items are rated on a 0-4-Likert Scale that ranges from 0= never to 4= very often. A sample item would be, "In the last month, how often have you been upset because of something that happened unexpectedly?" Participants in this study were asked to think of the items they had answered affirmative to on the WAS if applicable and if not, to think of another stressful event in their life as they filled out the PSS. Coefficient alpha reliability for the PSS ranged from .84-.86 based on the three initial samples tested. The internal consistency of the current sample is .533.

Ethnic Identity Scale (EIS; Umaña-Taylor, et al., 2004)

The EIS is an ethnic identity measure developed from Erikson and Marcia's theories of identity development as well as Phinney's (1989) three-stage model of ethnic identity (Umaña-Taylor, et al., 2004). The 17-item questionnaire uses a 4-point-Likert Scale that ranges from 1= "Does not describe me at all" to 4= "Describes me very well." Examples of items include "My feelings about my ethnicity are mostly negative" and "I am clear about what my ethnicity means to me." The questionnaire has three scales that separately measure exploration, affirmation, and resolution. Affirmation scores are meant to asses if the individuals have positive or negative feelings about their ethnicity. The four stages are then determined as follows:

-Diffuse (low exploration, low resolution)
-Foreclose (low exploration, high resolution)
-Moratorium (high exploration, low resolution)
-Achieved (high exploration, high resolution)

During the development of the scale, coefficient alphas were moderately high for all three scales (exploration, affirmation, and resolution), determining the measure's reliability as .89, .84, and .89 respectively. Construct validity was assessed by examining the intercorrelations of each subscale with of self-esteem, and a measure of familial ethnic socialization. In the current sample the internal consistency was .758 for the affirmation scale, .858 for the exploration scale, and .818 for the resolution scale.

Brief COPE (Carver, 1997)

The Brief COPE (Carver, 1997) is a shortened version of the COPE inventory (Carver, Scheier, & Weintraub, 1989). The COPE inventory is derived from the Lazarus and Folkman (1984) coping model and the Carver and Scheier (1981, 1990) model of behavioral self-regulation. The Brief Cope consists of 14 scales with two items each. The scales measure different forms of coping that include: active coping planning, positive reframing, acceptance, humor, religion, using emotional support, using instrumental support, self-distraction, denial, venting, substance, behavioral disengagement, and self-blame. The 28 items use a 3-point-Likert Scale ranging from 0=I haven't been doing this at all to 3= I've been doing this a lot. A sample item would be, "I've been saying to myself 'this isn't real'" (Denial). Participants in this study were asked to keep in mind the WAS or another stressful event, depending on what was applicable. Participants assessed how they coped with these stressors over the past three months. All the scales have a reliability that meet or exceeds the value of .50. All exceeded .60 except for Venting, Denial, and Acceptance. The internal consistency for in current sample was .280 for self-distracting coping, .757 for active coping, .818 for denial, .798 for substance use, .789 for emotional support, .730 for behavioral disengagement, .654 for venting, .654 for positive reframing, .548 for planning, .643 for humor, and .737 for religious coping.

Center of the Center for Epidemiologic Studies of Depression Scale (CESD; Radloff, 1977)

The CES-D (Radloff, 1977) is a self-report measure designed to measure symptoms of depression over a one-week period. The current sample was asked to think of the WAS or another stressful event, depending on what was applicable to them and to then answer each question based on a three month period of time. The 20-items use a 4-point-Likert Scale that range

from 1= Rarely or none of the time (0-25% of the time) to 4= Most or all of the time (75-100% of the time). A sample item would be, "I was bothered by things that usually don't bother me." The internal consistency of this measure was good, with a Cronbach's alpha of .85 for a general population and .90 for a psychiatric patient sample. The internal consistency in the current study was .912. *Emotional Distress Scale (Perzek, Carver, & Price, 2000)*

This measure was adopted and translated by Perzek, Carver, & Price (2000) from the Profile of Mood States (POMS: McNair et al, 1971) although it is not an officially sanctioned version of the measure. The measure includes a list of adjectives that describe mood. Participants indicate to what extent they have been feeling each mood over a specified time period (usually over the past week). A 4-point-Likert Scale is used that ranges from 0= not at all to 4= extremely. In this study the participants were instructed to think about the WAS (if applicable) or another stressor and answer the scale as it pertained to their emotions over the past three months. Six subscales are measured: anxiety, depression, vigor, fatigue, anger, and confusion. In an independent sample of 235 students the briefer scales correlated at .87, .93, .93, .88, .87, and .77 respectively with the full POMS scales (Perzek, et al., 2000) Only the scales for vigor and anxiety were utilized as to not repeat items already covered in the CES-D. In the current sample the internal consistency for vigor was .873 and .161 for anxiety.

Results

The following section reports the results of the current study. First descriptive statistics and intercorrelations will be described. Next, the results of the hypotheses will be reported. Finally, the last section will be dedicated to exploratory analysis. Correlations were initially done on all the variables included the IPV measure, but IPV will not be reported in these results since the whole sample was used and not all of the women reported IPV.

Descriptive Statistics and Intercorrelations

First the PSS and the EIS were assessed, the two scales designed in this study to assess appraisal. Results of these two scales were examined and compared to the original samples. The mean score on the PSS (M = 26, SD = 5.70) was a little higher than the females in Cohen et al., 1983 who had a mean of 23.57 and 25.71 in the student sample and 25.6 in the community sample with standard deviations of 7.55, 6.20, and 8.24, respectively. Over fifty percent of the sample (53.7%) had a perfect score of 24 on affirmation (M = 21.7, SD = 4.00). The mean for the current sample on the exploration subscale was 21.78 (SD = 5.75) and for the resolution subscale it was 15 (SD = 3.04). Umaña-Taylor et al. (2004) original study using the EIS did not report means for the subscales and instead used the scales to categorize the sample into the diffuse, foreclose, moratorium, and achieved statuses. The sample of the current study was too small to divide into the identity status categories, but it was similar to the Umaña-Taylor et al. (2004) sample when comparing affirmation scores. Only 10% of the Umaña-Taylor et al. (2004) sample reported low scores on the affirmation subscale.

The most popular form of coping reported by the women was religious coping, with 47.4% of the sample showing perfect scores on the scale. The mean was much higher in the current sample (M = 6.77, SD = 1.58) compared to a study by Perczek, Carver, Price, and Pozo-Kaderman (2000) who surveyed bilingual undergraduate students at the University of Miami. Students did not identify their culture of origin. The means of the current sample have been compared to the means reported on the Spanish version of the coping scale in the Perczek et al. (2000) study. Religious coping had a mean of 4.90 (SD = 2.14) for the Spanish scale. Other frequently used forms of coping in the current study included planning (M = 5.93, SD = 1.62), active coping (M = 5.89, SD = 1.77), acceptance (M = 5.52, SD = 1.95), self-distraction (M = 5.48, SD = 1.49), and positive reframing (M = 5.30, SD = 1.86). These means and standard deviations compared to the Perczek et al. (2000) sample as follows: planning (M = 6.00, SD = 1.61), active coping (M = 5.84, SD = 1.69), acceptance (M = 6.22, 1.61), self-distraction (M = 5.36, SD = 1.69), positive reframing (M = 5.46, SD = 1.57). The coping used least frequently was substance use (M = 2.56, SD = 1.30), which was also the lowest type used in the findings of Perczek et al. (2000) (M = 2.81, SD = 1.57).

Intercorrelations were also examined among the variables of interest in order to examine their possible relationships. The intercorrelations are presented in Table 1. The identity status scores were examined to understand their relationships to coping styles and mental health. Affirmation was positively correlated with self-distraction (r = .405, $p < 0.01$), planning (.53, $p < 0.01$), and venting (r = .35, $p < 0.01$) as well as anxiety (r = .32, $p < 0.01$). Exploration was positively related to religious coping (r = .31, $p < 0.05$) and vigor (r = .25, $p < 0.05$). Resolution was negatively related to behavioral disengagement (r = -.33, $p < 0.01$) and denial (r = -.26, $p < 0.05$) and positively related to religious coping (r = .29, $p < 0.05$) and vigor (r = .25, $p < 0.05$).

Test of Hypotheses

The hypotheses were designed to test the links of the Lazarus and Folkman (1984) model among stressors, appraisal, coping and mental health. Consistent with this model, appraisal was also analyzed to examine if it added unique variance above and beyond the frequency of a stressor to health outcomes.

Hypotheses one, two, three, and five were tested with a Pearson Product Moment correlation and hypothesis four with a hierarchical linear regression.

The first hypothesis, higher perception of stress will be related to poorer mental health, was also supported. Results showed consistency with the Lazarus and Folkman (1984) model that states that the appraisal of an event as stressful is related to health outcomes. The PSS was positively correlated with depression, ($r = .62$, $p < 0.01$) and anxiety, ($r = .58$, $p < 0.01$) and negatively correlated with vigor, ($r = -.44$, $p < 0.01$).

The second and third hypothesis, coping will be related to mental health with problem focused being related to better mental health and emotion-focused related to poorer mental health was partially supported. Lazarus and Folkman (1984) have argued that coping is related to mental health, and studies have shown that the type of coping used can lead to different mental health outcomes (Culver et. al., 2002; Utsey et al., 2000). Inconsistent with the hypothesis and some of the research, significant results of a Pearson correlation showed that active coping and planning were both positively correlated with anxiety ($r = .23$ and .25, respectively; $p < 0.05$).

Emotion-focused coping was related to poorer mental health. Coping was defined as emotion-focused coping by referring to Lazarus and Folkman's (1984) literature that defines emotion-focused coping as a way to relieve emotions related to a stressor and gives the examples of substance use and behavioral disengagement. Consistent with the hypothesis and previous research, emotional-focused coping was positively related to depression and anxiety, and negatively related to vigor. Depression was positively related to the following types of emotion-focused coping; denial ($r = .58$, $p < 0.01$), substance use ($r = .50$, $p < 0.01$), self-distraction ($r = .46$, $p < 0.01$), behavioral disengagement ($r = .44$, $p < 0.01$), and venting ($r = .44$, $p < 0.01$). Anxiety was also positively correlated with these types of emotion-focused coping: depression ($r = .41$, $p < 0.01$), substance use ($r = .50$, $p < 0.01$), self-distraction ($r = .48$, $p < 0.01$), behavioral disengagement ($r = -.38$, $p < 0.01$), and venting ($r = .50$, $p < 0.01$). Also, findings showed negative correlations with vigor: denial ($r = -.40$, $p < 0.01$), substance use ($r = -.40$, $p < 0.01$), self-distraction ($r = -.31$, $p < 0.01$), behavioral disengagement ($r = -.38$, $p < 0.01$), and venting ($r = -.36$, $p < 0.01$).

