Journal of Experimental Social Psychology 83 (2019) 78–87

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

Guilty by association: Time-dependent memory consolidation facilitates the generalization of negative – but not positive – person memories to group and self-judgments

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ARTICLE INFO

Handling editor: Aarti Iyer

Keywords:
Memory consolidation
Social memory
Group perception
Negativity bias

ABSTRACT

Over time, memory changes. Memory consolidation processes suggest that time produces qualitative changes in social memory rather than just quantitative changes in the amount of memories retrieved. As newly learned information becomes integrated into long-term memory, it is used in a more generalized fashion. Further, memory for negative (versus neutral or positive) information is bolstered over time. The present studies tested the hypotheses that over time, negative, but not positive, group information would generalize to other group members (Experiment 1) and to the self (Experiment 2). In Experiment 1, participants learned personal information about two members of two groups. Two members of one group were associated with negative trait information, while two members of the other group were associated with positive trait information. Participants then made trait and evaluative judgments about members of both groups. In Experiment 2, participants learned positive and negative information about their ingroup and an outgroup. Participants then evaluated themselves on those traits. Results were consistent with hypotheses. Participants generalized negative traits to members of the same group and generalized negative ingroup traits to evaluations of themselves, but only at a long-delay test.

1. Introduction

Many social-psychological constructs, group stereotypes, person impressions, and self-concepts, represent long-term semantic and evaluative memories. As such, the development of group stereotypes and self-concepts rely on long-term memory processes. For example, when meeting someone for the first time we may retrieve from long-term memory relevant group stereotypes (race; gender) and our past experiences with similar others (Smith & Zárate, 1992) to guide our behavior. Memory, however, is selective. One does not retrieve perfectly everything one experiences or learns. Rather, memory quantitatively and qualitatively changes over time as new information is encoded, stored, and retrieved. In addition, social learning occurs over multiple instances and over time. It takes time to form new, stable long-term memories. Social psychological research, however, often relies on one session experimental designs and rarely incorporates methods to systematically test how memory for social information changes with time (but see Forscher, Mitamura, Dix, Cox, & Devine, 2017). The present studies, therefore, use multiple test sessions to test memory for learned group information.

The focus of the present studies is the integration and generalization of new group information to similar others and the self. Newly learned information becomes integrated with existing memory structures over time through the process of memory consolidation. Memory consolidation occurs over time and presumably during periods of offline processing, such as sleep (Diekelmann, Wilhelm, & Born, 2009; Stickgold, 2005). Within our research program, time and sleep are treated similarly. Over time, people must sleep - or they die. In the present studies, participants learned trait and behavioral information about two groups. We then tested for memory consolidation processes by asking participants to return as close to 4 h later as possible (give or take 2 h within their schedules) and 48 h later. Four hours provides enough time for short term memory processes to fade. Forty-eight hours was chosen because it fits student class schedules. We refer to these as short- and long-delay tests, respectively. Below we outline memory consolidation processes as they relate to social information processing and present two studies directly testing predictions from this model.

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https://doi.org/10.1016/j.jesp.2019.02.008
Received 8 August 2018; Received in revised form 9 February 2019; Accepted 16 February 2019
Available online 28 March 2019
0022-1031/

1.1. Memory consolidation

Memory consolidation refers to relatively new, unstable memories becoming stable mental representations through the integration of the new information with stable memory structures. This is hypothesized to occur via enhanced network connections between regions of the medial temporal lobe and the neocortex (McGaugh, 2004, 2015). The complementary learning systems framework posits that there are two anatomically and functionally distinct memory systems (McClelland, McNaughton, & O'Reilly, 1995; O'Reilly & Norman, 2002). These systems are analogous to episodic memory and semantic memory (Zárate & Enge, 2013). According to this framework (McClelland et al., 1995), the medial temporal lobe, particularly the hippocampus, stores recently learned information and the neocortical system stores more stable, long-term memories in a distributed fashion. The neocortical system is involved in the slow, gradual learning of associations. Consolidation, then, is the process by which information is transferred from one system to the other via bidirectional pathways. This process occurs over time, theoretically during periods of offline processing, such as during sleep (Diekelmann et al., 2009; Stickgold, 2005). Over time, selective new memories become consolidated with existing memory structures in systematic ways.

1.2. Memory consolidation promotes integration and generalization

Integration and generalization are principles of learning and memory (c.f., O'Reilly & Norman, 2002) and are the hypothesized mechanisms of social memory formation and change. Integration refers to the strengthening of semantic connections between memory traces and the formation of overlapping representations. Newly learned information is assimilated into existing long-term memory structures, thus making it more resistant to interference. Our model assumes learning has taken place in some form (e.g., paired-associated learning; implicit learning; conditioning). In this context, two items become integrated with each other. Thus, learning that a face is associated with a personality trait at time 1 leads to conscious and active retrieval of that trait at that same time. Later, the face more easily and without effort activates the trait at time 2. In this case, then, integration could be observed as the strengthening of some (co)activations with the simultaneous reduction in the strength of other (co)activations. For example, one learns a member of a racial outgroup is arrogant. The representation of both the trait arrogant and that racial outgroup become integrated; activation of one of these concepts activates, in parallel, the other concepts.

After integration, memories shift from specific to more generalized, "gist-based" and "schema-like" representations (Lewis & Durrant, 2011; Preston & Eichenbaum, 2013; Stickgold & Walker, 2013). This allows learned information to be generalized to similar situations and allows inferences amongst items to be made. For example, Ellenbogen, Hu, Payne, Titone, and Walker (2007) gave participants a series of premise pairs (e.g., A > B; B > C; C > D, etc.) to learn during an initial session. Then, participants were tested for inferring relationships amongst distant (e.g., Is A > D?) and proximal (e.g., Is A > B?) premise pairs with or without a period of sleep. After a period of sleep, participants more readily inferred relationships amongst distant (vs. proximal) premise pairs. Thus, over time information became more readily accessible and well-integrated. In a related line of research, Durrant, Taylor, Cairney, and Lewis (2011) trained participants on a series of auditory tones, some of which had the same underlying tone pattern. Understanding the underlying tone pattern would allow participants to use a tone in one part of the sequence to predict the next tone in the sequence. After participants heard each individual sequence, they came back either after a night's sleep or an equivalent time period without sleep. Participants who slept (vs. those who did not sleep) between learning and test showed greater improvement in predicting the next tone in the series. Cai, Mednick, Harrison, Kanady, and Mednick (2009) further tested participants on a creative problem solving task with or without a period of sleep. In this task, participants were primed with a series of words. Then, later (with or without sleep) participants solved a series of anagrams. Participants were more likely to use primed words when tested after a period of sleep, though memory for primed words was equivalent between conditions. Thus, with time, connections between learned items facilitate making inferences in novel situations that contain those learned items.

