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Examining the Role of Threat Processing in Memory Consolidation and Prejudice Formation

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EXAMINING THE ROLE OF THREAT PROCESSING IN MEMORY CONSOLIDATION
AND PREJUDICE FORMATION

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Dedication

To my grandmother Graciela, though you are not here in corporeal form you are always here with me, I hope I made you proud. To my great aunt Guillermina who has been there for me through the best and worst of times. Without these great women in my life I would not be where I am today. To my Uncle Frank, who bought his niece since the age of 6 any book her little heart desired, from Sir Arthur Conan Doyle to books on Archaeology and Science, thank you for cultivating and supporting my thirst for knowledge. To John, who proved that the old saying “blood is thicker than water” is utter non-sense, thank you for your love and understanding. To Kevin, my love, thank you for bringing light into the darkest of times. Your devotion, support and love bring a profound understanding to the words “As you wish”.

EXAMINING THE ROLE OF THREAT PROCESSING IN MEMORY CONSOLIDATION
AND PREJUDICE FORMATION

By

STEPHANIE MARIE REYES, BA

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Abstract

Memory is a flexible system that integrates new incoming information into existing memory representations (Stickgold & Walker, 2007). Through sleep and over time, memories become stable via consolidation processes (Payne, Stickgold, Swanberg & Kensinger, 2008). Prejudice formation can occur through the consolidation of stereotype schemas. In a previous study Latino participants learned positive and negative trait information about in-group and out-group members (Enge, Lupo & Zárate, 2015). At test, participants responded more quickly to out-group targets paired with negative traits than in-group pairings with these traits. Findings indicate that participants also responded more quickly to in-group targets paired with positive traits indicating a positivity bias towards one's own group. The present study aims to replicate these findings and further examine this in-group response bias. The negativity bias was investigated to test if threat-based actions, both positive and negative, are better integrated over time. Threat response type behaviors, such as prosocial acts are promoted between in-groups as opposed to out-groups (Penner, et al., 2004). Furthermore, individuals tend to associate out-groups to various forms of threats (Cottrell & Neuberg, 2005). In the current study, participants learned both positive and negative information that was threat and non-threat related about in and out group members. Participants returned back twice for test sessions, 6 (+/- 2) hours and 48 hours post learning phase. Results indicate participants' responses were consistent with group bias. Furthermore, consolidation effects were prominent for threat related content.

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Introduction

Prejudice can lead to serious behavioral consequences. For example, past research on the shooter bias paradigm indicates that individuals show a negative response bias towards out-groups. During a shooting task, White participants incorrectly shot more at target stimuli depicting Black individuals than White target individuals who carried ordinary objects instead of weapons (Greenwald, Oakes & Hoffman, 2003). Considering recent events such as the 2015 events in Ferguson, MO and Trayvon Martin's murder, examining race bias (e.g. prejudice) is an important issue to investigate. By researching prejudice formation, we can determine how racial biases are formed through social learning and its lasting effects on memory. It is important to understand the encoding and formulation of race biases since these biases can influence negative behaviors such as race hate crimes and discrimination.

The formation of prejudice may partially take root in basic cognitive processes, specifically through memory and its associative networks. Memories become long term and stable through the consolidation processes (Ellenbogen, Hulbert, Stickgold, Dinges & Thompson-Schill, 2006). Consolidation and long term potentiation of recently learned information and established memories occurs through a suite of neurobiological changes as well as over the course of time and sleep (McGaugh, 2000; Payne, Stickgold, Swanberg & Kensinger 2008). However, not all memories are equally likely to become consolidated. Consolidation effects after sleep are pronounced for negative information relative to neutral information (Hu, Stylos-Allan & Walker, 2006), indicating that certain types of information benefits from consolidation processes due to sleep. This study will test whether certain types of information based on its valence and content becomes differentially consolidated as a function of sleep.

Group membership tends to result in favoring members from one's own group and opposing out-group members (Tajfel, Billig, Bundy & Flament, 1971). Positive judgments towards in-group members and negative judgments towards out-group members (e.g. prejudice associations) are often implicit and automatic responses (Greenwald, McGhee & Schwartz, 1998). Furthermore, distinct processes help people develop an overall social judgment about others. Amodio and Devine (2006) suggest that implicit social evaluations and judgments are influenced by cognitive and affective processes. Semantic information contributes to the formulation of social impressions (i.e. knowledge about a person) while affective processes guide evaluative judgments (i.e. like or dislike a person). In sum, semantic and emotional information influences the automaticity of prejudicial responses by providing information about and individual as well as whether they are liked or disliked. So for example, if a person learns about Mother Theresa and her acts of helping the sick and hungry (prosocial behavior), based on this positive information, that person can form and produce an automatic evaluation of Mother Theresa as a likeable person. At a later point, this summation can produce an automatic response in which these associations come to mind, when seeing a picture or video of Mother Theresa.

Semantic and emotional information are also subject to consolidation effects. Enge, Lupo and Zárate (2015) tested consolidation effects of prejudice formation. Participants (Latinos) learned both positive and negative trait information about in-group (Latinos) and out-group members (African Americans). After a learning phase, participants performed a memory test, the lexical decision test. Memory for learned items are determined when faster responses to learned items relative to novel items are present. To assess memory consolidation effects, half of the participants returned for a post memory test (lexical decision task) on the same day (i.e. short delay no sleep) and the other half returned 48 hours post learning (i.e. long delay, sleep phase).

Consolidation effects were determined when responses to learned targets at test day 2 improved relative to day 1. At test consolidation effects were present for learned targets; participants responded faster to out-group members paired with negative traits. Participants also responded faster to learned in-group targets when paired with positive traits, but not for out-group targets. Results reveal a negativity bias for out-group and a positivity bias for in-group targets.

The negativity bias found in Enge, et al., (2015) may be due to an assumption held by in-groups that out-groups are potential sources of threat (Stephan & Stephan, 2000). For example, out-groups (e.g. immigrants) moving into a new country may be considered a resource threat, while some out-groups are considered potential physical threats. Through self-report questionnaires, White participants associated African Americans to harm-related and aggressive forms of threat such as destruction of property and bodily injury (Cottrell, et al., 2005). The present study tests the hypothesis that this threat association (i.e. harm) may initiate an inherent survival response that enables prejudice formation. Literature suggests that due to group membership, biases are formed based off of threat associations made towards out-groups and pro-social ties to one's own group (Cottrell, et al., 2005; Stephan, et al., 2000; see review Penner, et al., 2004, Strumer, et al., 2005) stemming from a survival response that promotes the welfare of one's own group. Thus, our study aims to determine whether prejudice formation is a due to this survival response or if it simply due to a general positive/negative bias. If the survival response assumption holds then this could open up new avenues within prejudice research by incorporating a "survival" perspective, whereupon threat associations and prosocial tendencies facilitate biases as a result of group membership. Alternatively, it may be that we simply evaluate groups based on a generality of positive vs. negative framework.

1. 1 Social Memory: Impressions, schemas and stereotypes

Our social memory is derived from information we learn or observe about individuals and social groups. This information allows us to form impressions that become encoded and organized in memory (Srull & Wyer, 1989). Once this impression has been formed and encoded, processing social information is facilitated via associations made between traits and learned information (e.g. behaviors). If we learn about Sam who stole a woman's purse, we associate a "dishonest" trait to Sam. Traits become expectancies that serve as retrieval cues (Wyer & Gordon, 1982) for future instances. So when we meet Sam in a future scenario, we expect him to be "dishonest" because we learned about his purse-snatching behavior. Trait based expectancies are also used to form an overall evaluative and descriptive concept about the target individual (Srull, et al., 1989). In this example we evaluate Sam as a "bad" person. This expectancy can extend to similar others. In this case the negative evaluation made towards Sam can also generalize to his friends or other groups he belongs to. Thus, impression formation allows us to form an evaluative summation such as positive/negative or like/dislike about individuals and social groups.

This evaluative categorization process allows for group schemas (e.g. stereotypes) to develop. Stereotypes are generalizations made about individuals based on their group affiliations that stem from social information encounters or learned. With stereotypes comes prejudice, the emotional based evaluation (i.e. like or dislike) of others. Prejudice consists of emotional evaluations that stem from memories, based on past experiences (Amodio, et al., 2006). The definition of prejudice also extends to maintaining negative emotions such as anger or fear and evaluations such as like or dislike towards out-group members (Bodenhausen & Richeson, 2010; Stephan & Stephan, 1993). There is a distinction between stereotypes and prejudice that should be noted. Stereotypes are based on general beliefs about groups, while prejudice is the emotional

component that is attached to it. For example, in school people learn about the atrocities committed during WW II by Nazis, and this in turn evokes negative emotional sentiments. Hence, the stereotype that Nazis are bad people can also elicit strong negative emotions such as outrage, dislike, anger and resentment. In sum, memories, emotions and group categorizations help form social evaluations through stereotype and prejudice formation. Considering that memory is vital to prejudice formation, it would be beneficial for current prejudice research to investigate how information consolidation impacts prejudice formation.

1.2 Memory Consolidation

Learned information becomes integrated into long term memory via consolidation processes. Over time and through physiological events, new information becomes integrated and stabilized within established memory systems (see Walker, 2008, for a review). Research also indicates that sleep plays a crucial role in the consolidation of memories such as declarative memory (Payne, Stickgold, Swanberg & Kensinger 2008; Marshall & Born, 2007). During sleep stages, consolidation effects are promoted through physiological and neurochemical changes (Walker, 2008).

Previous memory consolidation research has used a modified form of the lexical decision task (LDT) to test participants' memory for learned, novel or similar items (Choi, et al., 2013; Payne et al., 2008; 2011; Strepenich, et al., 2009). To test memory for a learned item, the LDT is modified to include the presentation of a prime prior to the letter string. The prime is either an item that was learned, similar to the learned item or completely novel. Primes that were previously paired with items during the learning phase are the variables of interests to determine memory for learned items. During this lexical decision task, a photograph is presented as a prime, followed by the letter string target. Participants categorize the letter string as a word or

non-word. Memory for items is determined by comparing participants' response times to learned vs. novel items. Faster responses to learned relative to novel items the learned items have been stored in memory. Consolidation effects are determined by comparing response times obtained from two separated test sessions, one the same day and the other hours later once the participant has slept. The same day test is a baseline for showing improvement in memory for learned items relative to testing after sleep when consolidation processes have occurred. Consolidation effects are determined when response times are faster for the sleep relative to no-sleep condition for the learned relative to novel items.

1.2.1 Memory Consolidation and Emotional Information

As mentioned positive and negative emotional information helps formulate social memories and evaluations (e.g. prejudice). Also, sleep helps the consolidation of emotional information relative to neutral. Participants had prominent consolidation effects after they had slept for learned negative arousing objects more so than the object and its back ground relative to neutral objects and their backgrounds (Payne & Kensinger, 2011). However, not all emotional information is the same. The valence of the emotional information moderates the extent of consolidation after sleep. In general, negative information tends to be recalled more readily than neutral information (Hu, Stylos-Allan & Walker, 2006). Payne et al., (2011) examined memory consolidation effects for neutral and negative emotional scenes. During a learning phase, participants studied pictures of either negative or neutral items against a neutral background (e.g. a snake or chipmunk in the woods). Following a learning session participants performed a recognition task. Half of the participants performed the memory task 12 hours post learning, in which no sleep occurred (wake-delay) and the other half completed the task 12 hour after when sleep occurred (sleep-delay). Participants that slept prior to the recognition test demonstrated

enhanced recognition for negative objects relative to participants that did not sleep prior to the memory test.