The fifth hypothesis, higher perceived stress will be related to identity exploration was based on past identity development research that showed identity exploration in adolescence to be related to depression (Meeus, 1996) and other forms of distress (Kidwell, Dunham, Bacho, Pastorino, & Portes, 1995). Results did not yield significant results. Instead, higher perceived stress was related to affirmation, ($r = .31$, $p < 0.05$).

Hypothesis four, avoidance coping will add unique variance to health outcomes above and beyond perceived stress was supported by the results of a multiple regression. The results of this analysis are presented in Table 4. These results were also consistent with Utsey et al. (2000) who also found that avoidance coping was related to poorer mental health. An avoidance coping variable was computed by combining the scores of the self-distracting, denial, and substance use coping items. PSS was entered on step one and avoidance coping on step two of a multiple regression analysis that revealed that perceived stress accounted for a significant portion of the variance in anxiety, ($R^2 = .30$, $F(1, 49) = 23.29$, $p < 0.000$) and that avoidance coping added a unique variance to anxiety above and perceived stress, ($R^2_{inc} = .15$, $F(1, 48) = 12.60$, $p < 0.001$). In addition, perceived stress was found to account for a significant portion of the variance in depression, ($R^2 = .32$, $F(1, 49) = 23.29$, $p < 0.000$) and avoidance coping added significant variance to depression above and beyond perceived stress, ($R^2_{inc} = .20$, $F(1, 48) = 19.65$, $p < 0.000$).

Exploratory Findings

Other exploratory findings were examined. Religious coping was negatively related to depression ($r = -.28$, $p < 0.05$), anxiety, $-.28$, $p < 0.05$) and positively with vigor ($r = .42$, $p < 0.01$). This finding is consistent with previous research that found the Latino population tends to favor religious forms of coping (Alferi, Culver, Carver, Arena, & Antoni, 1999; Culver et al., 2002).

Discussion

The current study was done as an examination of how stressors are related to the mental health of Latina women. In addition, coping and appraisal were assessed to explore their role in the relationship between stressors and mental health. More specifically, ethnic identity was thought to be a possible form of appraisal salient to Latinas.

The current research was based on Lazarus and Folkman's (1984) model of stress and coping. The model not only says that stressors are related to mental health, but also explains that how a stressor is perceived or appraised may make difference in the health outcomes as well as how one copes with a stressor. In addition, how a person copes with a stressor also may change the health outcome. Previous research has indeed shown a link between appraisal and mental health as well as appraisal, coping style, and mental health (Carver, Scheier, & Weintraub, 1989; Folkman, Lazarus, Dunkel-Shetter, et al., 1986; Folkman, Lazarus, Gruen, et al., 1986). Furthermore, the coping style chosen may make a difference on whether mental health worsens or improves (Culver et. al., 2002; Utsey, Ponterotto, et al., 2000).

Consistent with the model and previous research, the current investigation assessed how

stressors and the appraisal of the stressor were linked to mental health. Perceived stress and ethnic identity were measured as forms of primary and secondary appraisal respectively. In addition, possible relationships were examined among appraisal, coping, and mental health.

The current study examined a possible link between primary appraisal and mental health. Results showed that PSS was positively correlated with depression and anxiety and negatively related to vigor. These finding provide some support for using the model with Latinas.

Coping was also related to mental health. The hypothesis that problem-focused coping would be related to better mental health was not supported. In fact, active coping and planning were both positively correlated with anxiety. Previous research has shown that the more stressful a situation is perceived, the worse a person's mental health, but also that the person will utilized more coping (Folkman, Lazarus, Gruen et al., 1986). In other words, active coping and planning may be utilized when a situation has already been found to be more stressful, making facing that problem all the more daunting. It should be noted that these problem-focused types of coping were only significantly correlated with anxiety and not depression or vigor. So it may be possible that anxiety decreases after the problem has been dealt with and solved and mental health improves in the long run.

It also should be noted that the Lazarus and Folkman model was based on a Caucasian population (Folkman, Lazarus, Gruen et al., 1986). Slavin, et al. (1991) suggested that the model should be adjusted for a multicultural population. Belonging to a culture may change one's appraisal and coping options. Specifically for Latinas, facing a problem head-on when they may have been taught to value *simpatía* or *marianismo* may be linked to more anxiety, because they are going against a cultural norm.

Nevertheless, emotion-focused coping was consistent with the hypothesis, and past research that has shown this type of coping is linked to poorer health outcomes (Utsey, et al., 2000). In fact, denial, substance use, self-distraction, behavioral disengagement, and venting were all positively correlated with depression and anxiety, and negatively correlated with vigor. In addition, combining the types of coping listed above made an avoidance coping scale. Avoidance coping, one particular form of emotion-focused coping, added unique variance to anxiety and depression above and beyond perceived stress. These findings led the author to conclude that ignoring problems keep an individual trapped in the cycle of stress, coping, and poor mental health. This cycle was demonstrated in the study by Culver et al. (2002) in which women going through breast cancer treatment who used behavioral disengagement also faced poorer mental health outcomes.

Latina women may be more prone to use emotion-focused coping, as self-distraction was one of the more popular forms of coping in the current sample. In addition, affirmation was positively related to self-distraction, venting, and planning. Most of the women in the current sample showed high positive affirmation, meaning they have strong positive feelings towards their ethnic group. Thus, if one feels positive about their ethnic group it could be hypothesized that this individual will use types of coping that are seen as appropriate or common to that group. In a study by Culver et al. (2002), venting and self-distraction were used more by Hispanics than the non-Hispanic Whites or African Americans in the sample, indicating that these forms of coping may be more culturally appropriate in a Latino population.

The exploratory analyses on identity exploration did not yield significant results. After closer examination of the research by Umaña-Taylor et al. (2004), it should be noted that although identity exploration has been related to poorer psychological well-being (Kidwell et al., 1995; Meeus, 1996), ethnic identity exploration has been associated with higher levels of self-esteem among ethnic minorities in a sample of high school and university students. In the current research, the author believed that exploration would indicate a conflict in the individual's ethnic identity and the larger culture and thus cause more distress as the individual worked through the exploration process. Although this may be true for individuals faced with the process of acculturation (Hovey, 2000a; Hovey & Magaña, 2002), ethnic identity development seems to be an internal process that may be catalyzed by a stressful event, such as discrimination (Pahl & Way, 2006), but may not be a stressful process itself. Indeed, ethnic identity exploration has not only been positively related to self-esteem, but also associated with proactive coping. It was also positively related to vigor in the current study. Thus, exploration may be a time in which individuals begin to gain the confidence to face their problems head on.

Inconsistent with previous research was the link between affirmation and planning. Umaña-Taylor, Vargas-Chanes et al. (2008) found no link between affirmation and proactive coping in a sample of adolescents. Maybe affirmation is linked to problem-focused coping in adults, but not in adolescents who may have not yet learned the skills needed to use planning as a way of coping, whereas adults who have a positive feeling about their ethnic group may also have more confidence and thus may plan more as a means of coping. In addition, over 50% of the population scored high on positive affirmation, negatively skewing the sample. This trend was also found by Umaña-Taylor, et al. (2004) who only found that 10% of the sample of high school students surveyed scored negatively on affirmation. This occurrence may be caused be social desirability. The environment that the surveys were collected in may have also had an effect on the current

sample. Many of the surveys were gathered at churches and organizations that promote strong positive feelings toward Latino culture. Furthermore, the EIS (Umaña-Taylor, et al. 2004) is very short and the construct of affirmation may be unclear, since many of the questions ask the same thing (e.g. "I feel negatively about my ethnicity" and "My feelings about my ethnicity are mostly negative"). Finally, the current sample also showed a positive correlation between affirmation and anxiety, indicating a possible inconsistency with past research that has linked affirmation to self-esteem (Umaña-Taylor, et al. 2004; Umaña-Taylor, Vargas-Chanes et al., 2008).

The remaining scale of the EIS, resolution, was negatively related to behavioral disengagement and denial, and positively related to religious coping and vigor. This is consistent with Umaña-Taylor, Garcia et al.'s (2008) findings that resolution is associated with proactive coping. Although the current study did not find that exact link, an individual scoring high in resolution is less likely to disengage or deny a problematic situation. This result may be because individuals with high resolution feel that they understand what their ethnicity means to them and thus have more confidence in coping.

The current study also showed a link between both exploration and resolution with religious coping, which has been shown to be a popular form of coping in Latino samples (Alferi, et al. 1999; Culver et al., 2002). These links may provide insight into the importance of religion to Latinas. The link may also be related to the high number of surveys that were collected at Catholic masses conducted in Spanish. In other words, the current sample may be more partial to religious coping in general and associate their ethnicity with a strong sense of Catholicism.

Limitations and Suggestions for Future Research

The first limitation of this study was small sample size. With a bigger N stronger relationships may have been found and in addition moderations could have possibly been determined. The sample was also convenience based and collection was predominantly done at churches. There was even a smaller sample of battered women in the current study (n = 34), limiting the amount of analyses and conclusions that could be accomplished with those women specifically.

Spanish translation was also an issue in the research. Several concerns were raised throughout data collection that some of the measures, particularly the PSS and demographics form, had translation issues. In addition, the translation may not have been appropriate for all education levels and dialects, as Puerto Rican Spanish differs from Mexican Spanish. This translation difference could of lead to confusion in answering the questions and takes away some of the validity of the survey. In the future, interviews should be conducted with participants using bilingual researchers in order to give the participants a chance to ask questions. In addition, back translations should be made by focus groups in order to correct any inaccuracies or confusion. Finally, if time allows, a pilot study could be done first with a group of bilingual participants in order to test the validity of the English and Spanish translations.

Finally, the EIS yielded a majority of high scores on the subscales, particularly affirmation. The author suggests further development and research be done on this measure so that the subscale items can be better defined by using a variety of questions. As noted above, the items on the subscales are very similar such as "I feel negatively about my ethnicity" and "My feelings about my ethnicity are mostly negative" on the affirmation subscale (Umaña-Taylor, et al. 2004). Having more items that are reversed scored or worded differently may help to counter the social desirability that may be leading to high EIS scores.

Further research may also examine acculturation instead of ethnic identity, as acculturation is more concerned with adapting one's cultural value systems and norms to the fit into the dominant culture. A comparison with an acculturation scale and the EIS may also be helpful to assess if there are overlaps in the two constructs. The construct of acculturation has been more commonly used in research on Latinos in the past (Hovey, 2000a; Hovey, 2000b; Hovey & Magana, 2000) as well as with research dealing with Latinos and IPV (Caetano, et al., 2000; Garcia, Hurwitz, & Kraus, 2005; Sanderson, et al., 2004).