Integration is the binding of recently learned information in a functional way that promotes generalization, inference, and determining how to act in future situations. For example, one might learn that subsets of group members are negative in nature (those two guys are jerks). Consolidation increases the integration of person (group member)-level information and the actual group representation. Thus, after consolidation, that person-level information should generalize to the group representation as a whole (that entire group is a bunch of jerks) over time. Similarly, if one identifies as a member of a group (i.e., an ingroup), then group information (my group is clumsy) should generalize to one's self-concept. One should more highly identify with ingroup traits over time.

Social memory is particularly well-integrated with other information, be it the self, the group, or with the environment. Because of the integrated nature of social memory, we hypothesize that memory consolidation should have three distinct effects within a social psychological environment. Compared to new memories, consolidated memories are more overlapping or highly *integrated*. With greater integration, consolidated memories are also more *accessible* (i.e., responded to and retrieved more quickly) and can be used to *generalize* across novel stimuli. The present studies tested the general hypothesis that newly learned information about social groups will generalize to members of the same group, including one's self, but only at a long-delay test.

Here, we also test the hypothesis that integration and generalization work differently as a function of the emotional valence of the learned information and whether or not that information is relevant to a social in- versus outgroup. Below we describe evidence supporting a negativity bias in memory consolidation. Further, we describe how this bias is predicted to be moderated by group membership.

1.3. Negativity bias in consolidation

Consolidation effects are selective. Consolidation demonstrates a negativity bias, as it benefits memory for negative information more so than positive or neutral information. In the memory consolidation literature, participants are exposed to scenes containing a negative (e.g., a crashed car) or a neutral object (e.g., a parked car) imposed on a neutral background (Payne et al., 2015; Payne & Kensinger, 2011; Payne, Stickgold, Swanberg, & Kensinger, 2008). Participants' recognition memory is then tested after a delay containing sleep or a wakeful delay. Participants who are tested after a delay containing sleep correctly recognized more negative objects than neutral objects compared to participants tested after an equivalent delay without sleep. Furthermore, the consolidation of negative versus positive information involves a tradeoff. When the scene contains a negative object, memory for its neutral background is impaired. This preservation of negative over neutral information emerges even when the delay is as short as 30 min (Payne et al., 2008).

Negative information is more readily consolidated because it is usually highly physiologically arousing and conveys survival related information. Highly arousing stimuli activate the release of stress hormones, such as epinephrine and cortisol, which are shown to moderate consolidation (McGaugh, 2004; McGaugh, 2006). Moreover, emotionally arousing information activates the amygdala, which projects to brain areas implicated in memory, such as the hippocampus. Thus, amygdala activation facilitates the consolidation of arousing information (McGaugh, 2004; McGaugh, 2006). Memory for negative information, therefore, is enhanced over time. In terms of social perception, we argue that this effect should be especially strong for negative information that is self-relevant.

Consolidation appears to benefit negative over positive or neutral in the social psychological realm as well (Enge, Lupo, & Zárate, 2015). We refer to this phenomenon as a "negativity bias". The present studies extend this effect to investigate how negative versus positive group information is generalized to, or used to make inferences about, members of the same group (Experiment 1) and the self (Experiment 2). We first provide greater expansion of our model.

One condition under which information is self-relevant is when it is associated with one's ingroup or a related outgroup. Enge et al. (2015) tested the effects of social group membership and trait valence on consolidation of learned social information. Enge et al. (2015) taught participants negative and positive information about racial in- and outgroup members (Latinos and African Americans, respectively). Participants were tested at a short time delay (2–6 h) and a long-time delay (48 h) on those learned targets and a set of novel targets. Results demonstrated that at the long-time delay, participants responded faster on a lexical decision task to negative information about racial outgroup members and positive information about racial ingroup members, despite learning both types of information about both groups. Thus, new information consistent with one's social identity was strengthened and therefore more accessible over time. Responses to novel targets reflected a general practice effect with no bias seen in how they were associated with positive or negative traits. Responses were, therefore, learning specific for positive ingroup information and negative outgroup information.

Enge et al.'s (2015) findings suggest that social group membership moderates the consolidation of negative and positive group information. These results are consistent with social identity theory (Tajfel & Turner, 1986) such that information that maintains a positive social identity is preferentially consolidated. In this case, positive ingroup traits were better remembered over time, whereas memory for negative ingroup traits was not influenced by time. While Enge et al. (2015) tested the accessibility of negative and positive in- and outgroup information, this study did not investigate how ingroup information is incorporated into the self-concept over time. People are motivated to take on the positive traits assigned to them. For example, the Barnum effect demonstrates that people evaluate general traits assigned to them as accurate, particularly when those traits are positive (Johnson, Cain, Falke, Hayman, & Perillo, 1985). Most of the descriptions used in the Barnum effect studies are vague, but they are also generally positive. Mnemic neglect studies show that self and ingroup traits are better recalled when they are positive than when they are negative (Sedikides, Green, Saunders, Skowronski, & Zengel, 2016). Thus, people readily take on positive statements given to them and identification with positive information is not expected to change over time.