Literature indicates that the amygdala, the brain region associated with emotional processing, plays a modulating role in consolidation effects. The amygdala is activated by the release of adrenal stress hormones. In turn, the amygdala promotes consolidation effects in other brain regions by the release of norepinephrine (McGaugh, 2000). Thus, consolidation effects are promoted by neural correlates of emotional-related components such as the amygdala and stress response hormones (i.e. adrenal stress).

Negative information such as harm and threat are consolidated differently than neutral information. After sleep, memory for items depicting harm (e.g. car accident) is better than the neutral counterpart of that object (e.g. undamaged vehicle) and its background (Payne, et al., 2008). Thus consolidation effects were found for only the negative objects, but not the object and its background. Furthermore consolidation effects for neutral object alone or with its background were not as prominent relative to its negative counterpart. This finding suggests that prioritizing negative information such as threat or harm produces consolidation effects. In sum, consolidation effects are found for negative information, even when the content is threat related.

1.3 Social memory: Prejudice formation and consolidation

Memory consolidation facilitates the processing of associations by incorporating new incoming information with established knowledge and past experiences (Walker, 2008). Within a social context people are continually learning new information about others they know or just met. This information can be generalized to similar others. After learning positive and negative information about individuals from in-group and outgroup targets, participants displayed prominent consolidation effects for information consistent with group bias.

1.4 Group membership: Out group threat associations

People tend to display in-group favoritism and dislike for out-group members (Tajfel et al., 1971). Group membership can also influence threat evaluations and responses. Stephan et al., (2000) proposed that prejudice is a byproduct of fear that is due to an underlying threat association made towards out-groups. Individuals not only associate out-groups to threat, but also maintain negative emotions towards them. Cottrell and Neuberg (2005) examined if participants associated out groups to various threat categories and also asked them about their emotions towards them. White participants reported that they perceive African Americans to pose a safety, property and general threat. They also reported having negative emotions towards them (e.g. prejudice and fear). Cottrell and Neuberg suggest that this threat association may be an adaptive sociofunctional response. People maintain negative biases towards out groups which can facilitate avoidance in order to deter possible threats. Conversely this threat response could be due to an inhibition of positive emotional responses by in-group members (Pettigrew & Meertens, 1995). This could account for the lack of positivity bias found for out-group members in prejudice formation.

1.4.1 Threat enhances memory for out-group members

By remembering a threat cue (e.g. angry face) future defensive behaviors can be facilitated. People tend to remember faces that express anger over neutral or fearful faces (Davis, et al., 2011). Numerous studies indicate that participants have better memory for out-group members when a threat cue is present (Ackerman, et al., 2006; Krumhuber, et al., 2011). During a learning phase, White participants were shown neutral and angry facial expressions of in-group members and out-group members (African Americans). At test participants were more accurate in recognizing angry facial expressions of out-group members than in-group members

(Ackerman, et al., 2006). Participants also showed better memory for out-group members that express fearful facial expressions than in-group members with the same facial expressions (Krumhuber, et al., 2011). The tendency for in-group members to show enhanced recognition of out-group members who display anger and fear warrants consideration given that they are threat-related emotions (Becker, 2009; Öhman & Mineka, 2001). Overall, the out-group threat association can influence memory for in-group members. Conceptually, this threat response matches a survival processing effect (Nairne, Pandeirada & Thompson, 2008) in the non-social domain. Specifically, memory is enhanced when individuals are primed about needing to survive in a hypothetical scenario prior to learning. Nairne, et al., (2008) propose that memory for learned information is enhanced when a survival context influences processing of information. Through a series of studies, Nairne and colleagues (2008) primed participants with a survival scenario (i.e. surviving in the wild/island) prior to learning a list of words. At test, participants who were primed with a survival scenario demonstrated better memory for learned words relative to other negative and control conditions. In tangent with survival processing, processing threat-related content may produce similar effects on learned social information. The current study aims to determine whether negative information learned about in-group and out-group members are better remembered when it pertains to a survival response, specifically when it pertain to responding to a threat association.

Survival processing mechanism enhances memory

From a survival perspective, remembering threatening information expressed by others can facilitate behavior responses in similar future threatening scenarios. Recent studies have examined the influence of “survival processing” on memory. The survival processing framework states that cueing survival enhances encoding processes that results in superior memory retention

(Nairne, et al., 2008). Survival processing studies show that priming participants with a survival scenario prior to learning word list items, enhances their recall at test when compared to priming controls or other negative priming conditions (Bell, Röer & Buchner, 2013; Nairne, Thompson & Pandeirada, 2007; Weinstein, Bugg & Roediger, 2008).

The processing of survival information enhances recall over other negative or highly arousing conditions. Bell, et al. (2013) examined if survival enhances memory relative to other death related processing. Across a series of studies, participants were either primed with a house moving, survival, suicide, or death scenario. Participants were then asked to rate words related to all of the scenarios on pleasantness. Following a distractor task, participants performed a free recall task of the words they previously rated. Across all priming scenarios, participants primed by the survival scenario showed enhanced memory performance. The survival processing effect also demonstrates memory consolidation effects as well. When participants were primed with survival cues prior to learning a list of words, participants accurately recalled more words after they have slept relative to delayed testing during wake states (Abel & Baum, 2013). Thus, processing survival related information enhances memory, more so after sleep has occurred.

1.4.2 The other side of the threat coin: The promotion of intergroup helping

If a survival response contributes to prejudice formation towards out-groups as a function of threat associations, then alternatively this may also influence the formation of positive biases towards in-group members. Conversely, survival related responses such as prosocial tendencies often associated with in-group members may also produce favoritism. Social identity theory (Tajfel, 1974) suggests that people tend to “feel better” when their own group’s welfare is good, while better welfare of out-groups which can lead to the inverse of “feeling good.” When it comes to promoting the welfare of one’s own group versus other groups, people are more likely

to help their own. Prosocial motivations are influenced by group dynamics. Through “communal helping” (i.e. prosocial behaviors) inclusive fitness and the success of genetic propagation is promoted by maintaining the safety of kin relationships (Penner, et al., 2004, see review). Hence by performing prosocial behaviors within a group, promotes group survival in the face of threatening situations.

Prosocial behavior has been examined primarily through the scope of interpersonal versus self-gain. However, at an intergroup level, this topic remains to be fully investigated. Strumer, et al., (2005) argue that emotional processing influenced by group affiliation can facilitate and inhibit prosocial behaviors. The authors suggest that as a result of group membership an attachment is formed towards other in-group members, giving way to positive outcomes such as perceiving self-other similarities and experiencing empathy and compassion that contribute to prosocial behavior. Conversely, inhibiting prosocial motivations towards out group members may also occur since helping out group members may result in experiencing negative emotions such as anxiety and insecurity (Stephan & Stephan, 1985).

Emotions and group membership influence the underlying processes of prosocial behavior. For example, Strumer et al., (2005) found that individuals were more likely to help in-group rather than out-group members, and this assistance was mediated by positive emotions (i.e. empathy). Neuroimaging findings further support this positive emotion in-group bias. Telzer, Ichien and Qu (2015) found that when subjects donate resources to in-group members activation occurred in the Ventra Striatum, an area commonly associated with the reward system. Activation in this region was not significant when donating to out-group members. These results indicate that prosocial deeds, behaviors that are theorized to promote and maintain the safety of the in-group, are associated with positive emotions and, possibly reward.

In sum, people tend to display a negative disposition towards out-groups in which negative emotions and threat associations can pave the way for prejudice formation. Likewise, a positive bias is present towards in-group members; facilitating both positive sentiment as well as prosocial tendencies. Given these findings we propose that consolidation of in-group and out-group information will not only be valence consistent with bias but also reflect an underlying “survival” response based on threat and prosocial related associations may produce stronger memory consolidation effects than traits that are not threat and pro-social related.

1.5 Goals of the Current Study

The aforementioned study (Enge, et al, 2015) used both positive and negative information, yet the content of this information differed. For example, the negative traits used in this study (e.g. Rude and Vile) could activate various associations about a person they learned about. For example “Vile” was used to describe a person who committed rape and murder, yet in a different context “Vile” could also describe repulsive or disgusting behavior like picking your nose or not showering. Depending on the context, a negative word may be processed and retained differently. Not all negative information is the same and can vary in content. For example the negative traits “rude” and “hostile” are both negative, yet each trait has a different connotation when it describes a person. “Rude” as a trait ascribes a personality flaw, often describing a person that is disrespectful, inconsiderate and has a flippant disregard for others. “Hostile” is a trait that can describe an individual as threatening, volatile and a physical danger to others. Both of these traits are negative, but both are distinct in context.

Research indicates that participants demonstrate better memory for out-group members that express threat cues (Ackerman, et al., 2006; Krumhuber, et al., 2011). Moreover, survival processing enhances memory (Bell, et al., 2013; Weinstein, et al., 2008). In line with these

findings, if people readily view out-groups as sources of threat then prejudice formation could be a psychological survival response (Cottrell, et al., 2005; Stephan, et al., 2000). We test the hypothesis that consolidation of prejudice formation is enhanced by survival processing in response to an underlying out-group threat and in-group prosocial association. Past studies determined the consolidation effects for prejudice formation and survival processing effect (Abel, et al., 2013; Enge, et al., 2015), hence the current study will also consider consolidation effects of learning survival (i.e. threat vs. prosocial) and non-survival related content during prejudice formation. The present study aims to determine if a psychological survival mechanism drives prejudice formation. Participants learned both positive and negative information that differ in content. In order to determine if group bias is influenced by survival processing, content presented during the learning phase will be threat, prosocial, negative and positive. We propose that consolidation effects will be prominent for threat and pro-social related traits relative to negative and positive trait related content.

1.6 Hypotheses

Hypothesis 1: Due to the in-group bias effect, it is anticipated that in-group favoritism will produce distinct consolidation effects for learned information. Prediction 1: A negativity bias towards out-groups will facilitate learning and consolidation effects of negative information for that group. We predicted greater consolidation effects for learned negative trait information paired with out-group targets relative to in-group targets. Greater consolidation effects will be determined when responses during test day 2 (sleep delay) have faster response to learned experimental trials relative to test day 1 (no sleep delay). Prediction 2: In-group favoritism will facilitate learning and consolidation effects for positive information. We predict greater

consolidation effects for learned positive trait information paired to in-group targets relative to out-group targets.

Hypothesis 2: It is proposed that group membership influences prejudice formation, whereupon a survival response guides group bias effects. Specifically, prejudice formation is influenced by out-group threat associations and prosocial in-group associations. We propose that due to a group bias survival response, consolidation effects will be prominent for threat and prosocial related information relative to non-threat and non-prosocial. Prediction 1: Due to a psychological threat processing mechanism, participants maintain a strong threat association towards out-group members. It is proposed that participants will demonstrate better implicit memory and prominent consolidation effects for learned negative threat trait information paired with outgroup targets relative to negative non-threat traits paired with out-group targets.

Prediction 2: As a result of underlying tendencies to promote group welfare, prosocial deeds are more readily associated to members of ones group than to out-group members. It is predicted that consolidation effects will be prominent for learned prosocial traits relative paired with ingroup targets to learned positive non-threat traits paired with in-group targets.