Other future research may want to assess how religion and particularly religious coping is related to a Latina woman's mental health and ethnic identity development. The current research showed that religious coping is related to better mental health for Latinas, but future studies may be able to further examine what kinds of religious practices (prayer, beliefs, social support from clergy, etc) are most beneficial. Results also showed a link between ethnic identity resolution and exploration with religious coping. Thus, religion may strengthen or be an important part of a Latina's ethnic identity and could be examined more closely in future research.

Future studies should aim to build trust within the Latino community they are studying by making connections with leaders in the community as well has having cultural competent and bilingual researchers. Although churches were very cooperative in the current study, further research should branch out beyond religious based communities in order to get a less religiously bias sample. Domestic violence centers and rape crisis centers could be important resources that were unable to be utilized in the current study. Interviews done with bilingual researchers instead of questionnaires may also allow for a more personal touch and make participants more comfortable about answering questions. Finally, offering an incentive, such as a gift

card or cash that could be handed directly to the participant after the survey was complete seemed most affective.

Conclusion

This examination of stress, coping, and appraisal showed support for the Lazarus and Folkman (1984) model in a Latina population. IPV was found to be correlated with both anxiety and depression and perceived stress added unique variance to anxiety and depression above and beyond IPV. These findings suggest how a Latina woman perceives the stressors is important to her mental health and should be assessed in future research.

Coping was also related to health outcomes and more specifically, avoidance coping added unique variance to depression and anxiety above and beyond perceived stress. In particular, religious coping was linked to positive mental health outcomes and was the most popular form of coping in this sample.

However, the current study did not find support for ethnic identity as a significant form appraisal. Social desirability and weaknesses in the measure may have been a limitation. Ethnic identity should be further developed and examined. In the mean time, acculturation may be a more appropriate form of appraisal to assess.

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Tables

Table 1 Intercorrelations among the variables of interest (n = 57)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	--													
2	.31*													
3	-.18	.06												
4	-.12	.03	.57**											
5	.17	.20	.21	.07										
6	.31**	-.03	-.17	-.26*	.33**									
7	.34**	.16	-.01	.01	.15	.58**								
8	.38**	.41**	.14	-.10	.51**	.40**	.39**							
9	.32**	.16	-.31*	-.33**	-.05	.58**	. 48**	.20						
10	.28*	.53**	.12	.22	.61**	.21	.23*	.41**	.07					
11	.46**	.35**	-.01	.22	.24*	.33**	.42**	.31**	.30*	.47**				
12	-.23*	-.14	.31*	.29*	.30*	-.15	-.17	.02	-.27*	.22	-.12			
13	.62**	.13	-.17	-.17	.20	.58**	.50**	.46**	.44**	.11	.44**	-.28*		
14	.58**	.32**	-.03	-.03	.23*	.41**	.42**	.48**	.47**	.25*	.50**	-.28*	.71**	
15	-.44**	-.22	.25*	.34**	.12	-.40**	-.31**	-.13	-.37**	.02	-.36**	.42	-.59**	-.47**

Note. 1= Perceived Stress Scale, 2 = Psychological Abuse, 3 = Physical Abuse, 4= Affirmation, 5= Exploration, 6= Resolution, 7= Active Coping, 8= Denial, 9= Substance Use, 10= Self-Distancing, 11= Behavioral Disengagement, 12= Planning, 13= Venting, 14= Religion, 15= Depression, 16= Anxiety, 17=Vigor * p < .05, ** p < .00

Table 2 Hierarchical regression analyses of perceived stress as a unique contributor to anxiety and depression

Step	Variable	B	R^2	R^2_{inc}	F_{inc}	df
			Anxiety			
1	Psy	.46	.25	.25	9.89**	1, 30
2	PSS	.44	.44	.20	10.24**	1, 29
			Depression			
1	Psy	.38	.17	.17	5.91*	1, 30
2	PSS	.36	.29	.13	5.33*	1, 29

Note. Psy = Psychological Abuse. PSS = Perceived Stress

Table 3 Hierarchical regression analyses of perceived stress as a unique contributor to anxiety and depression

Step	Variable	B	R^2	R^2_{inc}	F_{inc}	Df
			Anxiety			
1	Phy	.36	.15	.15	5.45**	1, 31
2	PSS	.45	.35	.20	9.21**	1, 30
			Depression			
1	Phy	.42	.19	.19	7.32*	1, 31
2	PSS	.33	.30	.12	4.56*	1, 30

Note. Phy = Physical Abuse; PSS = Perceived Stress

Table 4 Hierarchical regression analyses for tests of avoidance coping as a unique contributor to anxiety and depression

Step	Variable	B	R^2	R^2_{inc}	F_{inc}	df
			Anxiety			
1	PSS	.41	.30	.30	20.73***	1, 49
2	Avoid	.41	.44	.15	12.60**	1, 48
			Depression			
1	PSS	.41	.32	.32	23.29***	1, 49
2	Avoid	.47	.52	.20	19.65***	1, 48

Note. PSS = Perceived Stress, Avoid = Avoidance Coping

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Characterization in *Ethan Frome*: The Sun's Red and the Glitter of Winter

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Approaching what will be its centenary next year, Edith Wharton's *Ethan Frome* has been put through the critical apparatus many times already, yet critics continue to return to it. It has enjoyed acclaim and suffered disapproval. It has been read and reread from a variety of perspectives. *Ethan Frome* remains relevant in a postmodern context as a novel which requires a multifaceted interpretation, and as one which calls upon the reader to question the narrator's authority and the characters' credibility. It is a novel based in and upon a silent yet overwhelmingly powerful landscape which acts on its characters as much as they do upon it. As such, it is best approached skeptically, with a full awareness that it is an attempt at communication filtered through the silent void of Starkfield. Ultimately, the novel begs the question of to what extent Starkfield has influenced its inhabitants and how that influence has affected their identities. Wharton expresses this influence through her pervasive rendering of nature; it is an inescapable force, equally affecting the main characters who inhabit it and the narrator who draws upon its imagery to communicate his vision of the main characters.

Key words: Edith Wharton; Ethan Frome; characterization; Starkfield; imagery

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Approaching what will be its centenary next year, Edith Wharton's *Ethan Frome* has been put through the critical apparatus many times already, yet critics continue to return to it. It has enjoyed acclaim and suffered disapproval. It has been read and reread from a variety of perspectives. It remains relevant in a postmodern context as a novel which requires a multifaceted interpretation, and as one which calls upon the reader to question the narrator's authority and the characters' credibility as well. It is a novel based in and upon a silent yet overwhelmingly powerful landscape which acts on its characters as much as they do upon it. As such, it is best approached skeptically, with a full awareness that it is an attempt at communication filtered through the silent void of Starkfield. Ultimately, it begs the question of to what extent Starkfield has influenced its inhabitants and how that influence has affected their identities. Wharton expresses this influence through her pervasive rendering of nature; it is an inescapable force, equally affecting the main characters who inhabit it and the narrator who draws upon its imagery to communicate his vision of the main characters.

When Edith Wharton writes of the frame tale structure of *Ethan Frome*, "[I] had felt its peculiar difficulties… but could think of no alternative which would serve as well given the case," she is acknowledging a unique aspect of the novel and by doing so is underscoring its utility.[1] The usefulness of this technique, which utilizes multiple points of view to illuminate Ethan's unique one, in turn makes a statement about the novel. *Ethan Frome* is a novel in which silence prevails. In fact, most of the dialogue comes from characters other than that of the title and precedes the actual action of the story. The novel is one comprised almost entirely of the unspoken persuasions of its characters, with little being said, or even being possible to express, that could not be better articulated through some means other than words. With *Ethan Frome*, Wharton has not written a novel that can be expressed in the usual format, overflowing with the dialogue and activity of *The House of Mirth*, for example, but one which moves within the subtle undercurrents of the characters' inner lives. To this end, Wharton employs techniques which render her characters as vividly as the usual style of the drawing room novel, if not more so. The difference being that, in this case the characters are rendered from the inside out, defined not by their interpretation of externally prescribed manners but by their inherent personalities. Her use of the frame tale is successful in introducing the characters and setting of the novel as well as indicating the action to follow. It performs all of its necessary tasks while introducing the unique ambiguity of the story, communicating a palpable sense of the unknown or, at least, of the unsaid. The initial success of the frame structure is enhanced, and in many ways eclipsed, by her rendering of nature as a window onto the characters involved. Once the narrator has exhausted the commentary of the citizens of Starkfield, he allows the natural environment to begin its own narrative. The reader begins to truly sense the characters through their juxtaposition with the tangible aspects of the setting; elements of landscape and weather communicate as much about the characters as any action or dialogue does. Wharton's descriptions of nature fill the "perceptible gaps between [the] facts" left in Frome's story by the townspeople.[2]

[1] Edith Wharton, *A Backward Glance*, in *Ethan Frome & Summer,* (New York: Modern Library, 2001), 259.

[2] Edith Wharton, *Ethan Frome & Summer*, (New York: Modern Library, 2001), 11.