Over time, however, groups develop entitativity, or the self-perception that the group is a cohesive whole. In that sense, group members might change to be more similar. No doubt people often self-select into groups of similar others. Extroverts are more likely to self-select into groups that more often do extraverted group activities, and introverts are more likely to join groups that perform more calming and quiet activities. Once in those groups, however, it is also possible that group members then start to "take on" the characteristics of the groups – even the negative characteristics. For example, one can imagine two new graduate students. One enters a lab that tends to be somewhat arrogant. Another enters a lab that tends to be helpful. Over time, those students might describe themselves as arrogant and helpful, respectively. Memory consolidation processes suggest that over time, traits associated with your ingroup should be integrated into your self-concept. If you are a member of a group, and that group has certain characteristics, then over time, the group member should self-ascribe those group traits. This effect should be especially pronounced for negative ingroup traits, given that negative information benefits the most from consolidation processes.

1.4. Hypotheses

The present studies extend the extant literature to test how negative versus positive group information is generalized to similar group members and to one's self over time. After consolidation, negative group information should be more relied upon to make inferences compared to positive information. We propose several predictions in line with our model of social memory.

In Experiment 1, we predicted that over time group evaluations will generalize to other group members. Thus, participants learned about two groups, with six persons in each group. They also learned personal traits of two group members (individuated group members) from each group. We predicted that after time, other group members would be evaluated higher on those same traits as the two individuated group members. Specifically, information trait ratings of one group member should predict ratings of other group members, but only at the long-delay test. In addition to this primary generalization prediction, we also predicted more extreme effects for negative traits, consistent with the memory consolidation literature.

Experiment 2 tests the same basic hypothesis, but that negative ingroup traits will generalize to the self. In Experiment 2, we predicted that ingroup information will generalize to self-evaluations over time. Participants learned trait information about members of their ingroup and members of an outgroup. We predicted that after time, participants would rate themselves more highly on ingroup traits, and more specifically, we predicted that this effect would be most pronounced for negative, compared to positive, ingroup traits.

2. Experiment 1

In Experiment 1, we tested the hypothesis that trait information learned about two group members (individualized targets) will generalize to other members of that group (non-individualized targets). We hypothesized that trait ratings of individuated targets would predict trait ratings on non-individuated targets at the long-delay, but not the short-delay, test. Consistent with a negativity bias, we predicted this effect to emerge for negative, but not for positive, traits.

Research demonstrates that traits are readily inferred from behavioral descriptions (Uleman, Saribay, & Gonzalez, 2008). In this experiment, participants were provided trait and trait-consistent behavioral information that should primarily facilitate the use of trait information to make inferences about similar targets. Valenced behavioral descriptions of a social target may also lead to spontaneous evaluative inferences, or negative or positive affective associations with the target (Schneid, Carlston, & Skowronski, 2015; Schneid, Crawford, Skowronski, Irwin, & Carlston, 2015). In addition to trait ratings, therefore, we included evaluative ratings of group targets. Participants rated each learned target on how negative or positive they perceived them to be. Our secondary hypothesis was that evaluative judgments of individuated targets would generalize to non-individuated targets at the long-delay test.

2.1. Method

2.1.1. Participants

Sample size was determined before data were analyzed. A power analysis suggested that 74 participants were required to achieve 80% power to detect a moderate effect ($\eta^2 = 0.05$). Seventy-five self-identified Latino undergraduates participated in exchange for course credit. Of these, one subject reported personally knowing at least one of the targets presented and three subjects reported napping in the short-delay condition. Data from 71 subjects ($n = 31$ in the short-delay; $n = 40$ in the long-delay condition) were thus included for data analysis (45 women; $M_{age} = 19.96$, $SD = 3.64$).

2.1.2. Experimental protocol: Group learning and person impression tasks

2.1.2.1. Facial stimuli. During the learning tasks and test session, participants viewed frontal head and neck color photographs of Mexican-American males or females. There were no salient physical features that denoted membership in one of the two groups (described in further detail below). Consistent with previous research (e.g., Rivera, Arms-Chavez, & Zárate, 2012; Zárate, Stoever, Maclin, & Arms-Chavez, 2008), all photographs were cropped at 3.5 in. wide × 6 in. tall and were equated on luminance and contrast with the use of Adobe PhotoShop CS6.

2.1.2.2. Group learning task. Participants were told that they were participating in a study on categorization. Upon arrival, participants completed informed consent and a demographics questionnaire. Participants were told that they would see a series of 12 photographs (either all men or all women, counterbalanced between-subjects) and their task was to categorize the photos into Group A or Group B. Participants received feedback regarding their performance (correct or incorrect) in categorizing each photograph as "A" or "B". Both groups were arbitrary; no salient physical characteristic (e.g., a beard) denoted membership in either group A or B. Thus, this group categorization task was a randomized series of photographs with no characteristic denoting group membership. As such, we provided participants with feedback regarding their categorizations that is described in further detail below.

First, a fixation point appeared on the screen for 1000 ms. Then, a photograph was presented for 3000 ms, during which participants pressed, on a response pad, button "A" or button "B," denoting group membership. Participants received feedback on their categorizations. On correct trials, the next photograph in the sequence appeared and on incorrect trials, the photograph reappeared until the participant made the correct response. All participants first completed 20 successive blocks of group learning, after which their performance was checked to ensure they learned the groups to criterion at least once. If participants did not learn the groups to criterion after 20 blocks, they then completed another 20 blocks after which their performance was again checked.

2.1.2.3. Person impression task. After the group-learning task, participants were shown personal information about two members of each group. We refer to these targets as *individuated targets*. Targets about whom participants did not learn personal information (4 in Group A and 4 in Group B) are referred to as *non-individuated targets*. In the impression task, participants were shown four photographs, two from Group A and two from Group B, with personal trait information about those individuals. Group A targets possessed all negative traits and Group B targets possessed all positive traits (counter-balanced between-subjects). Participants were told that their task was to read the personal information carefully and complete an impression formation questionnaire. This questionnaire asked participants to rate how much they liked each target and how friendly they perceived each target to be on a 7-point Likert scale. Once these instructions were made clear, the task was delivered via a timed Microsoft PowerPoint slide show, where participants saw the four photographs three times. Each photograph was paired with the same trait information on each trial. During the first presentation, each target was presented for 30 s and participants completed the impression formation questionnaire. During the second and third presentations, each target was presented for 15 s each. Targets were presented in a randomized order for each presentation.