To test these hypotheses, the present study uses survival related (threat and pro-social), and non-survival (negative and positive) trait words. For the current study, Threat related traits will imply physical danger (i.e. “HOSTILE”), prosocial traits imply brave and saving acts (i.e. “HEROIC”), Negative traits will traits imply personality flaws (e.g. “RUDE”) and positive traits connote favorable personality traits (e.g. “SOCIABLE”). In the current study, Latino participants learned threat, pro-social, negative and positive related words about in-group and out-group members during an impression formation task. Because previously formed negative stereotypes may potentially confound learning responses towards negative traits, the current study will use

an Asian out-group. Asian stereotypes are typically more positive stereotypes such as being competent and hard-working hence if stereotyping out-groups is a function of perceived threat (i.e. them vs. us) then memory for threat related information should be present at day 2, somewhat irrespective of pre-formed stereotypes (Zhang, 2015);. In order to determine strength differences in associations made between the learned targets and trait information, participants will perform a Lexical Decision Task. In order to assess memory consolidation effects participants will return the same day 4 (+/- 2) hours after the learning phase constituting a no-sleep phase and 48 hours after the learning session in which sleep has occurred.

Methods

2.1 Design

We used a 2 (Target Group: Latino [In-group] vs. Asian [Out-group]) x 2 (Valence: Positive vs. Negative) x 2 (Trait Type: Survival vs. Non-survival related) x 2 (Post Learning Test Time Delay: [Short Delay] 2-6 hours vs. [Long Delay] 24-48 hours) within subjects design. When possible, procedures will follow Enge et al., (2015) to provide a replication of those findings. Participants returned twice for two testing sessions in order to determine consolidation effect differences. The first test session occurred 2-6 hours after the learning phase (short delay) and the second occurred 24-48 hours after learning phase (long delay).

2.2 Participants

A power analysis of the effects size is an average of two effect sizes ($d = 0.35$) from studies similar in methodology to the current study, ($d = 0.36$) from Enge, et al (2014) and ($d = 0.34$) from Arms-Chavez, Enge, Lupo, Rivera & Zárate, (2014) suggests a sample size of 68 to achieve power. UTEP IRB approval was obtained. Participants were recruited from The University of Texas at El Paso (UTEP) psychology undergraduate participant pool. To determine in-group effects, only data obtained from Latino participants were analyzed. Thus, data collected from a total of 78 Latino participants (58 females) ($M age = 20.7$, $SD = 4.9$) were analyzed.

2.3 Materials

Learned and novel face stimuli

A set of 32 photograph stimuli obtained from the Chicago Face Database was used for the current study (Ma, Correll, & Wittenbrink, 2015). These picture stimuli (9.11 X 6.4 inches) consisted of 16 Latino and 16 Asian males of around the same age ($M = 26.75$) with neutral

facial expressions and displaying no distinctive features (e.g. face or head accessories, such as glasses, hats). Half of the Latino and Asian stimuli set were used during the learning phase and test phase; the remainder was included only during the test phases to serve as novel stimuli.

Novel versus learned item sets were counterbalanced across participants.

2.4 Traits and Article Stimuli

Trait words used for the study were first obtained by using synonyms of words pertaining to the content of interest. Specifically, synonyms for heroism and violent obtained from <http://www.thesaurus.com> were used. In addition, words used to reflect positive and negative traits that were not threat or survival related were selected by using traits that convey personal characteristics. Hence, trait words such as thoughtful, tender, rude, stingy were also used as search terms to obtain synonyms. In addition, trait words were controlled for word frequency and length (refer to table 1). Word frequencies were obtained from SUBTLEX-US Word Frequency Database. Values are based on 51 million words, using the FREQcount's log Lg10WF.

Table 1

Trait Words: Word Length, Word Frequency and Syllable Count

Trait word	Valence	Trait Type	Word Length	Word Frequency
Selfless	Positive	Threat (Pro-social)	8	1.82
Heroic	Positive	Threat (Pro-social)	6	3.05
Bold	Positive	Threat (Pro-social)	4	7.54
Caring	Positive	Threat (Pro-social)	6	7.04
Average			6	4.86
Sociable	Positive	General	8	1.00
Cheerful	Positive	General	8	3.73
Thoughtful	Positive	General	10	7.80
Tender	Positive	General	6	8.88
Average			8	5.35
Depraved	Negative	Threat (Harm)	8	1.27
Vile	Negative	Threat (Harm)	4	4.43
Brutal	Negative	Threat (Harm)	6	7.35
Vicious	Negative	Threat (Harm)	7	8.59
Average			6.25	5.41
Stingy	Negative	General	6	1.24
Vulgar	Negative	General	6	3.27
Strict	Negative	General	6	7.02
Petty	Negative	General	5	8.59
Average			5.75	5.03

Note. Word frequencies obtained from SUBTLEX-US Word Frequency Database. Values are based on 51 million words, using the FREQcount's log Lg10WF.

Once traits were selected on frequency and length, new articles for the learning phase were created. Sixteen news articles 88-116 in word length were all created from online periodicals that were posted on Google (<http://news.google.com>). The articles selected from news google were selected based on the following criteria: 1) the trait/article selected had to be related in content 2) the article must discuss an individual performing an act pertaining to that trait. For threat trait/articles the individual had to perform a threatening or violent act towards another individual. For negative trait/articles, the individual had to perform a behavior consistent

with a personality flaw (i.e. being rude / stingy) and could not perform any physical harm. For pro-social trait/articles, the individual had to perform a behavior in which they saved another person's life. For positive trait/article, the individual had to perform a favorable behavior that was consistent with their trait.

Both the traits and the news articles were pre-tested on valence and arousal. To ensure that the content and trait words were related to survival, trait words and articles were rated on specifically "threat" and "heroism" relatedness. Traits and articles selected were based off of the ratings from 26 raters, via an online survey through Qualtrics. Ratings were based on a 1-7 likert type rating scale for threat (not threatening 1 – very threatening 7), arousal (calming 1 – exciting 7), valence (positive 1- negative 7) and heroic (not heroic 1 – very threatening 7). "Heroic" as a scale marker, was used since it conveys the pro-social content we are trying to obtain for the study. In order to ensure that traits were appropriately selected, traits selected for threat and heroic dimensions were based on ratings that were greater than the midpoint (4) and closer to its extreme point (7). Also, given the content rating, selection was mindful of equivocating the traits in accordance to its valence and arousal. Due to these guidelines for selection, four articles and one trait word were excluded. The selection for each type of trait and article were as follows.

Table 2.

Selection of learned traits based on range of ratings

Trait type	Threat Association	Heroic Association	Arousal	Valence
Threat	5.5-6.2	1.3-1.6	4.2-4.8	5.4-5.8
Negative	3.1-3.9	1.3-2.3	3.2-4.4	5.0-5.4
Prosocial	1.1-2.1	5.7-6.7	3.2-4.04	1.8-1.9
Positive	1.2-1.6	3.6-5.1	2.1-3.5	1.6-2.2

Note: Rating on dimensions were on a 1-7 likert type scale.

Threat Associations (1- Not threatening- 7 - Very threatening),

Heroic Association (1- Not Heroic - 7 - Very Heroic),

Traits used for the articles were embedded within the title and three times within the news article. Non-words used for the LDT were also controlled for on word length in order to match the target trait words. Four news articles were threat related and describe a target individual performing threat related actions such as violence and murder. An example of a threat article would be as follows: “**Vicious** neighbor murders for gold: Unemployed and **vicious** neighbor Mark Witt tortured his elderly neighbor for hours...”. Four news articles were prosocial related and describes a target individual performing altruistic and rescuing acts. An example of a prosocial article would be as follows: “**Bold** man rescued disabled man from home after fire: In a **bold** act, Will Mikels came to the rescue of his elderly neighbors when a fire broke out....”. Four news articles were negative and describe individuals performing unflattering acts such as being stringent or spiteful. An example of a negative article would be as follows: “**Principal** lays down strict rules: **Strict** principal Ross Pike sends girl home today because her haircut and color was too “distracting” to other students....”. Four news articles were positive and described individuals acting favorably such being amiable or sensitive. An example of a positive article would be as follows” **Sociable** entertainment manager saves festival: Arthur Cole has put his

sociable character to great use, after using his social connections to help fund a local festival event...”.

2.5 Procedure

The Learning Phase: Exposure and Impression Formation Task

After obtaining informed consent, participants completed the learning phase which involved an impression formation task (i.e. learning phase). During the impression formation task, participants learned about 16 target individuals through a timed Microsoft Office Power Point Presentation. The presentation consisted of sixteen slides presented in random order. Each slide depicted a picture of a target individual alongside a news article (refer to figures 1 & 2). Each news article included the target individual’s name and the learned trait word embedded within both the article and the headline.

a) Negative Threat Article

Depraved man kills children

On Sunday police arrested Rick Baker for the **depraved** killing of his two children with an axe. His wife had left him a few years ago after several altercations over money. They had four children, two of them had lived with their mother and the other two remained with their father. On Saturday, the couple had an argument. Early on Sunday, in a **depraved** act against his children Rick killed his six-year-old daughter and four-year-old son with an axe while they were asleep. Police took the bodies into custody for post-mortem examination. The **depraved** father awaits trial for the crimes he committed against his children.

Photograph of Asian or Latino
Male

b) Positive Threat Article

Bold man rescued disabled man from home after fire

In a **bold** act, Will Mikels came to the rescue of his elderly neighbors when a fire broke out. Explosions were heard when the van caught fire outside the home of an elderly couple. The paralyzed elderly man could not leave the house by himself. **Bold** Will ran past the burning van to rescue the disabled man. Will did not give a second thought to his own safety and dashed past the flames to ensure the elderly man was safe. The elderly couple is grateful for Will's **bold** behavior.

Photograph of Asian or Latino
Male

Figure 1. Examples of Threat Related News Articles Presented During the Learning Phase

To allow for trait encoding and impression formation of targets, participants saw the presentation in its entirety three times (Carlston & Skowronski, 1994). The first presentation was longer in duration (90 seconds per slide) in order to allow enough time for participants to thoroughly read the article. After the first presentation, participants were asked to fill out an impression formation questionnaire to rate the likeability on a 7 point likert type scale (1- not at

all; 7 very much) and friendliness (1-not at all friendly; 7-very friendly) of each target individual. The second and third subsequent presentations were shorter in duration (30 seconds per slide) whereupon participants were instructed to “focus on remembering the face and news article”. All slides were presented in random order. Once participants completed the impression formation task, they were asked to return back twice to perform a lexical decision task; once 4 (+/- 2) hours and 48 hours from the initial learning phase. The learning phase pairings of trait, article and target pairings were counterbalanced such that participants either received counterbalanced condition 1 or counterbalanced condition 2. Thus, some participants viewed the “Depraved” article paired with a Latino target while those in the second counterbalance condition saw the “Depraved” article paired with an Asian target.

The Test Session: Lexical Decision Task

At day one and day two, participants were tested on 8 previously learned and 8 novel target individuals; half were Asian and half were Latino. Learned and novel targets served as primes within the LDT. Participants performed three blocks of 64 trials resulting in a total of 192 trials. For each test day, within a single block of 64 trials, consisted of 8 learned target primes (4 Latino and 4 Asian), which were paired with learned traits (4 learned trait target words= 1 prosocial, 1 positive, 1 threat and 1 negative) and paired with valence consistent traits (1 prosocial, 1 positive, 1 threat and 1 negative). Each block also consisted of 8 novel target primes (4 Latino and 4 Asian), which were paired with (2 prosocial, 2 positive, 2 threat and 2 negative). Furthermore, each block also included a total of 32 non-word trials to match the number of “trait word” trials.