One of the first insights the reader has into the character of Ethan comes when he is explained to the narrator by Harmon Gow as having "been in Starkfield too many winters."[3] This description is appropriate and the ensuing chapters prove it repeatedly. The novel is set in winter and a large amount of it occurs outdoors, during which time the pervasive influence of winter is felt by all of the characters. Even toward the end of the novel, when some semblance of spring begins to emerge from beneath the leaden sky, the omnipresent winter of Starkfield shows through it as if perpetually waiting in the background while the other seasons have their turn. This feeling of perpetual winter is most prominent after Ethan discovers Zeena's plan for Mattie's banishment. He resolves to take some action against Zeena's decision and, going outside, experiences a scene in which "the early mist had vanished and the fields lay like a silver shield under the sun. It was one of those days when the glitter of winter shines through a pale haze of spring."[4] In this instance, Zeena's opposition to Mattie can be likened to the winter, Ethan's resolve to the "silver shield" of the fields, and the possibility of a future for Ethan and Mattie to the "pale haze of spring." Those metaphors exist for each character singularly while simultaneously suggesting greater meanings. For example, the "glitter of winter" has meaning for each character in a different way. For Zeena, it coincides with her constant illness and cold demeanor. For Mattie it develops more in context with the sunlight and physical lightness, the gracefulness of movement, with which Wharton characterizes her. For Ethan, both of those meanings resound in his interactions with his wife and Mattie, but some more personal, over-arching meaning develops as well. The phrase, "the glitter of winter" comprises two key elements in Wharton's characterization of Ethan: light and coldness. These two elements occur both separately and in concert to express his emotions throughout the novel. This connection is exemplified by the "cold fires" of Orion, under which young Ethan walks at the beginning of the story.[5] In this case, he is most identified with the coldness of the evening in which he walks to retrieve Mattie from the church social at which she dances in an infernal scene suffused with fiery light and heat. His association with the winter temperatures and hers with the indoor heat of the dance underscore their differences but also establish part of their attraction. He has been out in the cold of so many Starkfield winters for so long that his desire for her warmth has been honed to a keen yearning. Later, Ethan walks again beneath a combination of the winter's light and cold, this time while visualizing Mattie as "part of the sun's red and of the pure glitter on the snow."[6] Though he is not physically in her presence during the second instance, she still influences his perception of nature. Ethan also encounters scenes described with such paradoxical phrases as "pale sun" and "cold red" which emphasize his own inherent conflict as represented by his association with the cold light of winter. The prevalent coldness of the novel is a reflection of Ethan's inner coldness, engendered by the suffering he has endured throughout his life in Starkfield. It is his tempered reserve, his binding sense of responsibility. It is an expression of his personal hardening against those painful elements in an attempt at survival. In this sense, Ethan is certainly "part of the mute melancholy landscape, an incarnation of its frozen woe," both permanently a part of it yet longing for escape.[7] However, his is not a struggle without at least minor moments of redemption. These moments of redemption are enhanced for the reader through Wharton's use of light to counteract the otherwise dismal effects of winter. Light can be read as the buried sense of hope Ethan has of a better life, which radiates from him when he is in Mattie's presence. More generally, the light is a redeeming optimism or, at least, an ability in Ethan to appreciate what he can of the permanent Starkfield winter that is his life. His appreciation of natural beauty, expressed early in the novel, is a reflection of that hopefulness. He appreciates nature not in the mundane, utilitarian way of a farmer (despite his role as one), but with a sense of scientific awe at the natural world. In this way there is a sense that he would have made a better enlightenment scientist than a New England farmer. Or, better still, some Apollonian figure fitting the narrator's description of him "under the helmetlike peak of [his] cap, relieved against the banks of snow like the bronze image of a hero."[8] The image of bronze recurs when Ethan, about to embark on his final journey with Mattie, drives across snow littered with fallen cones "like ornaments of bronze."[9] The proximity of this recurring image to the tragic "smash-up" enforces Ethan's role as a fallen hero. However, it is an ironic image in that he was ultimately unable to successfully perform any heroic act, but still suffers the effects of a tragic demise.

Following Mattie's introduction at the dance, in her element of light and heat, her role as Ethan's salvific light is emphasized when he sees the faint light of her bedroom candle from beneath the door of the darkened bedroom he shares with Zeena.[10] Her frequent association with warmth and light clearly communicate her youth, energy and hopefulness, almost to excess given the circumstances under which she lives. Her characterization is particularly interesting contrasted with Zeena's unrelentingly cold personality which, like the Starkfield winter, has oppressed Ethan for so long. Yet,

[3] Ibid., 10.
[4] Ibid., 76.
[5] Ibid., 20.
[6] Ibid., 36.
[7] Ibid., 14.
[8] Ibid., 14.
[9] Ibid., 83.
[10] Ibid., 35.

Zeena shares some similarities with the Starkfield winter that can be interpreted positively. Like the winter, she is quiet and constant. She is quiet in that she, like Ethan, has endured suffering; first when she cared for his ailing mother and then later in her own marriage. She is constant in the capacity which Ethan most needed her after his mother's death; she is simply there. Her presence, in the beginning at least, was a comfort to Ethan who, after wanting his whole life to escape Starkfield, suddenly felt most alone when he was in fact most free. But Ethan treated the freedom he was offered after his mother's death more like a void to be filled than the rare opportunity for escape that it was. That void was filled by Zeena's convenient presence, but perhaps not necessarily by her love. So, it is with relative ease that Mattie captures Ethan's attention, enabling him to project onto their relationship a glimpse of the life he secretly imagines. This projection is not one which Mattie denies or negates. She encourages him and cultivates an appearance of youthfulness and beauty which defines her throughout the novel. She is introduced to the reader wearing a red scarf at the church dance and her color motif is continued throughout the story. Her presence is often followed by descriptions of the red sun rising and coloring the landscape. This image of Mattie in the color red is central to her character both through Ethan's eyes and Zeena's. Returning to Ethan's vision of Mattie as "part of the sun's red and of the pure glitter of the snow" one realizes how closely her nature, as defined by the color red, is related to Ethan's association with the cold white snow.[11] The red sun and white snow in this case have both the power to compliment and the power to destroy one another. Seen together, they create a beautiful picture of the natural world of Starkfield; however, their beauty is enhanced not by its serenity but by the fact that they represent opposing natures brought into dangerous proximity. This danger becomes clear when Mattie and Ethan have dinner on their night alone. In Zeena's absence, Mattie usurps her role as wife and sets out a pleasant dinner for Ethan complete with Zeena's red glass pickle dish. As a wedding present and sacred personal object, Zeena's pickle dish is a symbol of her marriage and the last remaining power she holds within her own home. Being red, the dish may also be associated with Mattie. In addition to her red scarf, the red sun, and her red-and-white bed spread, the red pickle dish is one of many objects which define Mattie, but it is particularly important because it belongs to Zeena. Its smashing upon the kitchen floor between Mattie and Ethan directly foreshadows the "smash-up" they will have later. Both occur for the same reason and both are events which restore Zeena's power to her. On the occasion of the broken dish, Zeena seizes the opportunity to evict Mattie, and after the "smash-up" she completely recovers her position of power in the house, though she rules desolate subjects in a ruined state. She even seems to regain some of her physical strength in the wake of the "smash-up," demonstrated by her becoming Mattie's caregiver. The exertion of her new power over Mattie is evident toward the end of the story when Mattie complains of the cold resulting from Zeena's neglect of the fire. The reversal is completed by Mattie's "querulous drone" and "bright witch-like stare," both qualities formerly associated with Zeena's incessant demands of Ethan and her prematurely crone-like appearance.[12] This reversal, in which Zeena is animated and able-bodied and Mattie is paralyzed and suffers from the cold, is an extension of that last Starkfield winter before the "smash-up." It is yet another snowfall of failure beneath which Ethan is buried, sinking deeper into his frozen woe.

The story of Ethan, Mattie and Zeena, framed by third party recollections, shrouded in a setting of seemingly endless winter, and told by a narrator who arrived on the scene years after the action of the story allows readers to better understand the characters and make conjectures of their own to fill in the "gaps" of the story. Wharton uses external devices such as the details of scenery, including weather, light and color to render the otherwise invisible internal worlds of the characters. These may be worlds that even the characters themselves do not fully understand and are therefore best represented in the highly visual style which she has employed. Wharton does her characters justice by expressing their varying ambitions, qualities, and flaws on the broad canvas of the Starkfield landscape. By expressing Ethan through such vast elements as the winter sky, snow and light, she gives him a voice which communicates his inner life better than he would be able to personally. Wharton's expression of Mattie and Zeena in similar ways and also through the domestic details which represent them explores the women's changing roles throughout the story. Their final reversal of roles is particularly powerful in communicating their personal changes and struggles, as well as enriching Ethan's story. Ultimately, Ethan's is a story fraught with failure and desolation briefly illuminated by the hopeful existence of his inner life and then buried again beneath the winter of Starkfield, over which silence reigns.

[11] Ibid., 36.

[12] Ibid., 93.

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The effects of the fatty acid amide hydrolase (FAAH) inhibitor URB597 on extinction of a conditioned taste aversion

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The Endocannabinoid System (ECS) has recently been implicated in the extinction of conditioned response learning. The current study sought to determine the effect of URB597, a fatty acid amide hydrolase (FAAH) inhibitor, on the extinction of a conditioned taste aversion (CTA). Rats first acquired a CTA to 0.3% saccharin when followed by an injection of lithium chloride (LiCl; 81.0 mg/kg, intraperitoneal (i.p.)). Following conditioning, the rats went through extinction training, in which they received either URB597 (0.30 mg/kg, i.p.), dissolved in dimethyl sulfoxide (DMSO), or DMSO vehicle control injections before each extinction trial. No difference in mean days to extinction was found between the two groups. However, compared to rats that received no injections throughout extinction, rats that received DMSO took significantly longer to extinguish. Next, c-Fos expression was compared at the end of extinction in the brains of URB597 rats and control rats. There was a significant increase in c-Fos expression in the infralimbic (IL) medial prefrontal cortex of URB597 rats compared to control rats. These results suggest that URB597 administration fails to enhance extinction, possibly due to chronic cannabinoid administration or the effects of DMSO on extinction learning.

Key words: URB597; conditioned taste aversion (CTA); extinction (EXT); Endocannabinoid System (ECS); fatty acid amide hydrolase (FAAH); cannabinoid 1 receptor (CB1), dimethyl sulfoxide (DMSO); lithium chloride (LiCl)

Post-Traumatic Stress Disorder (PTSD)

Post-Traumatic Stress Disorder (PTSD) is an anxiety disorder that can develop after one or more exposures to a traumatic event that threatened or caused physical harm. Some examples of traumatic events that may cause PTSD include war, rape, and natural disasters. Symptoms of PTSD are grouped into three categories: re-experiencing symptoms, avoidance symptoms, and hyperarousal symptoms (NIMH, 2002). Re-experiencing symptoms include flashbacks, nightmares, and frightening thoughts. Avoidance symptoms include avoiding situations that are a reminder of the traumatic event, feeling emotionally numb, and depression. Hyperarousal symptoms include anxiety, enhanced startle response, difficulty sleeping, and angry outbursts (NIMH, 2002). These symptoms are prime characteristics of learned fears, which commonly occur in patients with PTSD.

The most common pharmacological treatments for PTSD are selective serotonin reuptake inhibitors (SSRIs) and benzodiazepines (NIMH, 2002). However, due to side effects of these drugs, such as sedation and memory impairment with benzodiazepines and weight gain and sexual dysfunction with SSRIs (Vgontzas et al., 1995; Demyttenaere & Jaspers, 2008), alternative drugs are being considered for PTSD treatment. Since it is hypothesized that PTSD may involve an impairment in the extinction of learned fears (Pertwee, 2005), drugs that enhance extinction learning may be beneficial in the treatment of PTSD. Given that it has been shown that drugs such as fatty acid amide hydrolase (FAAH) inhibitors, which act on the Endocannabinoid System (ECS), enhance extinction learning (Varvel et al., 2007), these drugs may be effective in the treatment of PTSD.