Each person impression trial contained a photograph, a name, a trait and two behavioral descriptions of that trait. The photographs used were the same photographs from the group-learning task. Consistent with previous research, all traits and behavioral descriptions were written in the first person as if the target wrote the sentences themselves (Carlston & Skowronski, 1994; Zárate et al., 2008). The positive traits used in this task were "warm" and "considerate," and the negative traits used were "cold" and "cruel." For example, a photo of a Latino appeared next to his name ("I am Carlos"), a trait ("I am considerate"), and two behavioral descriptions of that trait ("I always help others when they are in need" and "I think of other people before I make a decision").

2.1.2.4. Time of tests: Short and long-delay testing sessions. Participants were randomly assigned to complete our dependent measures either 2–6 h (referred to as "short-delay") or 48 h after (referred to as "long-delay") the person and group-learning tasks. The first time of test took place no less than 2 h, but no > 6 h after the initial learning sessions. Participants in the short-delay condition completed a check-up questionnaire to assess how active they were during the short-delay and whether or not they slept during the short-delay. Participants in the long-delay condition completed a different check-up questionnaire to assess the quantity and quality of their sleep over the intervening 48-hour time delay. After completing either questionnaire participants completed the dependent variables via Superlab 4.0 (Cedrus Corporation).

2.1.3. Dependent measures

At test, participants were tested on all 12 targets (individuated and non-individuated) and 12 novel targets as well. Novel photographs consisted of Latino individuals who participants had not previously seen in the learning session. Consistent with individuated and non-individuated targets, novel targets were all Latino (either all male or female). Novel targets were identified only with a group label (Group A or Group B). Participants completed trait and evaluative ratings of each target. The order of these tasks was counter-balanced between participants. Participants' reaction time to make each decision was recorded, but we did not make specific hypotheses regarding this measure and thus it is not discussed further.

2.1.3.1. Trait ratings. Participants were shown (via SuperLab 4.0) a centrally presented photograph paired with the question "*How (trait) is this person?*" (7 point scale on a computer response pad; *1 – not at all; 7 – completely*). Each face was tested on all four learned traits and two orthogonal traits. For example, participants learned that one target from group A (A1) is warm and the other target (A2) is considerate, whereas for group B they learned that one target (B1) is cold and the other target (B2) is cruel during the initial person impression task. At test, for target A1, they were asked to rate to what extent that target is warm (learned trait), considerate (other learned trait), cold (opposite learned trait), cruel (opposite other learned trait), intelligent (orthogonal positive trait) and lazy (orthogonal negative trait). Alternatively, for target B1, they were asked to rate to what extent that target is "cold" (learned trait), cruel (other learned trait), warm (opposite learned trait) and considerate (opposite other learned trait), intelligent (orthogonal positive trait) and lazy (orthogonal negative trait). Participants completed these ratings for all 12 learned targets (4 individuated, 8 non-individuated) and all 12 novel targets. Thus, trait ratings consisted of six measurements for each target type (24 photos total) for a total of 144 trait-rating trials. The order of these trials was completed in randomized sequence for each participant. Individual photographs and trait ratings appeared on the screen for 5 s or until the participant responded. After responding, the next trial was presented.

2.1.3.2. Valence ratings. For the valence ratings, participants were shown a centrally presented photograph paired with the question *"In general, how would you evaluate this person?"* (7 point Likert scale on a computer response pad; *1- Generally negative; 7 – Generally positive*). Participants completed valence ratings for all learned targets. Individual photographs and valence ratings appeared on the screen for 5 s or until the participant responded. After responding, the next trial was presented.

All manipulations and exclusions are reported here. No other measures were collected.

2.2. Results

Original data and associated SAS code of this study are available at Mendeley Data (Lupo & Zárate, 2018).

2.2.1. Trait generalization

For the negative group, we predicted that trait ratings of individuated targets would generalize to non-individuated targets in the long-delay condition. For the positive group, we predicted no generalization of traits from individuated to non-individuated targets in the long-delay condition. Furthermore, we predicted that generalization would only occur from individuated to non-individuated targets and not from individuated to novel targets. Therefore, we analyzed non-individuated and novel targets separately.

2.2.1.1. Non-individuated targets. We first ran a 2 (time delay: short vs long) × 2 (trait valence: negative vs positive) × 2 (target type: individuated vs non-individuated) repeated measures ANOVA on trait ratings for individuated and non-individuated targets. The analysis had 80% power to detect an effect size of $\eta^2 = 0.10$. Counter-balancing condition, target gender, and participant gender were included as between-subjects predictors. These variables did not interact with our manipulated factors and are not discussed further.

Results demonstrated a main effect of target type, $F(1, 69) = 24.26$, $p < .0001$, $\eta^2 = 0.26$ such that individuated targets were rated higher ($M = 4.27$; $SD = 1.51$) on group traits than non-individuated targets ($M = 3.56$; $SD = 0.92$). There was also a main effect of trait valence, $F(1, 69) = 16.27$, $p = .0001$, $\eta^2 = 0.19$. Participants rated positive targets higher on positive traits ($M = 4.23$; $SD = 1.21$) than negative targets on negative traits ($M = 3.60$; $SD = 1.22$). The main effect of delay condition was not significant, $F(1, 69) = 2.28$, $p = .14$, $\eta^2 = 0.03$. The three-way interaction between target type, trait type, and time delay was also not significant, $F(1, 69) = 0.72$, $\eta^2 = 0.01$.