The lexical decision task is used for the post learning phase to test implicit memory for learned target trait pairings. During the LDT each trial included a presentation of a prime

stimulus (e.g. photograph of target individual) followed by a letter string target, in which participants categorized the letter string as a “word” or “non-word” via a response box “as quickly and accurately as possible”. The LDT sequence begins with a blank screen presented for 1000 milliseconds (ms) which is then followed by a fixation for 500 ms. Following the fixation point, the prime stimulus (novel or learned target individuals) was presented for 400 ms, followed by an interstimulus interval (ISI) of 50 ms. A letter string target appeared centrally on the screen, to which the participant responds. An error feedback is presented briefly on the screen if participants responded incorrectly prior to the next new trial. For each learning phase counterbalance condition (1 and 2) four counterbalancing scripts were created, resulting in a total of eight scripts.

2.6 Analysis

Due to programming errors only five of eight scripts were analyzed. Data obtained from the three unusable scripts were discarded from analysis. Non-response trials and reaction times less than 200 ms were coded as error trials. Only correct reaction times to yes responses were analyzed. Reaction times were truncated at 2.5 standard deviations above the grand mean ($M = 584$, $SD = 68$). After data cleaning, only data from 78 participants were analyzed. Data were analyzed using a 2 (Target Group: Latino [In-group] vs. Asian [Out-group]) x 2 (Valence: Positive vs. Negative) x 2 (Trait Type: Survival vs. non-survival related) x 2 (Post Learning Test Time Delay: [Day 1, Short Delay] 2-6 hours vs. [Day 2, Long Delay] 24-48 hours) within subjects design. Repeated measures analysis was conducted separately for each valence on learned trait paired with learned targets as well as novel target trials; non-word trials were not used for analysis. Hence for negative trait information, a 2 (Target Group: Latino [In-group] vs. Asian [Out-group]) x 2 (Trait Type: threat vs. negative) x 2 (Post Learning Test Time Delay:

[Day 1, Short Delay] 2-6 hours vs. [Day 2, Long Delay] 24-48 hours) repeated measured analysis was conducted. As well as, for positive trait information, a 2 (Target Group: Latino [In-group] vs. Asian [Out-group]) x 2 (Trait Type: Pro-social vs. positive) x 2 (Post Learning Test Time Delay: [Day 1, Short Delay] 2-6 hours vs. [Day 2, Long Delay] 24-48 hours) a repeated measured analysis was conducted. Analysis was conducted using PROC GLM (SAS Version 9.4; SAS institute). The current study predicts a pattern of results for responses to valence and content of trait words paired with target group (i.e. ingroup and outgroup).

Results

3.1 Threat and Negative trait information: Analysis Comparing the Learned and Novel Target Pairings

Hypothesis one proposes that as a function of group membership, a negativity bias towards outgroup members will result in prominent consolidation effects for negative learned trait information. Prediction one posits that consolidation effects will be greater for learned out-group targets and negative trait pairings relative to similar pairings with in-group targets. Also for hypothesis two, prediction one, these consolidation effects would be prominent for survival related items (i.e. threat traits). Recall that faster reactions times across test days are indicative of consolidation effects. Reaction times were tested for learned and novel targets paired with negative valance traits (i.e. threat and non-threat related), a 2 (Learned vs. Novel Target) X 2 (Trait type: Threat vs. Negative) X 2 (Target Group: Asian [Out-group] vs. Latino [In-group]) X 2 (Day 1 vs. Day2) repeated measures analysis of variance. Findings revealed a prominent main effect for test day, $F(1, 77) = 12.72, p = 0.0006$ indicating that responses were faster at day 2 relative to day 1 ($M_{\text{Day 1}} = 553 \text{ ms}, SD = 57 \text{ ms}; M_{\text{Day 2}} = 529 \text{ ms}, SD = 50 \text{ ms}$). This effect was consistent across all analysis conducted and will not be further discussed. No main effects emerged for learned vs. novel trials $F(1, 77) = 0.02, p = 0.90$, threat type $F(1, 77) = 1.44, p = 0.24$ or target group $F(1, 77) = 1.85, p = 0.18$. Only a significant two way interaction emerged between target group x day $F(1, 77) = 7.12, p = 0.0093$, revealing that for both learned and novel targets, responses across days significantly improved for both target groups. However, response improved more so for Asian target groups ($M_{\text{Asian day 1}} = 562 \text{ ms}, SD = 61 \text{ ms}; M_{\text{Asian day 2}} = 531 \text{ ms}, SD = 53 \text{ ms}$) $t(77) = 4.24, p < .0001$ relative to Latino targets ($M_{\text{Latino day 1}} = 557 \text{ ms}, SD = 60 \text{ ms}; M_{\text{Latino day 2}} = 540 \text{ ms}, SD = 55 \text{ ms}$) $t(77) = 2.32, p = 0.03$.

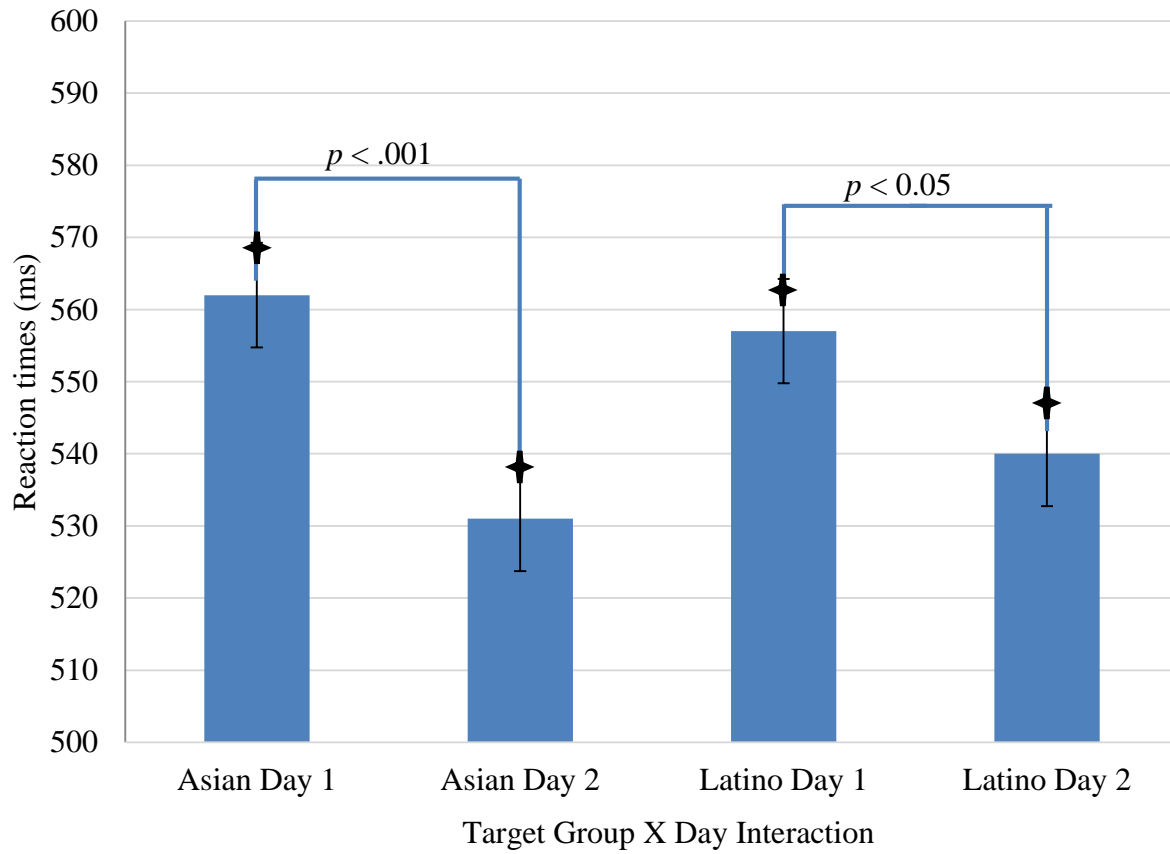


Figure 3. Mean differences tested for improvement in responses across test days for Asian and Latino target groups.

Further analysis was conducted at the trait type level, thus analysis for threat traits and negative traits was done separately to determine if improvement in reaction times across test days differed with respect to survival content. . Reaction times for learned vs. novel targets paired with negative traits (i.e. survival un-related) were analyzed using a 2 (Learned vs. Novel target) X 2 (Target group: Latino vs. Asian) X 2 (Day 1 vs. Day2) repeated measures design. No main effects were found for learned vs. novel targets $F(1, 77) = 0.65, p = 0.43$ or for target group $F(1, 77) = 3.34, p = 0.08$. Further analysis revealed that no other effects or interactions

were found. In sum, across the learned and novel level, no differences emerged for negative non-survival trait information.

With respect to survival related content, reaction times for learned vs. novel targets paired with threat traits were analyzed using a 2 (Learned vs. Novel target) X 2 (Target group: Latino vs. Asian) X 2 (Day 1 vs. Day2) repeated measures design. No main effect emerged for learned vs. novel target $F(1, 77) = 1.19, p = 0.28$ or target group $F(1, 77) = 0.01, p = 0.91$. A significant two way interaction for target group x day $F(1, 77) = 9.70, p = 0.003$ showed that across test days improvement in participants responses for both learned and novel targets paired with threat traits improved towards Asian targets ($M_{Asian\ day\ 1} = 566\ ms, SD = 65\ ms; M_{Asian\ day\ 2} = 533\ ms, SD = 52\ ms$) $t(77) = 4.21, p < .0001$ across test days relative to Latino targets ($M_{Latino\ day\ 1} = 555\ ms, SD = 64\ ms; M_{Latino\ day\ 2} = 531\ ms, SD = 55\ ms$) $t(77) = 1.74, p = 0.09$. Pertinent to the study's survival hypothesis a significant three way interaction was also found between learned vs. novel x target group x day $F(1, 77) = 4.36, p = 0.05$. To further understand this result, the three way interaction was decomposed. Thus analysis for threat trait type was conducted separately at the learned and novel level. For the learned targets, a 2 (Target group: Latino vs. Asian) X 2 (Day 1 vs. Day2) repeated measures analysis revealed a significant two way interaction target group x day $F(1, 77) = 10.42, p = 0.002$. Responses for learned Asian target threat pairings improved across test days ($M_{threat\ day\ 1} = 567\ ms, SD = 77; M_{threat\ day\ 2} = 525, SD = 62$) $t(77) = 3.99, p = 0.0001$, relative to Latino targets ($M_{threat\ day\ 1} = 552\ ms, SD = 75; M_{threat\ day\ 2} = 544, SD = 66$) $t(77) = 0.94, p = 0.36$. The notable difference across test days is that there is only a 8 ms difference for Latino targets while for Asian targets the difference was 42 ms. At the novel level, a 2 (Target group: Latino vs. Asian) X 2 (Day 1 vs. Day2) repeated measures analysis revealed only the reoccurring day effect $F(1, 77) = 8.78, p = 0.005$, no

interactions were found. In sum, responses improved for learned Asian targets paired with threat traits, no differences were found for novel targets.