Background on the Endocannabinoid System (ECS)

The chemical structure of Δ9-tetrahydrocannabinol (Δ9-THC), the main psychoactive component of marijuana, was described by Gaoni and Mechoulam (1964). However, it was not known how this chemical acted in the brain to produce its effects. In 1990, cannabinoid receptors were identified in the brains of several mammalian species using autoradiography (Herkenham et al., 1990). Receptor density was greatest in the basal ganglia, hippocampus and cerebellum, and lowest in lower brainstem areas (Herkenham et al., 1990). Shortly after this, the G protein-coupled receptor was cloned and named the cannabinoid 1 receptor (CB1) (Matsuda et al., 1990). This receptor is claimed to be the most abundant receptor in the mammalian brain (Matsuda et al., 1990). The finding of a specific cannabinoid receptor for THC led to the discovery of an entire endogenous signaling system, which is termed the ECS. This system includes the cannabinoid receptors, the endocannabinoids that bind to these receptors, and the enzymes involved in the synthesis and inactivation of the endocannabinoids. The first endocannabinoid, N-arachidonoyl-ethanolamine, was reported in 1992 and was named anandamide (AEA) (Bisogno et al., 2005). The second endocannabinoid to be reported was sn2-arachidonoylglycerol (2-AG). These two endocannabinoids belong to a class of biologically active endogenous fatty acid amides. Unlike classical

neurotransmitters, anandamide is not stored, but synthesized upon demand (Gómez-Ruiz et al., 2007). Anandamide binds to both the central and peripheral cannabinoid receptors with a high affinity, and produces many cannabimimetic activities such as motor activity reduction, hypothermia, analgesia, and memory impairment (Piomelli et al., 1998). 2-AG also has a high affinity for both cannabinoid receptors, but the affinity is slightly lower than that of anandamide (Piomelli et al., 1998).

In order for endocannabinoid signaling to cease, these endogenous compounds need to be inactivated. There appears to be a two-step process for the inactivation of endocannabinoids. First, endocannabinoids are transported into cells by a facilitated transport system (Gómez-Ruiz et al., 2007). Next, certain enzymes hydrolyze the endocannabinoids to their component parts, which include arachidonic acid and ethanolamine (Gómez-Ruiz et al., 2007). This hydrolysis occurs through the integral membrane-bound enzyme Fatty Acid Amide Hydrolase (FAAH) (McKinney & Cravat, 2005). FAAH has wide substrate specificity for derivatives of long-chain fatty acids, although anandamide is the most active substrate (Gómez-Ruiz et al., 2007). In the rat brain, FAAH activity is high in areas with the greatest CB1 receptor density (Gómez-Ruiz et al., 2007). FAAH levels are highest in the hippocampus and cerebral cortex, moderate in the cerebellum, olfactory bulb, thalamus, and striatum, and lower in the hypothalamus and brainstem (Thomas et al., 1997).

FAAH is found post-synaptically in many different brain areas, often with neurons that express CB1 receptors (Marsicano & Kuner, 2008). The enzyme is predominately located in the somata and dendrites of principal neurons in the cerebellar cortex, hippocampus, and neocortex, which are postsynaptic to axon fibers expressing the CB1 receptor (Egertova, Cravatt, & Elphick, 1998. Thus, a model was proposed that endocannabinoids are synthesized and inactivated post-synaptically and function as retrograde neurotransmitters that act on pre-synaptic CB1 receptors to inhibit the release of classical neurotransmitters (Egertova et al., 1998; Elphick & Egertova, 2001). Previous studies have shown this to be true in the hippocampus and cerebellar cortex (Kreitzer & Regehr, 2001; Wilson & Nicoll, 2001).

Drugs Affecting Cannabinoid System

There are numerous drugs that act on the cannabinoid system. The most commonly used are CB1 and CB2 agonists and antagonists (Varvel et al., 2005; Chhatwal et al., 2005). CB2 agonists and antagonists tend to affect the immune system, while CB1 agonists and antagonists tend to affect the nervous system (Matsuda et al., 1990; Gómez-Ruiz et al., 2007). A fairly new class of drugs discovered that affect the ECS are the FAAH inhibitors. These drugs work by inhibiting the enzyme FAAH that degrades anandamide, resulting in increased anandamide levels in the brain.

There are many different types of FAAH inhibitors, including fatty-acid trifluoromethylketones, fluorophosphonates, α-keto esters and α-keto amides, bromoenol lactones and alkylcarbamic acid aryl esters. Alkylcarbamic acid aryl esters are a specific second generation class of FAAH inhibitors and include the commonly used URB597. In vitro, URB597 inhibits the breakdown of anandamide, without preventing its reuptake and causes it to accumulate in the neuron and eventually exit (Piomelli et al., 2006). In vivo, intraperitoneal (i.p.) injections of URB597 cause significant inhibition of FAAH activity in the brains of rats, which is half-maximal at about 0.15 mg/kg. This causes an increase in anandamide levels in brain tissue. The inhibition of FAAH is rapid in onset (less than 15 min) and persistent (greater than 12 hrs) at 0.30 mg/kg i.p. (Piomelli et al., 2006). Although URB597 elevates levels of anandamide, it does not alter levels of 2-AG (Dinh et al., 2002). Also, URB597 does not produce cannabinoid-like effects, such as hypothermia and catalepsy, commonly produced by exogenous cannabinoid agonists (Gobbi et al., 2005).

Cannabinoid Effects on Learning and Memory

The ECS plays an important role in learning and memory, in particular extinction learning. Administration of THC, a CB1 agonist, impairs hippocampal-dependent memory in rats by interfering with the temporal synchrony of neuronal networks (Robbe et al., 2006). While the administration of CB1 agonists cause impairment in the acquisition of memory, mice genetically lacking the CB1 receptor show increased memory performance in certain behavioral tasks such as active avoidance and object recognition (Reibaud et al., 1999). It has been shown that this memory enhancement in CB1-deficient mice is age-dependent, with a greater enhancement in younger rats compared to older rats (Bilkei-Gorzo et al., 2005). Memory acquisition enhancements can also be seen with administration of CB1 antagonists, such as SR141716 (Wolff & Leander, 2003).

However, CB1 antagonists affect extinction differently. In a spatial memory water maze task, Varvel et al. (2005) showed that CB1 receptor deficient mice and mice administered SR141716 led to impairments in extinction. Also, Chhatwal et al. (2005) showed that by using fear-potentiated startle, administration of SR141716 caused significant, dose-dependent decreases in extinction learning. Conversely, administration of AM404, an inhibitor of endocannabinoid reuptake, led to dose-dependent enhancements in extinction. This effect was blocked once SR141716 was administered again, which shows that the enhancement of extinction caused by AM404 is CB1-receptor-dependent. This enhancement in

extinction was most likely due to an increase in CB1 receptor activation during the extinction training (Chhatwal et al., 2005). The effects of increasing CB1 signaling have mostly shown improvements in extinction learning. Another study by Pamplona et al. (2006) showed that administration of the CB1 agonist WIN 55-212,2 at a low dose of 0.25 mg/kg, but not at 2.5 mg/kg, enhanced the extinction of contextual fear in a fear conditioning task and spatial memory in a water maze reversal task. WIN 55-212,2 facilitated the extinction of both recent (1-day old) and remote (30-day old) contextual fear memory and was blocked by the co-administration of the CB1 antagonist SR141716 (Pamplona et al., 2006).

Inhibition of the enzyme FAAH, which breaks down anandamide, has been shown to enhance extinction. In a study by Varvel et al. (2007), mice were either given the FAAH inhibitor OL-135 or were genetically engineered to lack the FAAH enzyme [FAAH (-/-)]. Both FAAH (-/-) mice and mice treated with OL-135 had a significant enhancement in the rate of extinction in a spatial memory water maze task compared to controls, without displaying any of the typical memory or motor impairment seen with cannabinoid treatment. Surprisingly, both groups were also able to find the platform significantly faster than control groups, which also shows an enhancement in acquisition (Varvel et al., 2007). The effects of OL-135 on acquisition and extinction were reversed with the CB1 antagonist SR141716, which shows that this process was mediated through the CB1 receptor. The effect of OL-135 on extinction was present in the second extinction trial, which shows that just one extinction trial in the presence of elevated levels of anandamide was enough to extinguish the learned response (Varvel et al., 2007). THC, a CB1 agonist, was also administered to the rats but no significant effect on extinction was reported.

Neural Mechanisms of Enhanced Extinction

It has been shown that the amygdala is involved in conditioned fear and that CB1 receptors are highly expressed here. Since activation of the CB1 receptor suppresses firing of neurotransmitters such as glutamate and GABA in certain brain areas such as the amygdala, it is proposed that this may be the mechanism through which the ECS affects extinction learning. Azad et al. (2003) showed that cannabinoids decrease glutamatergic and GABAergic synaptic transmission in the lateral amygdala through CB1 receptor activation. Sotres-Bayon et al., (2007) demonstrated that NMDA NR2B receptors in the lateral amygdala are necessary for the acquisition of fear extinction. Thus, it is possible that FAAH inhibitors may enhance extinction by increasing activity at the CB1 receptor and therefore modulating glutamatergic and GABAergic transmission in the lateral amygdala. Marsicano et al. (2002) showed that there were elevated levels of anandamide and 2-AG in the basolateral amygdala (BLA) of mice that went through extinction of a conditioned freezing task. Also, in the BLA, endocannabinoids and the CB1 receptor were shown to be crucially involved in long-term depression of GABA-mediated inhibitor currents. It was therefore proposed that endocannabinoids facilitate extinction of aversive memories through their selective inhibitory effects on local inhibitory networks in the amygdala (Marsicano et al., 2002). Taking all this research into consideration, Lafenetre, Chaouloff, & Marsicano (2007) proposed a model for CB1-dependent extinction of cued conditioned fear in the amygdala. Under normal conditions, a tone presentation is not enough to elicit a fear response. During conditioning, the simultaneous presentation of the tone (conditioned stimulus) and a shock (unconditioned stimulus) potentiates “fear” circuits. During extinction, non-reinforced and prolonged tone presentation may cause sustained stimulation of “no-fear” pathways, which may be disinhibited through ECS-mediated inhibition of GABAergic transmission. Simultaneously, retrograde activation of the ECS through glutamatergic neurons decreased glutamate transmission and may thus de-potentiate “fear” pathways (Lafenetre, Chaouloff, & Marsicano, 2007). It has also been shown that the medial prefrontal cortex has many projections to the amygdala (McDonald et al., 1996). Quirk et al. (2003) showed that stimulation of the medial prefrontal cortex decreases the responsiveness of central (CE) amygdala output neurons to synaptic activation from the BLA and insular cortex. From these results, it was proposed that the medial prefrontal cortex controls transmission from BLA to CE output neurons, therefore regulating the expression of conditioned fear responses (Quirk et al., 2003). These data highlight the important roles of both the amygdala and prefrontal cortex in the extinction of fear.