To test if trait information was generalized from individuated to non-individuated targets as a function of time, we regressed ratings of non-individuated targets on ratings of individuated targets separately by time-delay and trait valence. These analyses had 80% power to detect an effect size of $R^2 = 0.17$ and 0.21 in the long-delay and short-delay conditions, respectively. Individuated target ratings should predict non-individuated target ratings, but only in the long-delay condition and only for negative targets. Results supported this prediction. For negative targets, ratings of individuated targets predicted trait ratings of non-individuated targets in the long-delay condition, $\beta = 0.39$; $t(38) = 2.59$, $p = .02$, $SE = 0.10$, $R^2 = 0.15$, but not in the short-delay condition, $\beta = 0.06$; $t(29) = 0.30$, $p = .77$, $SE = 0.13$, $R^2 = 0.003$. Generalization of negative group trait information, therefore, only occurred in the long-delay condition. For positive targets, trait ratings to individuated targets did not predict ratings to non-individuated targets in the long-delay condition, $\beta = -0.07$; $t(38) = -0.45$, $p = .66$, $SE = 0.08$, $R^2 = 0.005$, or in the short-delay condition, $\beta = 0.31$; $t(29) = 1.75$, $p = .09$, $SE = 0.11$, $R^2 = 0.10$. These results are consistent with the prediction that positive trait information would not generalize across members of the same group.

2.2.1.2. Novel targets. We conducted similar tests to test the effects of time on trait ratings for novel targets. Two separate tests were conducted. Positive and negative novel group target trait ratings were analyzed separately. Time delay and trait ratings on their associated individuated targets were the predictor variables (and their interaction). The analysis had 80% power to detect an effect size of $\eta^2 = 0.10$. Time delay had no influence on trait ratings for negative, $F(1, 67) = 0.43$, $p = .52$, $\eta^2 = 0.008$, or positive, $F(1, 67) = 0.07$, $p = .80$, $\eta^2 = 0.01$, novel targets. Novel negative target trait ratings were predicted by the individuated negative targets $F(1, 67) = 4.51$, $p = .04$, $\eta^2 = 0.06$. The interaction between time and individuated target trait ratings was not significant, $F(1, 67) = 0.41$, $p = .53$, $\eta^2 = 0.008$. Novel positive target ratings were not predicted by the positive individuated targets, $F(1, 67) = 0.75$, $p = .39$, $\eta^2 = 0.004$, or the interaction between individuated targets and time delay, $F(1, 67) = 0.06$, $p = .81$, $\eta^2 = 0.01$. Therefore, trait information for negative targets generalized to novel targets, but not as a function of time.

2.2.2. Evaluative generalization

To test the hypothesis that evaluative ratings about individuated targets generalize to non-individuated and novel targets, we conducted the same ANOVA and regressions reported for the positive and negative group trait ratings, except with evaluative ratings to individuated and non-individuated targets in the positive and negative group as our main dependent variables. These analyses had 80% power to detect an effect size of $\eta^2 = 0.03$ or $d = 0.34$. First, a 2 (time delay: short vs long) × 2 (trait valence: negative vs positive) × 2 (target type: individuated vs non-individuated) repeated measures ANOVA was conducted. Results demonstrated that the three-way interaction between target type, trait type, and time delay was significant, $F(1, 69) = 4.40$, $p = .04$, $\eta^2 = 0.04$.

To test the above three-way interaction, evaluative ratings for the negative and positive groups were analyzed separately in their own 2 (delay condition: short vs long) × 2 (target type: individuated vs non-individuated) ANOVA. For negative targets, there was an interaction between time and target type, $F(1, 69) = 6.61$, $p = .01$, $\eta^2 = 0.07$. The ratings for the individuated targets did not differ between the short- ($M = 4.31$, $SD = 1.54$) and long-delay ($M = 4.25$, $SD = 1.72$) conditions. Non-individuated targets, however, were evaluated more negatively $t(69) = 4.58$, $p = .0001$, $d = 1.11$, at the long- ($M = 3.72$; $SD = 1.06$) versus the short-delay ($M = 2.63$; $SD = 0.89$) condition. For positive targets, there was no main effect of time delay, $F(1, 69) = 2.43$, $p = .13$, $\eta^2 = 0.03$. The interaction between time delay and target type was also not significant $F(1, 69) = 0.43$, $p = .52$, $\eta^2 = 0.005$. Therefore, evaluative judgments became stronger over time only for negative, but not positive, non-individuated targets. This supports our hypothesis that negative information is more readily consolidated than positive information.

To test if evaluative information was generalized from individuated to non-individuated targets as a function of time, we regressed evaluative ratings of non-individuated targets on ratings of individuated targets separately by time-delay and trait valence. These analyses had 80% power to detect an effect size of $R^2 = 0.04$ and 0.07, in the long-delay and short-delay conditions, respectively. For negative targets, evaluative ratings of individuated targets did not predict evaluative ratings of non-individuated targets in the long-delay, $\beta = 0.08$; $t(38) = 0.48$, $p = .64$, $SE = 0.10$, $R^2 = 0.006$, or in the short-delay condition, $\beta = 0.06$; $t(29) = 0.34$, $p = .74$, $SE = 0.11$, $R^2 = 0.004$. Similarly, for positive targets, evaluative ratings of individuated targets did not predict evaluative ratings of non-individuated targets in the long-delay, $\beta = 0.02$; $t(38) = 0.11$, $p = .92$, $SE = 0.12$, $R^2 = 0.0003$, or in the short-delay condition, $\beta = 0.18$; $t(29) = 0.99$, $p = .33$, $SE = 0.17$, $R^2 = 0.03$.

2.3. Discussion

Experiment 1 made two basic predictions. Over time, information learned about some group members would generalize to other group members. It was further hypothesized that this generalization process would be stronger for negative information. Those predictions were supported by the data. Moreover, this effect was exactly as predicted for trait generalization ratings. Learning that two group members were cold led participants to evaluate other members of that same group as cold, but only after a time delay. Beyond that, the effects suggest that the proposed negativity bias extends to novel items. Learned information about negative group members led to more negative trait ratings for novel group targets. This last effect, however, was not at all influenced by time.

The positive information did not generalize to the rest of the group. This was predicted based on the negativity bias one normally sees in the memory consolidation literature. This might mean a few things, however, for social psychologists. In particular, this suggests that memory consolidation is one way negative stereotypes and prejudice develop. Negative information seems to have greater long-term memory effects than does positive information. If negative information is more readily generalized than is positive information, then over time, social beings simply store more negative experiences. This general effect is highly consistent with previous memory consolidation effects showing group identification effects on group learning over time (Enge et al., 2015).