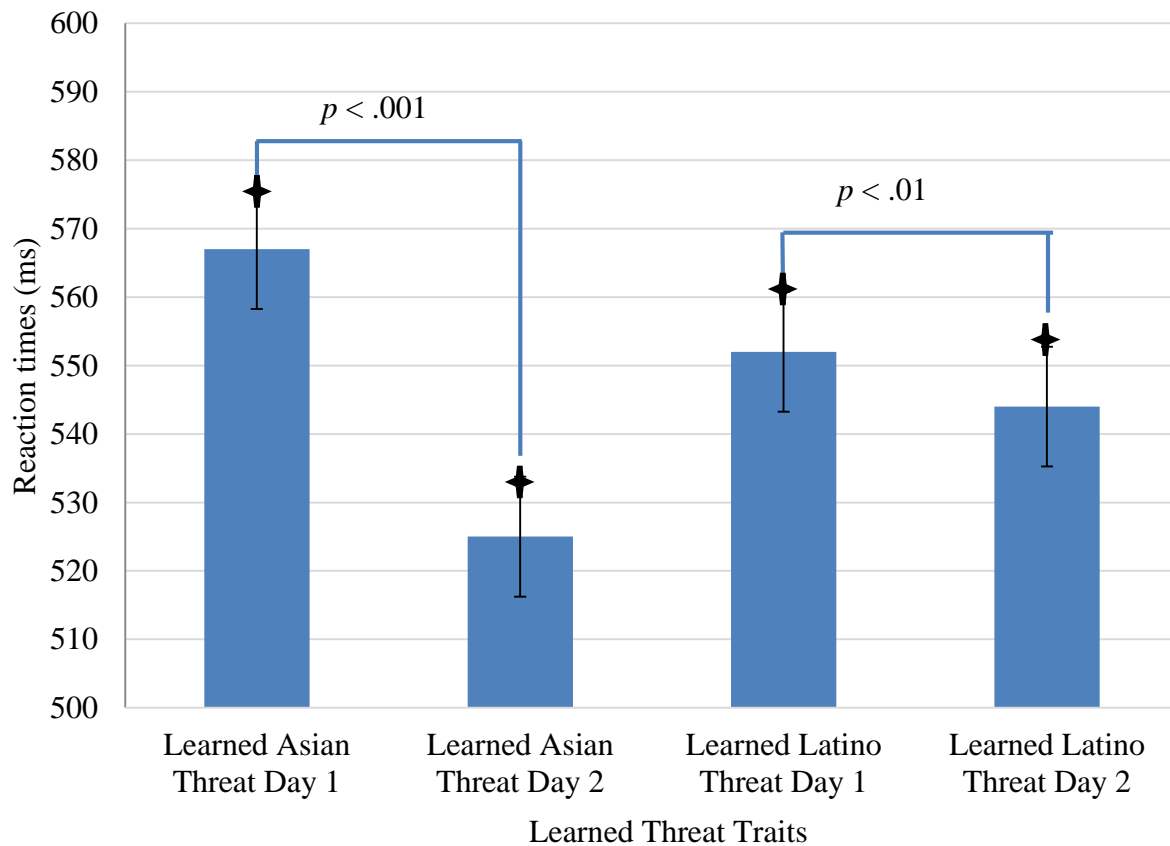


Figure 4: Mean differences tested for target group x day interaction.

3.3 Prosocial and positive trait information: analysis comparing the learned and novel target pairings

Hypothesis one proposes that as a result of group membership, favoritism for one's own group will result in distinct consolidation effects for learned positive trait information. Prediction two anticipates that consolidation effects will be greater for learned in-group targets positive trait pairings relative to similar pairings with out-group targets. Reaction times were tested for learned and novel targets paired with positive valance traits (i.e. survival and not survival related), a 2

(Learned vs. Novel Target) X 2 (Trait type: Pro-social vs. Positive) X 2 (Target Group: Asian [Out-group] vs. Latino [In-group]) X 2 (Day 1 vs. Day2) repeated measures analysis of variance. No main effects emerged for learned vs. novel targets $F(1, 77) = 0.03, p = 0.87$, target group $F(1, 77) = 1.98, p = 0.17$ or threat trait type $F(1, 77) = 0.60, p = 0.45$. Among interactions tested, relevant to our hypothesis, a significant three way interaction between target group x trait type x test day, $F(1, 77) = 4.84, p = 0.04$. Means across learned and novel targets were tested to determine this group by trait by day interaction. Analysis revealed that across learned and novel targets, for prosocial traits, improvement across test days occurred for Latino targets ($M_{day 1} = 551$ ms, $SD = 64$; $M_{day 2} = 524$ ms, $SD = 54$) $t(77) = 3.26, p = 0.002$, relative to Asian targets ($M_{day 1} = 537$ ms, $SD = 64$; $M_{day 2} = 524$ ms, $SD = 53$) $t(77) = 1.78, p = 0.08$. Unexpectedly, for positive traits, improvement across test days occurred for both Latino ($M_{day 1} = 548$ ms, $SD = 65$; $M_{day 2} = 521$ ms, $SD = 53$) $t(77) = 3.60, p = 0.0006$ and Asian targets ($M_{day 1} = 551$ ms, $SD = 64$; $M_{day 2} = 520$ ms, $SD = 59$) $t(77) = 3.86, p = 0.0002$. In sum, results indicate improvement across learned and novel targets, with significant differences for prosocial and Latino targets and positive traits for both Latino and Asian targets. Further analysis was conducted at the learned and novel level separately.

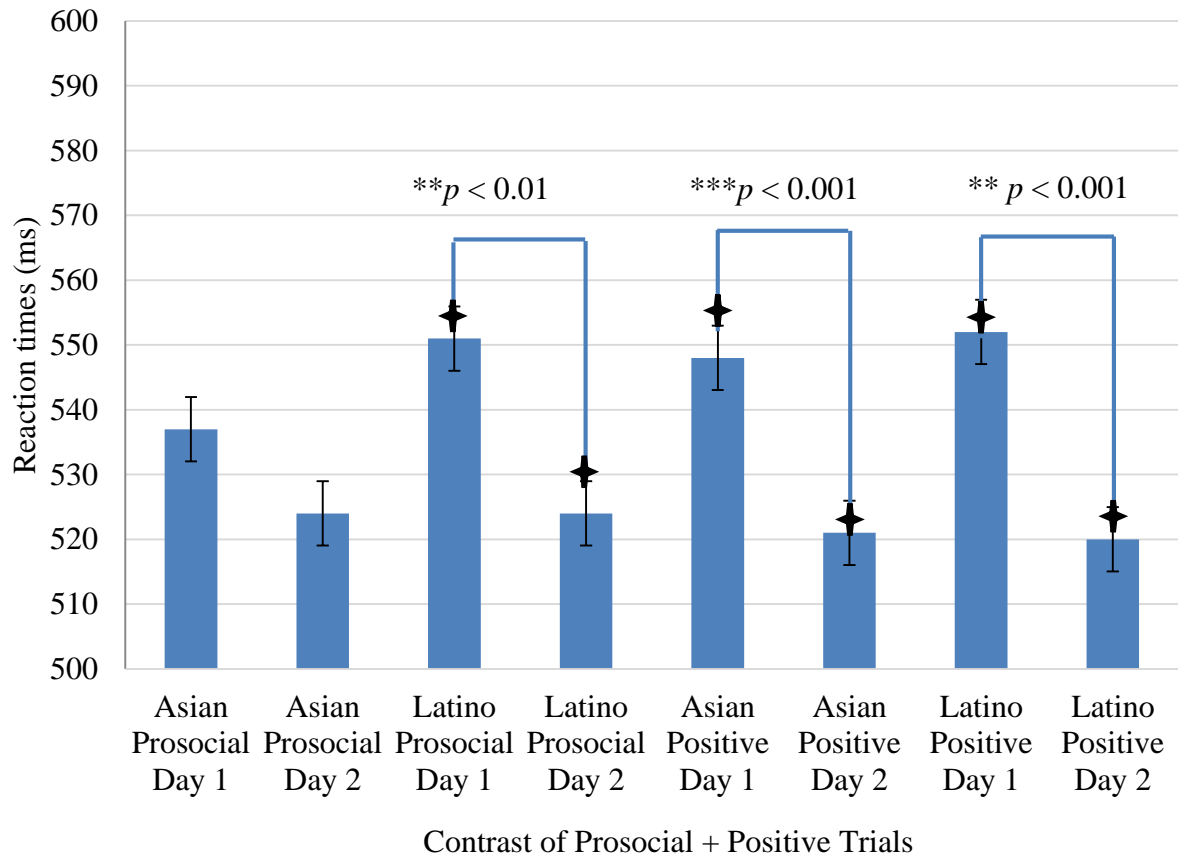


Figure 5. Mean differences tested for target group x trait type x day, three way interaction.

Discussion

Previous research has demonstrated that group membership produces ingroup favoritism and negativity towards out groups (Tajfel et al., 1971). This prejudice formation is also influenced by the valence of social information learned and can produce distinct consolidation effects in social memory (Enge, et al., 2015). The current study contributes to the gap of knowledge concerning the more complex memory processes of integrating learned social information via consolidation processes. Specifically, this study proposed that as a function of group membership, social memory for group evaluations extend beyond a general valence dispositions and more on survival related associations. The outlined hypothesis asserts that group evaluation may stem from an underlying survival processing by virtue of threat and pro-social associations made towards out group and in-group respectively. We predicted that consolidation effects for learned information would reflect a group bias (hypothesis one) and a survival processing effect (hypothesis two). The data supports our group bias hypothesis (1). We anticipated that when it pertained to out group targets, consolidation effects would be prominent for negative valence traits relative to in-group targets. For our hypothesis two, we anticipated that survival type would produce distinct effects. Specifically, consolidation effects would be prominent for out-group targets that they learned about as being threatening (i.e. physically dangerous) relative to a negative traits such as being rude or stingy.

Across test days, consolidation effects across both negative trait information improved more so for Asian targets and relative to response improvement towards Latino targets. In addition, consolidation effects were prominent for threat traits paired with Asian targets relative to Latino targets, thus supporting our survival hypothesis. This lends support to theories present in the literature that in-group members readily associate out-groups to threat (Stephan, et al.,

2000). In sum, these findings indicate that participants displayed an overall negativity bias for out-groups and threat associations also impact prejudice formation.

For positive valence trait information, hypothesis one proposed group favoritism, in which post learning consolidation effects would be prominent for ingroup positive trait pairings. In addition, reflecting hypothesis two's survival assumption, consolidation would be greater for survival related traits, namely due to prosocial association about one's own group; these effects would surpass positive non-survival trait pairings. The data support hypothesis one, people consolidate favorable information about their own group and this is further supported by results indicating consolidation for positive valence information. Analysis also revealed that the content of learned information play a role, specifically when participants learned survival related content about in and out group targets, distinct consolidation effects were present.

The data also supports our hypothesis two, prominent consolidation effects for prosocial trait information paired with in-group relative to out group were consistently found across the learned and learned vs. novel level. The findings not only support our hypothesis but also reflect other findings in the prosocial research. Literature suggests that as a result of group membership, prosocial tendencies are facilitated when it is aiding in-group members, since it promotes group well-being and welfare (Penner, et al., 2004). In addition, helping out-group members is often inhibited (Strumer, et al., 2005) and can result in experiencing anxiety and negative emotions (Stephan, et al, 1985). This could explain why no test effect was found for learned pro-social (i.e. positive threat) out-group targets. Thus, our findings not only replicated the group bias effect found in Enge, et al (2105) but we further extended upon this and found that the content of what is learned does have an influence on prejudice formation.