Conditioned Taste Aversion and c-Fos

One particular model used to evaluate defensive reactions to fear memory in rats is the conditioned taste aversion (CTA) paradigm (Welzl et al., 2001). A CTA is formed when an animal consumes a novel taste (conditioned stimulus, CS) and then experiences negative symptoms of poisoning (unconditioned stimulus, US) (Garcia et al., 1955). When the animal is later given the choice between the conditioned stimulus and a more familiar taste like water, the rat will avoid the conditioned stimulus. Extinction of a CTA is accomplished through repeated exposures to the conditioned stimulus without any aversive effects, until the animal finally reaccepts the once-avoided taste (Schafe & Bernstein, 1996). In order to measure the neural activity correlated with extinction, the expression of the protein product c-Fos of the c-fos gene is measured. C-Fos is a good measure of neural activity in the brain and may also be necessary for the formation of CTAs (Lamprecht & Dudai, 1996; Swank et al., 1996). In

order to determine the role of c-Fos in CTAs, Lamprecht & Dudai (1996) injected the antisense to the c-fos gene into the amygdala several hours before CTA training. The antisense is expected to bind to the target mRNA and thereby block translation. They found that the injection of antisense into the amygdala did indeed impair CTA formation. This suggests that measuring c-Fos expression is a good indicator of the neuronal activity correlated with extinction of a CTA.

Hypotheses

Since the Endocannabinoid System seems to be involved in the process of extinction, it is hypothesized that administration of the FAAH inhibitor URB597 will enhance the extinction of a CTA, by shortening the time to reach asymptotic extinction. The CTA will be produced by providing the rats with saccharin and subsequently giving them an injection of lithium chloride, intraperitoneally (i.p.). After the injection of lithium chloride, the rats will be expected to avoid saccharin. Extinction of the CTA occurs once the rat reaccepts the saccharin. It is known that certain brain areas are involved in extinction such as the gustatory neocortex (Mickley et al., 2004), amygdala (Lin et al., 2009a; Mickley et al., 2007) and medial prefrontal cortex (Knapska & Maren, 2009; Mickley et al., 2005). Therefore, it is also hypothesized that there will be an increase in c-Fos expression, compared to controls, in the gustatory neocortex, amygdala (specifically the basolateral and central nucleus), and prefrontal cortex (specifically the prelimbic and infralimbic cortex).

Materials and Methods

Subjects:

Twenty adult male Sprague-Dawley rats were obtained from Charles-River (Wilmington, MA). Animals were housed individually in plastic “shoebox” cages (44.45cm x 21.59cm x 20.32cm). Rats were on a 12/12 hour light/dark cycle (lights on at 06:00 hr and off at 18:00 hr) in a temperature controlled room (23-26 ^{o}C). Purina Rat Chow (No. 5001, PMI Nutrition International, Brentwood, MO) was provided ad libitum for the entire study.

Drugs:

All chemicals were purchased from the Sigma-Aldrich Chemical Company (St. Louis, MO). URB597 was dissolved in a dimethyl sulfoxide (DMSO)/saline vehicle solution (2:1, DMSO:SALINE) and administered intraperitoneally (0.30 mg/kg) at 1 ml/kg (Fegley et al., 2005). This concentration of DMSO was based on a previous study that used a similar concentration (Kathuria et al., 2003). Lithium chloride (LiCl) was dissolved in physiological saline and administered intraperitoneally at 81 mg/kg. Saccharin (SAC) was dissolved in deionized water for a solution with a final concentration of 0.3%. SAC and LiCl concentrations/doses were selected based on previous experience with this regimen indicating that these parameters create a strong CTA that is resistant to rapid extinction (Mickley et al., 2007).

Conditioning Phase:

The conditioned taste aversion (CTA) paradigm carried out in this study followed that used by Mickley et al. (2004). Animals were put on a 23 hr water deprivation schedule two days prior to the start of conditioning trials. On the first day of conditioning trials, the water-deprived animals were allowed access to 0.3% saccharin (SAC) for 30 minutes. Following this, animals were given an injection of lithium chloride (LiCl) (81 mg/kg; i.p.) in order to form the conditioned taste aversion. Fifteen minutes after the LiCl injection the animals were given access to water for 30 minutes in order to prevent dehydration. CTA animals received conditioned stimulus-unconditioned stimulus pairings on three conditioning days (experimental days 1, 3, and 5) and received access to two thirty-minute presentations of water on three resting days (days 2, 4, and 6). The two thirty minute presentations were split with a fifteen minute period without water. The No CTA animals still received SAC on days 1, 3, and 5, but they received LiCl injections on days 2, 4, and 6. This prevented the animals from pairing the conditioned stimulus with the unconditioned stimulus and forming a CTA (Mickley et al., 2004; Mickley et al., 2007). The purpose of this group was to account for any residual effects of LiCl and SAC exposures.

Extinction Phase:

The extinction phase began after day 6 of the conditioning phase. Animals remained on the 23-hour water deprivation schedule and received a daily exposure to SAC for thirty minutes. The animals were then given 30 minute access to water 15 minutes after SAC exposure, to prevent dehydration. CTA + (URB)EXT animals were injected with URB597 (0.3 mg/kg; i.p.) 30 minutes prior to SAC exposure. After an injection of URB597 (0.3 mg/kg; i.p.) in rats, FAAH inhibition is rapid in onset (<15 min), persistent (>12 hrs), and accompanied by significant elevations of anandamide in the brain (Fegley et al., 2005). The CTA + EXT control animals received physiological saline injections 30 minutes prior to SAC exposure. The No-CTA animals were also injected with saline 30 minutes prior to SAC exposure while the No CTA (URB) group received URB597 (0.3 mg/kg; i.p.) 30 minutes prior to SAC exposure. (NOTE: Injections were stopped for all animals after twenty-six days of extinction, due to skin

lesions forming at the injection sites). The purpose of the No CTA (URB) group was to ensure that URB was not acting to suppress or enhance drinking independent of its effects on memory.

Statistical Analysis:

Extinction was operationally defined as the point when an animal consumed greater than or equal to 70% of the baseline SAC level. Since pre-exposure to SAC would impede future CTA training, baseline SAC consumption cannot be recorded in these experimental animals. Therefore, baseline SAC consumption was calculated by averaging SAC consumption for the first 12 days of the study from the No CTA group (N = 5).

To analyze the extinction data, the time course of extinction was separated into three phases, similar to those used by Nolan et al. (1997): static, dynamic, and asymptotic. The three phases represent different ranges of saccharin consumption relative to baseline. Saccharin consumption less than 10% of baseline corresponds to the static phase; 10-60% of saccharin consumption corresponds to the dynamic phase; and 60-100% corresponds to the asymptotic phase. When animals reached 70% of baseline saccharin consumption, the fear was considered extinguished.

SPSS software (Chicago, IL) was used for all analyses. A one-way analysis of variance (ANOVA) was performed to analyze saccharin consumption during CTA conditioning between the CTA and No CTA groups, and mean days to extinction between groups for the different phases of extinction. A one-way ANOVA was also used to analyze differences in c-Fos expression in the prelimbic cortex, the gustatory neocortex, and the basolateral and central nucleus of the amygdala between all four treatment groups. An independent samples t-test was used to analyze the mean days to extinction and the effect of DMSO on mean days to extinction between groups. An independent samples t-test was also used to analyze differences in c-Fos expression in the infralimbic cortex between groups.

Refer to *Table 1* for a summary of group designations; Refer to *Table 2* for a summary of the experimental procedure.

Table 1: Group Treatments

Group Number	Group Abbreviation	Description
1	***CTA+EXT***	Acquires a CTA. Extinguishes the CTA. Given saline treatment for twenty-six days of "extinction".
2	***CTA+(URB)EXT***	Acquires a CTA. Extinguishes the CTA. Given URB597 treatment for twenty-six days of "extinction".
3	***No CTA***	Does not acquire a CTA. Therefore does not extinguish the CTA. Given saline treatment for twenty-six days of "extinction"
4	***No CTA(URB)***	Does not acquire a CTA. Therefore does not extinguish the CTA. Given URB597 treatment for twenty-six days of "extinction".

Perfusion and Immunohistochemistry:

Animals were sacrificed 90 minutes following the end of the last SAC exposure on the day they reached 70% baseline saccharin consumption. Before the perfusion, animals were deeply anesthetized with sodium pentobarbital (100 mg/kg; i.p.). Each animal was transcardially perfused with heparinized saline followed by a perfusion of 4% paraformaldehyde (Skinner, 1971). After the perfusion, the brains were immediately removed and placed in 4% paraformaldehyde, and stored at 4° C. Eight hours later, the brains were transferred to a 30% sucrose solution mixed in phosphate buffered saline and 0.01% thimerosal. Brains were sliced using a freezing microtome and were stored in a solution of phosphate buffered saline containing 0.2 % sodium azide until the assay was performed. Coronal sections underwent a c-Fos assay, to check for neural activity (Dragunow & Robertson, 1988; Hsu et al., 1981a&b). Slices were then mounted on gelatin and chrom-alum-coated slides and stained with neutral red, and finally cover slipped with Permount. The slides were then be viewed using a light microscope and AxiovisionTM software and the number of c-Fos activated cells was counted in brain areas involved in extinction, such as the gustatory neocortex, basolateral and central nucleus of the amygdala, and the prelimbic and infralimbic regions of the prefrontal cortex (Mickley et al., 2004). Cells with dark, punctate nuclear staining were counted within these brain areas of interest. Diffusely stained cell bodies were not counted. Nuclei were located using standard demarcations from The Rat Brain in Stereotaxic Coordinates (Paxinos & Watson, 1998).

Table 2: Summary of Experimental Procedures

Group Designation	Number of subjects	Conditioning						Extinction Phase
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	
CTA+EXT	5	SAC[1] + LiCl[2]	Water	SAC + LiCl	Water	SAC + LiCl	Water	SAC
CTA+ (URB)[3]EXT	4	SAC + LiCl	Water	SAC + LiCl	Water	SAC + LiCl	Water	(URB)SAC[4]
No CTA	5	SAC	Water +LiCl	SAC	Water + LiCl	SAC	Water + LiCl	SAC
No CTA (URB)	5	SAC	Water +LiCl	SAC	Water + LiCl	SAC	Water + LiCl	(URB)SAC

1SAC=0.3% saccharin salt solution
2LiCl= lithium chloride solution (81 mg/ml) prepared in physiological saline; administered at a dose of 81 mg/kg, i.p.
3URB= URB597 dissolved in a DMSO/saline vehicle solution (2:1, DMSO:SALINE) and administered intraperitoneally (0.30 mg/kg) at 1 ml/kg
4(URB)SAC=URB597 administered 30 minutes before saccharin exposure

Results

As shown in Figure 1, SAC consumption increased steadily over the three conditioning days and the first day of "extinction" for the No-CTA control group and decreased for the CTA group. A one-way analysis of variance confirmed that there was a significant decrease in SAC consumption by the CTA group compared to the No CTA group on Day 3, Day 5, and Extinction Day 1 [$F(1,18)=21.564$, $p<0.001$, $F(1,18)=48.347$, $p<0.001$, & $F(1,16)=91.171$, $p<0.001$, respectively].