The hypothesis that evaluative ratings would generalize over time was partially supported. Evaluative ratings did not generalize from individuated to non-individuated targets as a function of time. Non-individuated targets in the negative group, however, were evaluated as more negative at the long-delay test. No effects emerged for targets associated with the positive group. This is consistent with the idea that negative information is better consolidated over time. Individuals associated with a group that possessed negative traits were evaluated as more negative at a long- versus short-delay test.

These effects seem to be at the core of prejudice development processes. Negative traits of individual members of a group have especially potent effects on judgments about their social group compared to positive traits. Exposure to negative information about just a few members of a group facilitates the belief that all members possess those same qualities, whereas positive information appears to be either forgotten or at least less relied upon. For example, learning about a few undocumented immigrants committing violent crimes may then increase the perception that undocumented immigrants as a group are violent. Positive information, in contrast, seems to carry less weight in making predictions about the group and its members, and thus developing stereotypes. Though evaluative judgments did not demonstrate the same generalization effect, individuals associated with a group who possessed negative traits elicited more negative affect. Thus, members of groups associated with negative traits become perceived as more negative over time.

3. Experiment 2

Experiment 2 takes the same basic hypothesis and tests it regarding the self-concept. People are members of multiple groups, and those group memberships become important parts of the self-concept (Tajfel & Turner, 1986). Memory consolidation constructs suggest that over time, information becomes integrated to reflect a more cohesive conceptual structure. We test the hypothesis that group information and self-ratings are important conceptual structures and can act in the same fashion. Thus, over time, people will take on the negative traits of the group. If the group is described as arrogant, and I identify as part of the group, then I too am arrogant. One is not motivated to say they are anxious or arrogant. One is, however, motivated to become part of the group. Once in that group, and over time, one might very well take on the negative traits of the group. Experiment 2 tests the hypothesis that negative ingroup traits will be more highly ascribed to one's self at a long- compared to a short-delay test. We do not expect any differences in self-ratings on positive ingroup traits over time, as positive traits are readily identified with in general.

In Experiment 2, participants were asked to complete an ostensible personality test and were randomly placed into one of two groups. They were then told they were competing with the alternative group. The competition was designed to increase identification with the new group. They were then presented with information about other ingroup and outgroup members. That information was manipulated to include both negative and positive information about both groups. The primary question concerned how that information generalized to self-ratings later.

Experiment 2 also tests how these memory processes influence the conscious retrieval of information from memory. It is proposed that consolidated memories are retrieved differently than non-consolidated memories. As information becomes more integrated with existing memory structures, we hypothesize that the retrieval of those items should be facilitated. Using the "remember-know" distinction (Tulving, 1985), we suggest that non-consolidated memories are consciously remembered, whereas consolidated memories are retrieved in a more "know" like fashion. We test the hypothesis that non-consolidated memories are retrieved consciously from temporary long-term memory. Thus, these memories are consciously retrieved and judgments are made on a "remember" like basis. Consolidated memories, however, are hypothesized to be retrieved from memory more effortlessly. Memories are "known" rather than recalled.

Finally, Experiment 2 extends the memory consolidation literature to test one more hypothesis. The group entitativity literature suggests that some groups develop a more cohesive group perception (Lickel et al., 2000). Experiment 2 tests the prediction that over time, a group should be perceived as more cohesive over time. Here, that was tested with two distinct questions, regarding physical similarity and personal similarity. It was hypothesized that over time, groups would be perceived as more physically and personally similar.

3.1. Method

3.1.1. Participants

Sample size was determined before data were analyzed. A power analysis suggested that 74 participants were required to achieve 80% power to detect a moderate effect ($\eta^2 = 0.05$). Data were collected from 100 undergraduate participants in exchange for course credit. One participant reported napping in the short-delay condition and was removed from analyses. None of the participants reported personally knowing any of the targets presented. Data from 99 participants were thus included in analyses (64 women; 85 Latinos; $M_{age} = 20$, $SD = 2.89$). Of these, 48 participants were assigned to the short-delay condition and 51 to the long-delay condition.

3.1.2. Learning session

For the group learning task, participants were first asked to complete a "figure/ground" test adapted from Judd and Park (1988). To complete the task, participants were given a series of images and were instructed to press a key labeled either "figure" or "ground" to identify which part of the picture they noticed first. Participants were told this identifies a new type of personality. Once completed, participants were randomly assigned to one of the two groups and were told of their group membership. Participants were then told that group F members were warm and anxious while G members were told their group tends to be competent and arrogant (both groups received a positive and negative trait). Participants were led to believe that they and members of their ingroup would be competing in a trivia contest against members of the outgroup for extra experimental credit.

Participants were then given a group learning task. Participants were given information about four other ingroup members and four outgroup members. Information was counter-balanced across groups. Across the group members, the first target always possessed the group prototype. Thus, the first F person was always warm and anxious, and the first G person was always competent and arrogant. In all, three of four group F members were warm or a synonym of warm and three were anxious or a synonym of anxious. Each person was also described by an unrelated third trait. The same structure held for the G group. The first was always competent and arrogant. The first target was described in this way to initiate the formation of the group prototype (Zárate & Smith, 1990). Three of four members were described as competent or a synonym of competent, and three of four were described as arrogant or a synonym of arrogant. A third unrelated trait described each of the members. Only two of the four members from each group had both group traits, but every person had at least one of the traits. This was done to mask the group structure. Moreover, the third unrelated trait given to each target was also done to mask the overall group prototypic structure and to make the stimuli more believable.

Participants were presented with a PowerPoint slide show depicting the eight group members (4 ingroup and 4 outgroup members). Participants were told of the general group description and were presented with the eight targets. Each group member was presented individually for 30 s. They were presented with their group membership and their three trait descriptions. The trait descriptions were provided with behavioral descriptions of those traits. Group members were presented as a group, and presentation of their ingroup or outgroup was counterbalanced across participants. The presentation was divided into three blocks. During the first 30-second block, participants completed an altered version of an Impression Formation Questionnaire used in previous research to promote encoding of novel person information (Enge et al., 2015). In this version of the Impression Formation Questionnaire, participants were asked to rate the extent that they like each target (*1 – not at all; 7 – completely*); how friendly the target appears (*1 – not at all; 7 – completely*), and if that target is part of their group or not ("Does this person belong to the same group as you?" [Y/N] and "Which group is this target part of?" [F/G]). After completing the first 30-second presentation, participants then viewed the targets two more times in a different, randomized order, each in 15 s blocks (thus, each participant learned about each target for 1 min).