Unexpectedly, the learned vs. novel positive trait analysis revealed that consolidation effects were present for positive non-prosocial trait Asian target pairing. This finding may be due to stereotype consistency. As mentioned, an Asian out group selected since other out groups such as African Americans (Cottrell, et al., 2005) have strong threat associations. Conversely, associated positive Asian stereotypes such as warmth and competence (Zhang, 2015) could also produce consolidation effects for positive information since they may be stereotype consistent.

General Discussion

The current study bridges the gap between prejudice and stereotype formation with social memory by examining complex memory processes social memory includes group schemas which contain stereotype and prejudicial that is obtained from information we learn over time evaluations (Amodio, et al., 2006; Bodenhausen, et al., 2010; Srull, et al., 1989; Wyer, et al., 1982). Group membership can influence the type of information we maintain in memory, in which memory tends to be better for positive information about our own groups and negative information about out groups (Enge, et al., 2015). Learning information becomes stable and long term within our memory through consolidation processes (see Walker, 2008 for a review). Thus, examining how stereotypes and prejudice is consolidated is important for understanding the prolonged effects of learning social information. In the world we are constantly learning new information thereby updating the schemas we have previously established.

Social memory research can benefit greatly from examining the prolonged effects of learning information after the initial day of encoding. The current study determined that after sleep people have better memory for favorable characteristics for members of their own group, yet effects were more prominent for members that performed pro-social acts such as saving

others. Furthermore, people had better memory for negative information overall towards out groups, yet consolidation effects were most prominent for threat related information.

In examining social memory for threat and pro-social information, acts that are survival related, we were able to further examine an interesting line of inquiry. The survival processing effect (Bell, et al., 2013; Nairne, et al., 2008; Weinstein, et al., 2008) suggests that when primed with a survival scenario in which a person must respond to various threats to survival prior to learning, memory for items learned after the priming are better relative to other negative or control priming scenarios. Coupling with literature suggesting that prejudice and stereotype formation is a fear response (Stephan, et al., 1985; 2000), then perhaps social memory is also affected by this threat response. Conceptually, if we function on the basic principles of survival (i.e. fight or flight) this can also have an impact on how we socially interact with one another. We were able to examine survival processing in prejudice formation and the distinct consolidation effects as a result of it.

Contributions

In line with the findings in Enge, et al (2015) we found consolidation effects reflecting the positive in-group and negative out-group bias. Our study replicates these effects and extends upon this finding by examining the differences in consolidation effects for the type of content learned. This study examined whether learning threat, pro-social, positive and negative related content about in-group and out-group members produced different consolidation effects. Our study also found that content of information learned produces distinct consolidation effects as a function of group membership. Consolidation effects across valence were the most prominent for survival related information, namely threat and out groups associations and prosocial in-group associations. This study reveals that though group bias reflected consolidation effects that were

valence consistent, the learning effects were also influenced by content. In addition, these learning effects were influenced by processing survival related group associations. Thus, future social memory research can benefit from examining how intricate processing such as survival can impact social perception and behavior.

To the best of the author's knowledge, this is the first study to examine pro-social associations and social memory. Previous studies have examined social memory and threat associations (Ackerman, et al., 2006; Krumhuber, et al., 2011). Research conducted on threat responses/associations have focused on primarily on the concept that it's a singular construct that is negative in nature. Yet responding to a threat cue is a basic survival response. Survival processing can be a wider concept to understand, such as saving others to ensure the survival of others as well proved mutually beneficially. Logically speaking, a person cannot survive without others, placing an importance on social affiliations. In addition, it is in those social affiliations that can produce prejudice formation. The study's findings have implications for group biases and pro-social associations.

In line with literature, we found that social memory is influenced by learning survival related content when it pertains to in-group members. Also, when learning about outgroup individuals performing heroic feats, no learning or testing effects were found despite using an out group that has been associated with positive stereotypes (Zhang, 2015), negativity biases were still present. The current study also found that positivity bias for in-group targets and consolidation effects were prominent for learned pro-social traits relative to positive traits. Hence, content produced distinct consolidation effects for positive information as a function of group membership.

Future directions

The current study is part of an ongoing novel trajectory line of research examining the effects of memory consolidation and prejudice formation. Enge, et al., (2015) demonstrated the influence of group membership on consolidation effects for prejudice formation. In line with Enge, et al (2015) findings, participant's responses were consistent with in-group bias. In the current study participants consolidated negative out group trait information, yet was more prominent for threat related information. This extends the negative response bias found in Enge, et al (2015) in which at test; responses were quicker to learned negative trait out-group target pairings. Enge, et al also found consolidation effects for learned in-group targets paired with positive traits, we found this with positive traits and more so for pro-social (i.e. survival related). Both studies implicate the role of group membership in prejudice formation. This study took it a step further and determined that threat content can produce different effects.

A follow up study is planned to determine if stereotype consistency of a given out-group can influence memory consolidation if the learned information is valence consistent. In the current study an Asian out-group was used. Literature suggests that Asian American stereotypes are perceived as competent, warm and elicit positive sentiments like admiration (Zhang, 2015). Though Asian stereotypes can be positive, they can also evoke negativity in tandem, such as low warmth and envy (Fiske, Cuddy, Glick & Xu, 2002).

Conversely, other out-groups such as African Americans are regarded with prejudice and viewed as a danger (i.e. physical, destruction of property) (Cottrell, et al., 2005). Considering the effects found for this study, would consolidation effects be present for negative learned information about an out-group associated with positive stereotypes also result in a negativity bias? In conclusion, there are consistent findings that implicate group membership's role on

prejudice formation. Given these results, future social memory studies should consider the consolidation effects on the integration of information and its context.

In conclusion, the current study examined the role of threat context in the consolidation of prejudice formation. It extends upon the current literature of the influence of emotional content, social memory and perception. Past social theories have proposed the function of threat associations as a contributing factor of stereotype and prejudice formation. Findings from our study suggest that out-group negative threat associations may be more of a function of generalization; having little impact on target group specific learning. We were able to examine threat and group bias in a positive aspect, specifically pro-social ties to in-group members influences social memory. In sum, the current study promotes the bridging of social psychological components and the dynamics of complex memory processes. By expanding on this novel trajectory of research, future studies can uncover the integrating parallel processes of emotions, memory and how those processes differ for content and valence of social information.

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Appendix

Table 1

Trait Words: Word Length, Word Frequency and Syllable Count

Trait word	Valence	Trait Type	Word Length	Word Frequency
Selfless	Positive	Threat (Pro-social)	8	1.82
Heroic	Positive	Threat (Pro-social)	6	3.05
Bold	Positive	Threat (Pro-social)	4	7.54
Caring	Positive	Threat (Pro-social)	6	7.04
Average			6	4.86
Sociable	Positive	General	8	1.00
Cheerful	Positive	General	8	3.73
Thoughtful	Positive	General	10	7.80
Tender	Positive	General	6	8.88
Average			8	5.35
Depraved	Negative	Threat (Harm)	8	1.27
Vile	Negative	Threat (Harm)	4	4.43
Brutal	Negative	Threat (Harm)	6	7.35
Vicious	Negative	Threat (Harm)	7	8.59
Average			6.25	5.41
Stingy	Negative	General	6	1.24
Vulgar	Negative	General	6	3.27
Strict	Negative	General	6	7.02
Petty	Negative	General	5	8.59
Average			5.75	5.03

Note. Word frequencies obtained from SUBTLEX-US Word Frequency Database. Values are based on 51 million words, using the FREQcount's log Lg10WF.

Table 2: *Trait Words Ratings*

Trait word	Ratings Threat	Heroic	Arousal	Valence
Depraved	5.04	1.36	4.08	5.84
Vile	5.44	1.36	4.60	6.04
Brutal	6.28	1.16	4.96	6.04
Vicious	6.40	1.44	4.64	6.40
Selfless	1.80	5.28	2.52	2.12
Heroic	1.24	6.80	3.68	1.40
Bold	2.00	5.28	3.76	2.12
Caring	1.20	5.76	2.12	1.48
Stingy	3.52	1.68	3.44	5.36
Vulgar	4.36	1.52	4.00	6.04
Strict	3.16	2.84	3.32	4.48
Petty	2.64	2.16	3.32	4.36
Sociable	1.48	4.08	3.12	1.64
Cheerful	1.24	3.84	2.32	1.12
Thoughtful	1.04	4.52	2.00	1.24
Tender	1.20	4.28	1.36	1.28

Note. Ratings on a 1-7 likert type scale. Threat (1 not threatening- 7 very threatening); Heroic (1 not heroic – 7 very heroic); Arousal (1 calming – 7 exciting); Valence (1- positive – 7 negative).

Table 3.

Selection of learned traits based on range of ratings

Trait type	Threat Association	Heroic Association	Arousal	Valence
Threat	5.5-6.2	1.3-1.6	4.2-4.8	5.4-5.8
Negative	3.1-3.9	1.3-2.3	3.2-4.4	5.0-5.4
Prosocial	1.1-2.1	5.7-6.7	3.2-4.04	1.8-1.9
Positive	1.2-1.6	3.6-5.1	2.1-3.5	1.6-2.2

Note: Rating on dimensions were on a 1-7 likert type scale. Threat Associations (1- Not threatening- 7 - Very threatening), Heroic Association (1- Not Heroic - 7 - Very Heroic), Arousal (1- Exciting - 7 - Calm), Valence (1 - Positive - 7 - Negative)

a) Negative Threat Article

Depraved man kills children

On Sunday police arrested Rick Baker for the **depraved** killing of his two children with an axe. His wife had left him a few years ago after several altercations over money. They had four children, two of them had lived with their mother and the other two remained with their father. On Saturday, the couple had an argument. Early on Sunday, in a **depraved** act against his children Rick killed his six-year-old daughter and four-year-old son with an axe while they were asleep. Police took the bodies into custody for post-mortem examination. The **depraved** father awaits trial for the crimes he committed against his children.

Photograph of Asian or Latino
Male

b) Positive Threat Article

Bold man rescued disabled man from home after fire

In a **bold** act, Will Mikels came to the rescue of his elderly neighbors when a fire broke out. Explosions were heard when the van caught fire outside the home of an elderly couple. The paralyzed elderly man could not leave the house by himself. **Bold** Will ran past the burning van to rescue the disabled man. Will did not give a second thought to his own safety and dashed past the flames to ensure the elderly man was safe. The elderly couple is grateful for Will's **bold** behavior.

Photograph of Asian or Latino
Male

Figure1. Examples of Threat Related News Articles Presented During the Learning Phase

a) Negative Non-Threat Article

Vulgar doctor fired

Doctor Carl Everett was fired Monday for being vulgar to a patient after losing his temper. The elderly patient asked for help after falling out a bed, while Carl yelled “talk to the hand” leaving the patient on the floor. Carl was vulgar to another patient that was suffering from dementia. Every evening the patient would wander over to the nurses’ station to look at the ringing telephones. Carl saw the patient examining the nurses’ station and screamed at her "Don't touch the phones!" Disciplinary panel removed the vulgar nurse from the doctors register to protect the public’s interest.