It was hypothesized that administration of URB597 would enhance the extinction of a CTA by shortening the time to reach asymptotic extinction. However, an independent samples t-test showed that there was no significant drug effect between CTA + (URB)EXT and CTA + EXT (Figure 2). The extinction data were analyzed further by looking at the different phases of extinction. A one-way analysis of variance verified that URB597 did not cause a change in time spent in each phase of extinction compared to vehicle control animals between CTA + (URB)EXT and CTA + EXT groups for the static, dynamic, and asymptotic stages of extinction (Figure. 3).

Due to the large value of mean days to extinction (73.2 days for CTA + EXT and 56.0 days for CTA + (URB)EXT), the effects of DMSO on extinction were evaluated. Extinction data from a previous study were used in this analysis (Mickley et al., 2007). Mean days to extinction were compared between the CTA + (DMSO)EXT group that received only DMSO during extinction and the CTA + (No Drug)EXT group that received no injections during extinction. An independent samples t-test showed that the CTA +(DMSO) EXT group took significantly longer to reach asymptotic extinction than did the CTA + (No Drug)EXT group [$t(4.429)=3.135$, $p=0.030$] (Figure. 4).

The second prediction of this study was that there would be an increase in c-Fos expression in the medial prefrontal cortex (prelimbic and infralimbic cortex), the amygdala (basolateral and central nucleus), and the gustatory neocortex in the CTA+(URB)EXT group compared to the CTA + EXT group. An independent samples t-test revealed that there was an increase in c-Fos expression in the infralimbic cortex in the brains of the CTA+(URB)EXT group compared to the CTA + EXT group [$t(7)=-3.084$, $p=0.018$] (Figure 5). A one-way analysis of variance revealed that there were no significance differences in c-Fos expression between any of the groups for the prelimbic cortex (Figure 5), the basolateral and central nucleus of the amygdala (Figure 6), as well as the gustatory neocortex (Figure 7). These data indicate that URB597 increased neuronal activity in the infralimbic cortex, but did not alter the neuronal activity of the prelimbic cortex, amygdala, or gustatory neocortex at the end of extinction.

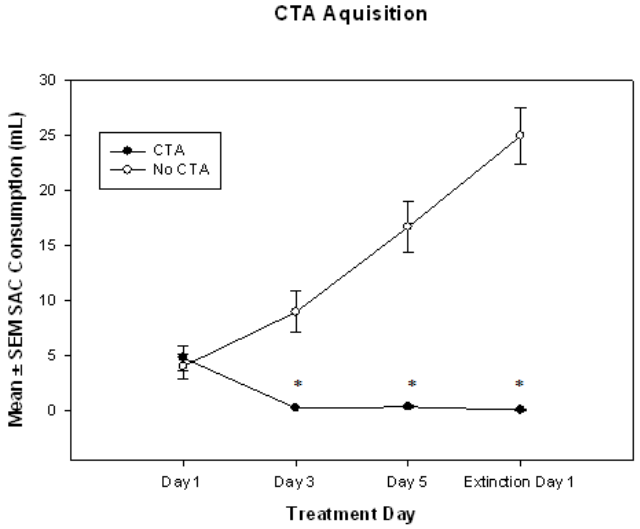

Fig. 1. SAC consumption data showing drinking behavior over the first three days of conditioning and the first day of extinction (see Table 1 for group nomenclature). * = Significantly less SAC consumed compared to No-CTA rats. α=0.05.

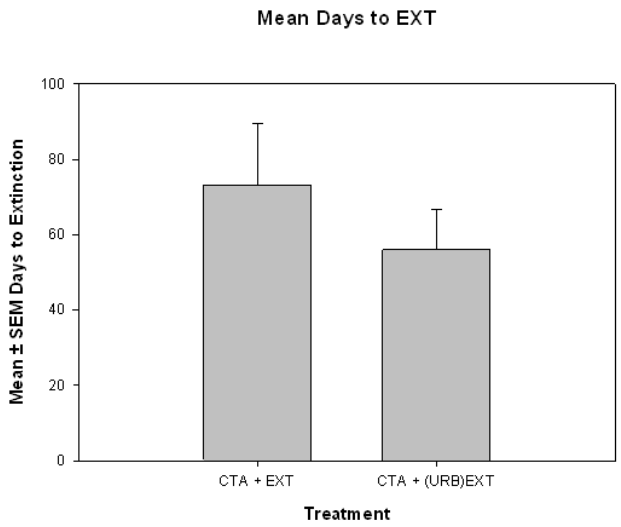

Fig. 2. Extinction data illustrating mean days to asymptotic extinction. A t-test revealed no significant difference between CTA + EXT and CTA + (URB)EXT groups. α=0.05.

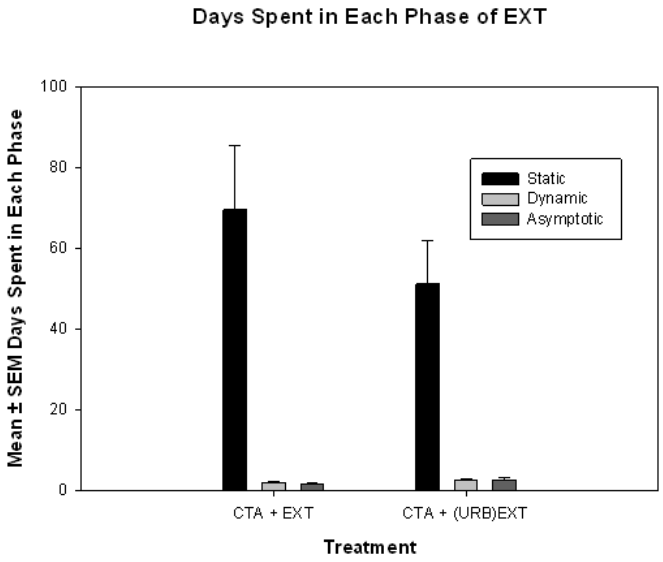

Fig. 3. Extinction data showing mean days spent in each phase of extinction (static, dynamic, & asymptotic). There was no significance between the CTA + EXT and CTA + (URB)EXT groups. α=0.05.

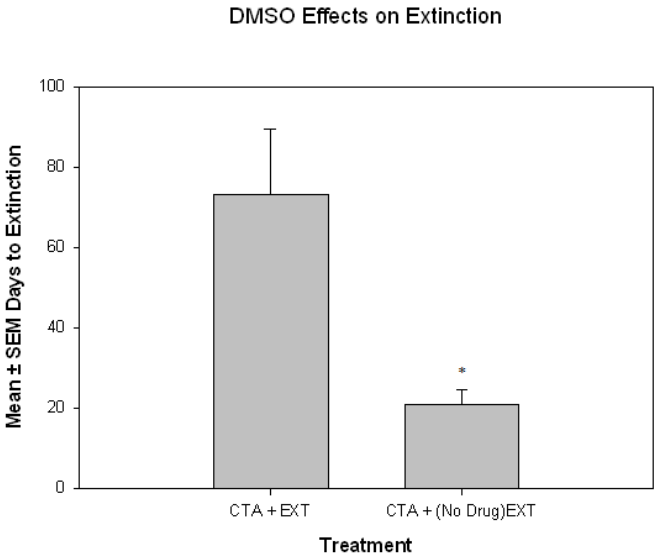

Fig. 4. Extinction data illustrating mean days to asymptotic extinction. The CTA + (DMSO)EXT group were from the current study and received DMSO injections only during extinction. The CTA + (No Drug)EXT group was from an older study (Mickley et al., 2007) and received no injections during extinction. * = significantly less time to reach asymptotic extinction. α=0.05.

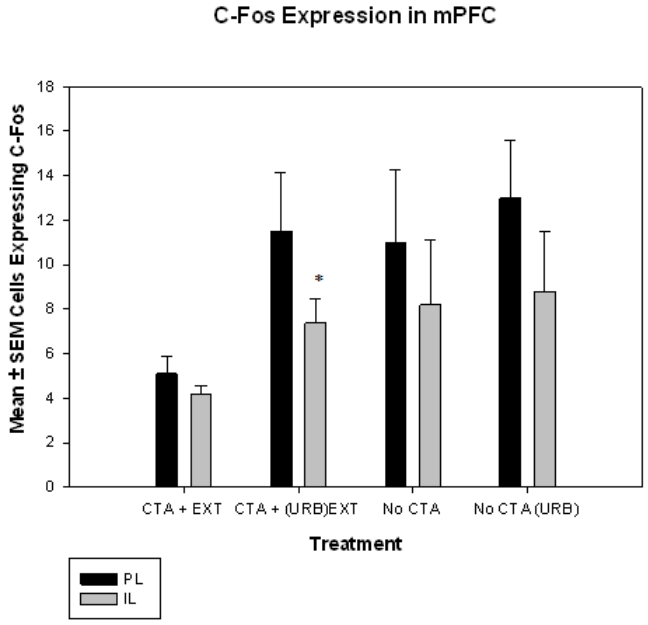

Fig. 5. C-Fos immunohistochemical data illustrating mean number of cells expressing c-Fos in the mPFC (specifically, the Prelimbic (PL) and Infralimbic (IL) cortex). * = significantly more c-Fos expression compared to CTA + EXT. α=0.05.

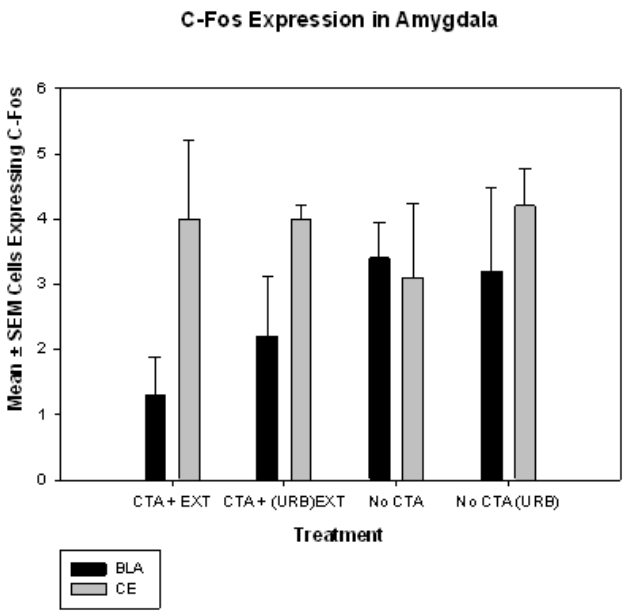

Fig. 6. C-Fos immunohistochemical data illustrating mean number of cells expressing c-Fos in the Amygdala (specifically, the Basolateral (BLA) and Central nucleus (CE)). There were no significant differences between any of the groups. α=0.05.