3.1.3. Test Sessions

At test (either the short [2–6 h post-learning] or long [48 h post-learning] time delay), participants completed four items regarding their group identity and membership. As a manipulation check, we asked which personality type they were part of ("Which group are you a member of?" F *or* G; all participants correctly indicated their group). Then, participants completed our dependent measures on group entitativity items, the self-trait ratings (order randomized within subjects) group trait ratings (ingroup first or outgroup first was counterbalanced between subjects; the order of the trait ratings was randomized within subjects) on both the learned traits and antonyms of the prototypic traits.[2] After the trait ratings, participants completed remember/know items for both their group and the outgroup. Lastly, participants completed the trivia competition, which included 20 multiple choice questions regarding U.S. politics. These dependent measures are discussed in more detail in the following sections. Participants' reaction time to respond to each dependent measure was recorded, but we did not make specific hypotheses regarding this measure and thus it is not discussed further.

3.1.3.1. Self and group. After completion of the group entitativity items, participants completed trait ratings for the self, ingroup and outgroup. Here, participants, were asked to rate each group on each prototypic trait[3] (e.g., "Rate the extent to which you [your group/their group] identify with being Arrogant"; *1 – Not at all; 7 – Completely*). For the group ratings, participants rated the entire group on the traits, not the individual targets. As with self-ratings, participants were asked to rate each group on each trait (e.g., "Rate the extent to which Group G [F] is competent"; *1 – Not at all; 7 – Completely*). This trait rating method has been used in other research in our lab and as such follows the same procedure.

3.1.3.2. Remember-know: Dichotomous and continuous measures. After completing the group trait ratings, participants were asked to give remember/know judgments for in- and outgroup traits. Participants were asked to choose whether they "remember", "know", or "don't know" the in- and outgroup traits. These response options are consistent with the standard way of testing the qualitative difference of memories that are remembered (episodic) versus memories that are known (based on familiarity; Tulving, 1985). In addition, we also included continuous measures of remember/know judgments on separate 7-point Likert scales. For these continuous measures, participants rated the extent to which they **remembered** each group's traits ("Please rate the extent to which you remember your [the other] groups traits?"; *1 - Not at all; 7 - Completely*); **knew** each groups traits/trait structure ("Please rate the extent to which you know all of the group traits/trait structure"; *1 - Not at all; 7 - Completely*); how **confident** they were in both how they remembered and knew each groups' traits ("Please rate how confident you are that remember [know] the groups traits"; *1 - Not all confident - 7 - Very confident*) and the percentage of time they felt they had guessed on group trait ratings ("Please rate the extent to which you used guessing as a strategy to remember the groups traits. You will not be penalized for guessing, so please be honest"; *1% - 100%*).

3.1.3.3. Group entitativity and identification. Participants completed the group entitativity and identification items in reference to their ingroup. Participants were asked the extent to which they are personally and physically similar to their group (separate items, e.g., "How similar do you think you are to your group in terms of traits and characteristics?" "How physically similar are you to your group?"; *1 – Not at all; 7 – Completely*) and the extent to which they identify with their group versus the outgroup ("Please indicate the extent to which you identify with your group?"; *1 – Not at all; 7 – Completely*).

All manipulations and exclusions are reported here. No other measures were collected.

3.2. Results

Original data and SAS code of this study are available at Mendeley Data (Lupo & Zárate, 2018).

3.2.1. Self-ratings

The primary prediction was that over time, groups would evaluate themselves higher on the negative ingroup traits over time. To test that, we first ran a repeated measures analysis of variance on the negative and positive trait ratings for the self for the ingroup traits and the outgroup traits. Group trait ratings (in- versus outgroup) and valence (negative versus positive) were treated as within subject variables, and time was a between subject variable. This analysis had 80% power to detect an effect size of $\eta^2 = 0.02$. Results revealed a main effect of trait valence, $F(1, 97) = 5.09$, $p = .03$, $\eta^2 = 0.05$. As expected, participants evaluated themselves higher on positive ($M = 5.00$, $SD = 1.01$) than on negative ($M = 3.45$, $SD = 1.18$) traits overall. Thus, participants demonstrated the expected positivity bias in that positive traits were more highly identified with than negative traits.

Next, we analyzed the effect of time on responses to negative in- and outgroup traits. Trait ratings were treated as a repeated measures variable and time as a between subjects variable. These analyses had 80% power to detect an effect size of $\eta^2 = 0.02$ or $d = 0.28$. There was no difference in self-ratings on negative ingroup traits ($M = 3.67$, $SD = 1.74$) and negative outgroup traits ($M = 3.23$, $SD = 1.76$), $F(1, 97) = 2.67$, $p = .11$, $\eta^2 = 0.03$. Regarding the negative ingroup traits, the univariate results revealed a significant effect of time, $F(1, 97) = 8.29$, $p = .0049$, $d = 0.58$. Participants rated themselves higher on the negative ingroup traits at the long-delay ($M = 4.14$, $SD = 1.51$) than in the short-delay ($M = 3.17$, $SD = 1.84$). Post-hoc analysis of the counter-balancing factor of group (in – or outgroup presented first at learning) revealed that presenting the outgroup targets first produced a

[2] To equate the groups on competition, the last set of items asked participants about perceptions of the other group related to aggressiveness, hostility, likelihood of cheating and evaluation of each group and each groups' traits. These items are not discussed further.

[3] Participants were also tested on antonyms of each prototypic trait. Our manipulations did not predict self-identification with antonyms of ingroup traits and this measure is not discussed further.

stronger effect of time on these negative self-ratings, $F(1, 95) = 5.37$, $p = .03$, $\eta^2 = 0.05$. The negative trait ratings for the outgroup traits showed no differences between the long- ($M = 3.20$, $SD = 1.87$) and short-delay ($M = 3.27$, $SD = 1.66$) conditions, $F(1, 97) = 0.04$, $p = .84$, $\eta^2 = 0.0005$.