Photograph of Asian or Latino
Male

b) Positive Non-Threat Article

Artist’s cheerful art on display at new coffeehouse

Great Falls artist Ian Sharp is exhibiting his **cheerful** paintings at Katie’s Coffee House on Friday. Ian selected them to provide a Bright and **Cheerful** atmosphere for the customers of Katie’s Coffee House as they get their morning coffee and start their day. Ian took up painting during college and fell in love with it. Ian aspires to create art that evokes **cheerful** and happy feeling in people. His works have been featured in national and local publications and are in private collections across the United States.

Photograph of Asian or Latino
Male

Figure 2. Examples of Non-Threat Related News Articles Presented During the Learning Phase

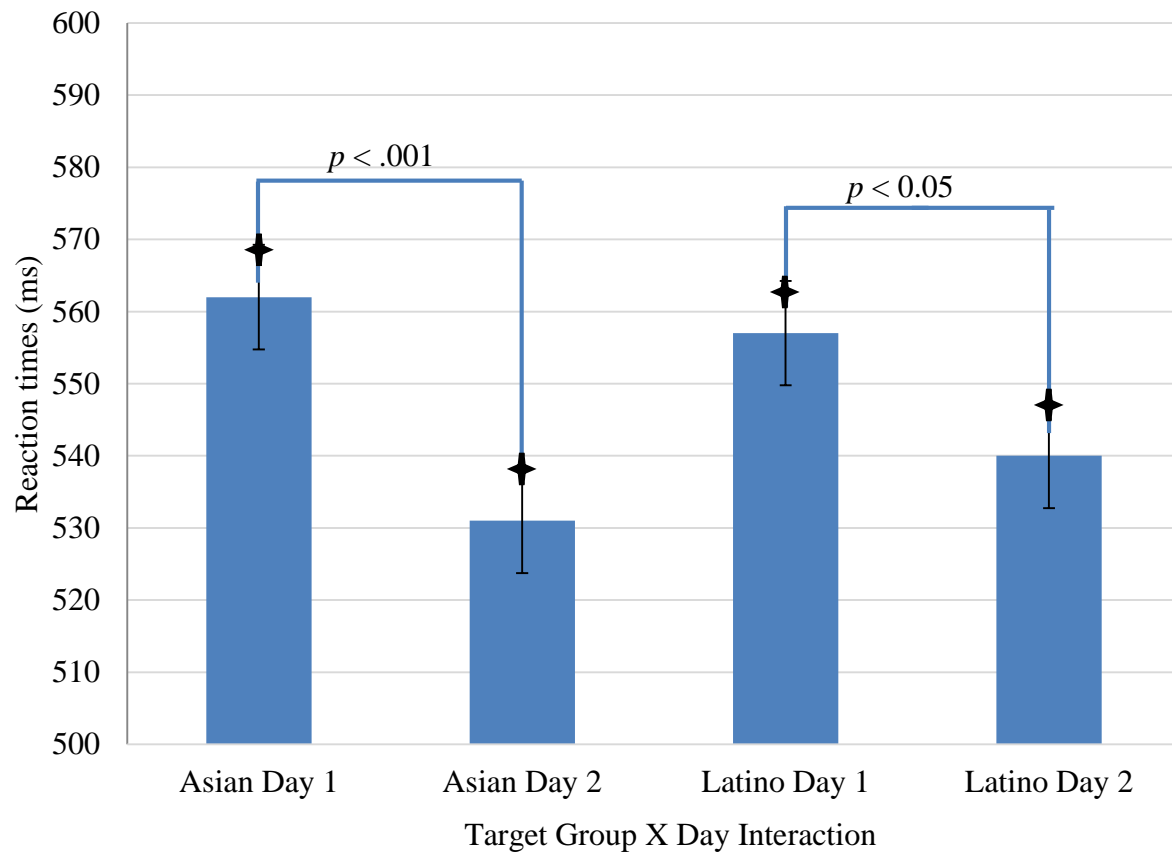


Figure 3. Mean differences tested for improvement in responses across test days for Asian and Latino target groups.

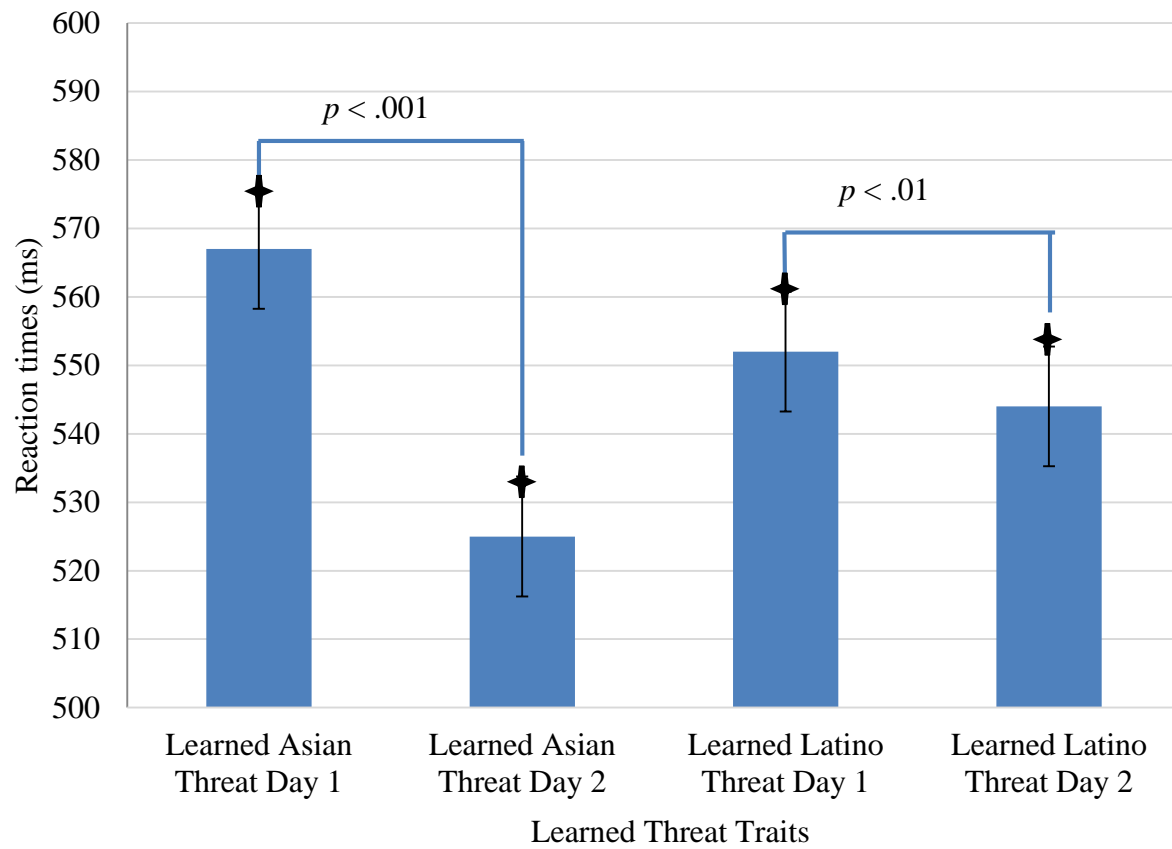


Figure 4 Mean differences tested for target group x day interaction.

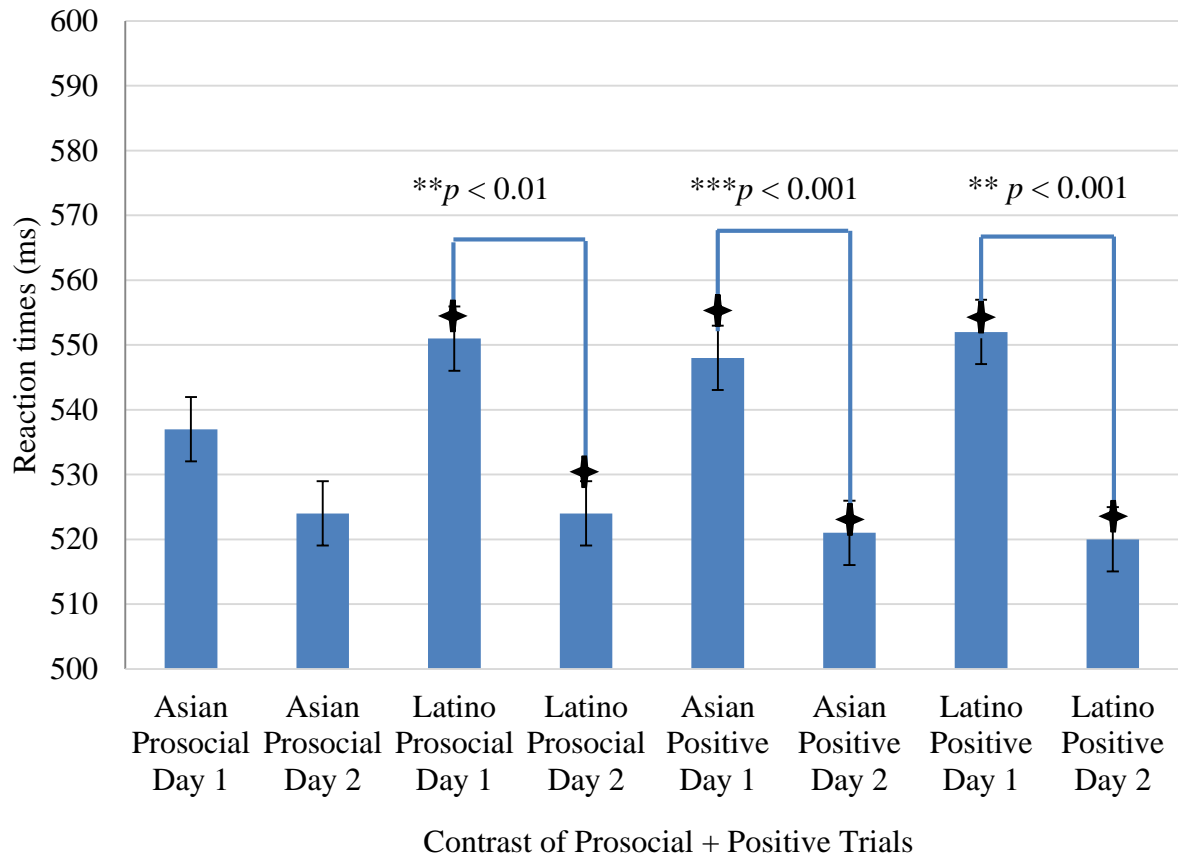


Figure 5. Mean differences tested for target group x trait type x day, three way interaction.

Negative threat articles used during the impression formation task

Grandson charged with brutal murder

Adam Braun who has been in trouble in the past for his **brutal** temper is now being charged with murdering his grandparents. Both grandparents were shot and stabbed to death. Investigators have charged their 22 year old grandson Adam for their **brutal** deaths. Adam was caught by police when he was pulled over for speeding and fleeing the crime scene. The police officer that pulled him over reported that Adam was covered in blood. A knife and pistol stained with blood was also found in the backseat of his car. Adam was taken immediately into custody. Adam faces the death penalty for the **brutal** murder of his grandparents.

Ratings: Threat=5.56 Arousal=4.4 Valence=5.36 Heroic=1.32

Depraved man kills children

On Sunday police arrested Rick Baker for the **depraved** killing of his two children with an axe. His wife had left him a few years ago after several altercations over money. They had four children, two of them had lived with their mother and the other two remained with their father. On Saturday, the couple had an argument. Early on Sunday, in a **depraved** act against his children Rick killed his six-year-old daughter and four-year-old son with an axe while they were asleep. Police took the bodies into custody for post-mortem examination. The **depraved** father awaits trial for the crimes he committed against his children.