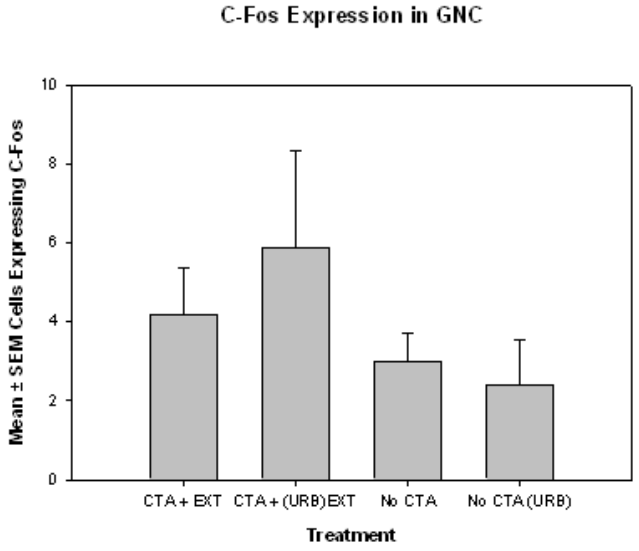

Fig. 7. C-Fos immunohistochemical data illustrating mean number of cells expressing c-Fos in the Gustatory Neocortex (GNC). There were no significant differences between any of the groups. α=0.05.

Discussion

The data confirmed that the rats in the CTA group (CTA + EXT and CTA + (URB)EXT) successfully formed a CTA, after 3 pairings of LiCl and saccharin. The data also revealed that rats treated with URB597 did not extinguish more quickly than control rats. There was also a lack of significant difference between the CTA + (URB)EXT and CTA + EXT groups for time spent in the different phases of extinction. These data indicate that URB597 failed to enhance extinction memory, which is in contradiction to the literature regarding FAAH inhibition (Chhatwal et al., 2005; Varvel et al., 2007).

Since the rats received URB597 chronically for twenty-six days, this could have prevented enhancements in extinction that are typically seen with FAAH inhibitors. A study by Lin et al. (2008) showed that chronic cannabinoid administration actually impairs extinction learning. In this study, rats were treated with the CB1 receptor agonist WIN55212-2 once a day for seven days. Using a fear-potentiated startle paradigm, the WIN-pretreated rats were conditioned and then underwent extinction training after an infusion of WIN55212-2 in the infralimbic region of the prefrontal cortex. The data showed that WIN-pretreated rats had a significant reduction in the extinction-enhancing effects normally seen with the drug. There was also a significant decrease in the expression of CB1 receptors after the pretreatment, which appeared to prevent WIN55212-2 induced inhibition of GABAergic transmission in the prefrontal cortex (Lin et al., 2008). As mentioned previously, Chhatwal et al. (2005) showed that a single administration of AM404, an inhibitor of endocannabinoid reuptake, led to dose-dependent enhancements in extinction in a fear-potentiated startle paradigm. Therefore, chronic administration of URB597 in the present study may have caused a down-regulation in the CB1 receptors, leading to impairment in extinction learning. Perhaps acute administration of URB597 would have prevented the CB1 receptor tolerance that may have occurred. Future studies should focus on CB1 receptor population after chronic URB597 administration.

Comparing the current data from the present study with archival data from an older study (Mickley et al., 2007), it was found that animals that received DMSO injections throughout extinction took significantly longer to extinguish than animals that received no drug or injections. Due to its polar aprotic nature, DMSO is widely used as a solvent for molecules, such as URB597, that are relatively insoluble in water. Lu and Mattson (2001) investigated the effects of DMSO on NMDA and AMPA receptors in the nervous system. NMDA and AMPA receptors are activated by glutamate, the main excitatory neurotransmitter in the nervous system. Glutamate receptor activation results in the influx of calcium, which acts as a second messenger and regulates many important processes such as gene expression, neurotransmitter release, and synaptic plasticity (Berridge et al., 2000). Lu & Mattson (2001) showed that DMSO, at concentrations typically used in experimental studies (1 %), suppressed NMDA- and AMPA-induced ion currents and calcium influx. These suppressions were rapid (within minutes) and reversible. This suggests that the effects of DMSO do not involve changes in gene expression, but rather a more direct effect on the activity of NMDA and AMPA receptors. According to Lu & Mattson (2001), there are several possible mechanisms through which DMSO might

suppress NMDA and AMPA responses. The first possibility is that DMSO directly interacts with glutamate receptor channel proteins, since it has been shown to decrease sodium and potassium currents in cardiac myocytes (Ogura et al., 1995). Another possibility is that DMSO nonspecifically alters cell membrane properties, which consequently changes the activity of glutamate receptor channels. For example, DMSO has previously been shown to increase membrane fluidity, which was associated with a blockade of action potentials in the frog sciatic nerve (Larsen et al., 1996).

NMDA and AMPA receptor activity is necessary for the occurrence of long-term potentiation (LTP), which is considered one of the cellular bases of learning (Kalat, 1998). When glutamate binds to the NMDA receptor, there is no response because the ion channel is blocked by magnesium ions. The activation of NMDA receptors requires both the presence of glutamate and the removal of the magnesium ions. AMPA receptors need to be activated repeatedly, causing a depolarization in the dendrite of the neuron. This depolarization results in the release of the magnesium ions and allows glutamate to open the NMDA channels, through which sodium and calcium ions enter. The calcium influx stimulates the expression of genes that are normally inactive (Kalat, 1998). These genes then produce proteins that modify the dendrite structures and cause an increase in the future responsiveness of the AMPA receptors in the area. Drugs that block NMDA receptors, such as MK-801 and ketamine, block the establishment of LTP (Gustafsson & Wigstrom, 1990). Furthermore, studies have shown that impairing LTP can interfere with learning. Sakimura et al. (1995) produced a mutation in a gene controlling NMDA receptors in mice. The mutated mice showed impairments of LTP as well as spatial learning. Conversely, studies have shown that drugs that facilitate LTP can enhance learning (Izquierdo & Medina, 1995). Herry & Garcia (2002) showed that LTP in the prefrontal cortex is associated with the maintenance of extinction of a learned fear in mice. Based on this collection of literature, it is hypothesized that DMSO impaired extinction learning, and consequently blocked any extinction-enhancing effects URB597 may have had, through the suppression of NMDA and AMPA activity. It would be interesting to utilize a variety of solvents when determining the effect URB597 has on the extinction of a CTA.

It is also possible that DMSO may have impaired extinction by having an aversive effect in the rats. DMSO is very hygroscopic and generates heat when mixed with water (Rosenbaum et al., 1965). Therefore, when the chemical is given undiluted and at high doses, it absorbs water in and around the area of application and can cause a burning pain sensation (Ramirez, 1967). When the i.p. injections were given in the current study, the rats tended to squeal and sometimes lick the injection site, indicating that the DMSO may have produced a burning sensation. Additionally, some of the rats developed hard spots as well as flesh wounds at the injection sites (this led to early termination of injections). Since the rats received saccharin after the DMSO injection, it is possible that the taste of saccharin may have been associated with the aversive effects of the DMSO injection. Another property of DMSO is that it has very high cell permeability and when administered to humans, it can produce nausea as well as an unusual garlic/oyster smell on the body and breath (Ferguson, 2004). Patients have even reported being able to taste this "garlic" taste when the chemical is administered (Kutscher et al., 1967). It is possible that the rats may have been able to taste this and it may have produced nausea in the rats, acting as an unconditioned stimulus and causing a greater aversion to the saccharin. Additionally, it is also possible that this taste may have masked the taste of the saccharin, consequently hindering the extinction process.

The data supported the hypothesis that rats in the CTA + (URB) EXT group would have increased c-Fos expression in the infralimbic cortex compared rats in the CTA + EXT control group. Studies have shown the infralimbic cortex to be important in the extinction of fear memory (Sotres-Bayon et al., 2004; Quirk et al., 2006). Neurons in the IL have been shown to inhibit the main output regions of the amygdala, which are important in the expression of fear responses (Quirk et al., 2003). Furthermore, lesions and the inhibition of protein synthesis in the IL impairs the recall of extinction (Quirk et al., 2000; Santini et al., 2004), while stimulation of the IL (mimicking extinction-inducing tone presentations) reduces fear responses (Milad & Quirk, 2002). Lin et al. (2009b) investigated the importance of IL CB1 receptors in the modulation of fear memory. Pre-extinction infusion of the CB1 receptor antagonist AM251 into the IL blocked extinction, while infusion of the CB1 receptor agonist WIN55212-2 thirty minutes before extinction, facilitated extinction of a conditioned fear. Additionally, infusion of WIN55212-2 into the IL 24 hours after training reduced fear potentiated startle, even in the absence of extinction training. The results suggest that activation of CB1 receptors in the IL are important in facilitating extinction of a learned fear, as well as a rat's general ability to adapt to aversive situations (Lin et al., 2009b).

It may be that the activation of CB1 receptors in the IL by URB597 led to increased c-Fos expression. Remarkably, this increase was seen in the absence of enhanced extinction learning. This suggests that there may be a "threshold" of infralimbic activity that needs to be reached before extinction enhancements can take place. Perhaps the NMDA- and AMPA-suppressing effects of DMSO in the IL prevented this threshold from being reached. It is also possible that chronic administration of URB597, through CB1 receptor down-regulation, made the threshold unattainable. As mentioned previously, Lin et al. (2008) found a decrease in CB1 receptors in the IL after chronic administration of WIN55212-2. Future experiments should look at the

effects of acute URB597 administration on IL c-Fos expression.

In summary, there was a significant increase of c-Fos expression in the IL of URB597 rats, compared to controls, that was not accompanied by an enhancement in the extinction of a CTA. After comparing the DMSO vehicle control group with rats that received no injections during extinction, it was found that DMSO-treated rats took significantly longer to extinguish the CTA compared to controls. It is hypothesized that this is due to the suppression of NMDA and AMPA receptor activity caused by DMSO. This may have also prevented activity in the IL from reaching a certain threshold, thus dampening URB597-induced extinction. Future studies should investigate the use of different URB597 solvents, in addition to DMSO, to compare and contrast the effects they have on extinction, as well as c-Fos expression in the IL.

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