Ratings: Threat=6.2 Arousal=4.8 Valence=5.8 Heroic=1.4

Vicious neighbor murders for gold

Unemployed and **vicious** neighbor Mark Witt tortured his elderly neighbor for hours. The torture was an attempt to make the elderly neighbor give up the whereabouts of a safe containing his collection of gold bonds. The disabled 66-year-old was left for dead on the floor of his apartment. When initially questioned by the police about his deceased neighbor, Mark gave a **vicious** response, "I don't care. Why would I? I don't even know him." Blood was found on his watch and jeans along with his footprints at the scene. The **vicious** neighbor awaits for trial and faces life imprisonment.

Ratings: Threat=5.92 Arousal=4.28 Valence=5.8 Heroic=1.6

Man charged with vile assault on heavily pregnant woman

Robert Page was charged in court today for causing the death of an unborn child after his **vile** attack on a pregnant woman. The woman, whose name had been withheld, was 32 weeks' pregnant and remains in a critical condition after the **vile** assault near her home on Monday night. Police said that she was pushed to the ground by Robert who kicked and stamped her stomach repeatedly. Robert is accused of child destruction and grievous bodily harm with intent. Bob awaits trial for his **vile** crime.

Ratings: Threat=6.04 Arousal=4.4 Valence=5.84 Heroic=1.44

Negative articles used during the impression formation task

Principal lays down strict rules

Strict principal Ross Pike sends girl home today because her haircut and color was too “distracting” to other students. Ross says that schools should enforce **strict** rules on behavior and uniform, as he warned parents had to take more responsibility for their children. The principal has taken an increasingly tough line on behavior in schools, claiming to be ‘dismayed’ that students are not well “controlled” during classes. Today he called for **strict** ban on mobile phones and students are only allowed to use the school’s phone if they need to contact their parents. Parents of the girl and other concerned parents are outraged.

Ratings: Threat=3.12 Arousal=4.4 Valence=5.36 Heroic=1.32

Stingy criminal caught

A **stingy** criminal identified as Ryan Cook used a fraudulent check for \$3,000 to buy a second-hand car. Ryan resold the car to a dealership that was later sold to an innocent motorist. The car was seized from the new owner when the fraudulent check bounced. Ryan had previous convictions for similar **stingy** offences including theft and fraud. He pleaded guilty to one charge of theft and two counts of fraud. He was sentenced to 20 weeks in prison and was ordered to do 250 hours of community service for his **stingy** behavior.

Ratings: Threat=3.12 Arousal=3.2 Valence=5.28 Heroic=1.48

Vulgar doctor fired

Doctor Carl Everett was fired Monday for being **vulgar** to a patient after losing his temper. The elderly patient asked for help after falling out a bed, while Carl yelled “talk to the hand” leaving the patient on the floor. Carl was **vulgar** to another patient that was suffering from dementia. Every evening the patient would wander over to the nurses’ station to look at the ringing telephones. Carl saw the patient examining the nurses’ station and screamed at her "Don't touch the phones!" Disciplinary panel removed the **vulgar** nurse from the doctors register to protect the public’s interest.

Ratings: Threat=3.92 Arousal=3.76 Valence=5.04 Heroic=2.32

Petty man stole his grandfather’s life savings

Jerry Clark has been jailed after he emptied his grandfather’s bank account. **Petty** Jerry stole over \$50,000 of his 84-year-old grandfather’s life savings and spent a majority of it on designer clothes. He also spent over \$15,000 on his failing bar business. Because Jerry was so **petty**, no money was left over for his grandfather’s funeral. The family funeral he had carefully planned prior to dying had to be cancelled. The **petty** grandsons plead guilty to one count of fraud and will be jailed for 40 months.

Ratings: Threat=3.28 Arousal=4.08 Valence=5.44 Heroic=1.44

Positive threat (i.e. prosocial) articles used during the impression formation task

Bold man rescued disabled man from home after fire

In a **bold** act, Will Mikels came to the rescue of his elderly neighbors when a fire broke out. Explosions were heard when the van caught fire outside the home of an elderly couple. The paralyzed elderly man could not leave the house by himself. **Bold** Will ran past the burning van to rescue the disabled man. Will did not give a second thought to his own safety and dashed past the flames to ensure the elderly man was safe. The elderly couple is grateful for Will's **bold** behavior.

Ratings: Threat=1.6 Arousal=3.92 Valence=1.92 Heroic=6.6

Heroic man died in rescue

Ben Gordon, a **heroic** man died while trying to rescue two teenage girls from the sea. Ben and his wife had been walking their dog out on the beach when they saw the girls screaming for help. In a **heroic** attempt, Ben swam out and managed to save one of the girls. Ben then got caught in the rip tide and had to be recovered by coastguards after the tide pulled him down into the sea. He was later pronounced dead. A memorial will be held Monday for the **heroic** man who lost his life saving others.

Ratings: Threat=2.08 Arousal=4.04 Valence=2.92 Heroic=6.68

Caring man raises money for his elderly neighbor

A **caring** neighbor Eric North set up a fund raising page for his elderly neighbor who was robbed outside of her home. After the attack, Eric set a target of \$500 to raise in order to help her pay the rent. With over 20,000 donations pouring in from across the world, Eric ended up raising \$330,000 for his neighbor. In Eric's **caring** effort he was able to buy a new house for his elderly neighbor with the proceeds. With no family left, the elderly neighbor is thankful for Eric's **caring** behavior.

Ratings: Threat=1.08 Arousal=3.2 Valence=1.8 Heroic=5.72

Selfless act: Homeless man turns in \$2,000 to police

Cops are praising the **selfless** actions of a homeless man, Paul Whitaker who found more than \$2,000 in cash and turned it in to police. Paul recently found the large sum of money on the ground in an unmarked envelope on the sidewalk. The **selfless** man who is currently homeless, surprised the police officers when he said that he wanted to return the money because it was the right thing to do. The police department plans to help Paul for his **selfless** actions and find him a home.

Ratings: Threat=1.48 Arousal=3.92 Valence=1.92 Heroic=6.6

Positive articles used during the impression formation task

Social entertainment manager saves festival

Arthur Cole has put his **sociable** character to great use, after using his social connections to help fund a local festival event. Prior to last week the event was about to be canceled due to lack of city funding. According to Arthur being a **sociable** person is essential, it's about knowing how to speak to promoters, booking your own gigs, invoicing your fees and creating publicity. All of these will earn you brownie points when it comes to entertainment management. If you can prove that you are **sociable**, exciting to work with and prepared to go the extra mile in terms of hard work, you are more likely to get the funds or resources you need.

Ratings: Threat=1.6 Arousal=2.76 Valence=2.24 Heroic=4.8

Artist's cheerful art on display at new coffeehouse

Great Falls artist Ian Sharp is exhibiting his **cheerful** paintings at Katie's Coffee House on Friday. Ian selected them to provide a Bright and **Cheerful** atmosphere for the customers of Katie's Coffee House as they get their morning coffee and start their day. Ian took up painting during college and fell in love with it. Ian aspires to create art that evokes a **cheerful** and happy feeling in people. His works have been featured in national and local publications and are in private collections across the United States.

Ratings: Threat=1.28 Arousal=2.12 Valence=1.76 Heroic=3.6

Thoughtful CEO offers new parents a year of paternity leave on full pay

John Collins CEO of V-Mobile international announced a **thoughtful** new policy that allows employees to take up to a year of paid parental leave. "If you take care of your employees they will take care of your business," The **thoughtful** CEO said in a statement. "As a father and now a granddad to three wonderful grandchildren, I know how magical the first year of a child's life is but also how much hard work it takes." The CEO's **thoughtful** offer also includes an unlimited vacation policy in addition to their entire annual salary for the time off.

Ratings: Threat=1.6 Arousal=3.56 Valence=1.6 Heroic=5.12

Nurse awarded for his tender caregiving

Out of all the caregivers employed at Chestnut Knoll Hospice, Rory Dahl was recognized as the "Tender Caregiver of the Year" for his outstanding service. The director describes Rory as one of the best caregivers he has ever employed, noting his tender and supportive elderly care. Rory has set an example for others and has trained others on how to provide the best possible care. Rory has gone above and beyond his duties to make every client feel comfortable. Patients regard him as the tender nurse with a heart of gold.

Ratings: Threat=1.2 Arousal=2.72 Valence=1.68 Heroic=3.64

Vicious Murder: Grave digger kills and buries wife

In a **vicious** crime, Sam Smith shot his 24-year-old wife who was the mother of his four children. Dental records of his wife matched the body of a woman found on May 13. In a **vicious** act, Sam shot his wife in the face and buried her body in an unmarked grave in Albany Memorial Park Cemetery, where he works as a gravedigger. The Albany County sheriff's office began looking for her when she failed to show up for work. Cops issued a warrant for Sam's arrest on first-degree murder charges. Sam voluntarily turned himself in for his **vicious** crime.

Ratings: Threat= 5.56 Arousal= 4.40 Valence=5.36 Heroic=1.32

Vile father jailed for child abuse

John Jackson is accused for **vile** child abuse. His son, now 7, was found severely malnourished and dehydrated. John's **vile** abuse left his son with bruises and scrapes on his body. The abuse was discovered when the son was taken to the hospital after ingesting fingernail polish remover. Medical personnel also discovered blistered burns on the child's arms and legs. If John goes to trial for his **vile** child abuse, he runs the risk of being convicted and sentenced to up to 40 years.

Ratings: Threat= 5.68 Arousal=4.32 Valence= 5.72 Heroic=1.72

Patient man makes a tender display of love

Hugh Murray is making headlines after making a public **tender** act of affection. Hugh was spotted anxiously waiting for hours inside the airport with a bouquet of flowers in one hand, a letter in the other (presumably a love letter) and a smile on his face. The **tender** love struck man had patiently waited for his long distance girl friend whose flight was delayed for three hours. Once his girlfriend arrived, the two shared a kiss. A bystander posted a video of Hugh's long wait and the romantic overture on his Facebook page for all to see this **tender** act of love.

Ratings: Threat=1.20 Arousal=2.72 Valence=1.68 Heroic=3.64

Thoughtful car seller donates car

After seeing the misfortunes of a local couple with a new baby, a **thoughtful** car dealership owner Andrew McGraw has stepped in to make parenthood a little bit easier. The couple who recently became parents came out of Providence hospital Wednesday night to find their car had been stolen. Andrew, the **thoughtful** owner of Eastern Shore Cars watched the car theft on the news and decided he wanted to donate a car to the couple until they could get on their feet. The couple is grateful for the **thoughtful** and unexpected donation.

Ratings: Threat= 1.40 Arousal=3.08 Valence=1.84 Heroic=5.28

Vita

Stephanie Marie Reyes was born in El Paso, Texas. Raised in Irving, Texas by her grandmother Graciela Carrillo and great aunt Guillermina Carrillo. She graduated from Franklin High School, El Paso, Texas in May 2004. On May 2012, she graduated from The University of Texas at El Paso with a bachelor's of arts degree majoring in Psychology and minoring in Anthropology. She also completed an Honor's Thesis entitled "*Assessment of concealed attitudes with affective priming using the late positive potential*". The Fall of 2012 she entered The University of Texas at El Paso Psychology doctoral program, in the concentration of Social Cognition.

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