We then analyzed the positive traits in the same way. Participants evaluated the self on the positive traits of the ingroup prototype and the outgroup prototype. Those trait ratings were treated as a repeated measures variable, with time as a between subject variable. Participants rated themselves similarly on ingroup ($M = 5.20$, $SD = 1.46$) and outgroup ($M = 4.81$, $SD = 1.38$) positive traits, $F(1, 97) = 3.75$, $p = .06$, $\eta^2 = 0.04$. Regarding the positive ingroup traits, as predicted, there was no effect of time, $F(1, 97) = 0$, $p = .97$, $\eta^2 = 0.00002$. Participants rated themselves equally high on positive ingroup traits in the short- ($M = 5.21$, $SD = 1.52$) as in the long-delay ($M = 5.20$, $SD = 1.40$) condition. For positive outgroup traits, however, participants provided higher self-ratings in the short- ($M = 5.13$, $SD = 1.35$) than in the long-delay ($M = 4.49$, $SD = 1.42$) condition, $F(1, 97) = 5.20$, $p = .03$, $d = 0.46$. This effect was not predicted.

3.2.2. Remember-know judgments

We predicted that learned information would be retrieved in a "know" like fashion after consolidation. Participants completed dichotomous (remember/know/don't know) and continuous remember-know judgments. For dichotomous judgments, we analyzed ingroup trait and outgroup trait judgments in separate logistic regressions. These analyses had 80% power to detect an effect size of $W = 0.30$. Results revealed no effect of time delay on remember-know judgments of ingroup, Wald $X^2(1, N = 89) = 1.16$, $p = .29$, $W = 0.11$, or outgroup, Wald $X^2(1, N = 89) = 0.0056$, $p = .95$, $W = 0.008$, traits. For continuous judgments, participants rated the extent to which they "remember" and the extent to which they "know" the ingroup and outgroup traits. These ratings were treated as within subject repeated measures variable, with time delay as a between subjects variable. This analysis had 80% power to detect an effect size of $\eta^2 = 0.02$ or $d = 0.28$. The main effect of time delay was not significant, $F(1, 97) = 3.76$, $p = .06$, $\eta^2 = 0.04$. The more important test of the two-way interaction between time delay and remember-know judgments was also not significant, $F(1, 97) = 1.70$, $p = .20$, $\eta^2 = 0.02$. Regarding the univariate tests, this analysis produced only one effect. Participants reported remembering outgroup traits more so at the short- ($M = 4.89$, $SD = 1.62$) than at the long-delay ($M = 4.06$, $SD = 1.77$) test, $F(1, 97) = 5.70$, $p = .02$, $d = 0.48$. Thus, this analysis produced only one effect consistent with our hypothesis.

3.2.3. Perceived entitativity

The next analysis investigated the effects of time on perceived entitativity. There were three single item measures of entitativity. The first item assessed perceived physical similarity between the group targets, the second item assessed perceived psychological similarity between the targets, and the third item assessed how strongly participants identified with their group. Those three ratings were treated as a within subject repeated measures variable, with time as a between subjects variable. This analysis had 80% power to detect an effect size of $\eta^2 = 0.02$. Time delay did not produce a main effect, $F(1, 97) = 0.82$, $p = .37$, $\eta^2 = 0.008$. Regarding the univariate tests, time delay had no effect on personal similarity, $F(1, 97) = 2.04$, $p = .16$, $\eta^2 = 0.02$, physical similarity, $F(1, 97) = 0.08$, $p = .78$, $\eta^2 = 0.0008$, or group identification, $F(1, 97) = 0.07$, $p = .80$, $\eta^2 = 0.0007$. Thus, our hypothesis that one's ingroup would be perceived as more cohesive over time was not supported.

3.3. Discussion

Within a memory consolidation framework, over time, information becomes more integrated, both with each other and with existing memory structures. We tested this prediction as it relates to self- and group information. The negative group trait is a strong test of the memory consolidation idea. We predicted that the self would identify with negative information about one's ingroup after consolidation has taken place. Experiment 2 is largely consistent with our hypothesis. Over time, participants ascribed more negative ingroup traits to the self. In the learning session, participants learned that their group tends to be either arrogant or clumsy. Over time, they evaluated themselves as having more of that negative trait. Thus, as a member of a particular group, if I find that my group tends to have particular traits, I too will self-ascribe those traits, even if they are negative.

Identification with positive group traits, however, did not benefit from consolidation. Although positive traits were more highly identified with than negative traits in general, our results showed no difference in how participants evaluated themselves on positive ingroup traits over time. It is not surprising that participants take on the positive group characteristics. This finding is consistent with several theories (Brewer, 1999, 2007; Tajfel & Turner, 1979). Further, this finding is consistent with our memory consolidation model of social memory in which negative information tends to be better remembered over time.

Our secondary hypotheses were that group entitativity would increase over time and that consolidated memories would be retrieved in a more "know" versus a "remember" like fashion. These hypotheses were not supported. The null findings on the group entitativity items may be a result of our stimuli. Target photographs were chosen to be similar in age and physical attractiveness. Targets, therefore, were already highly physically similar to each other. Further, targets were described in the learning session as possessing highly similar traits. Targets, therefore, were presented as highly psychologically similar to each other. Alternatively, it may be that the inclusion of negative ingroup traits impeded identification with the group, even though participants more highly ascribed those negative traits to themselves over time.

3.4. General discussion

Social cognitive researchers purport to study memory processes. Our memory consolidation research suggests that memory is selective and it evolves over time and in predictable fashions. Of course, the primary change over time is that we lose memory. We have known this since the famous Ebbinghaus forgetting curve was first reported in 1885. Thus, in these studies, we have participants return for testing 4 h later and two days later. Much of the primary memory loss occurs within those first few hours, which means the first testing reduces short term memory effects. Thus, our primary effects of time are meant to test the effects of time on memory consolidation. Our design is consistent with memory research in the cognitive sciences (Payne et al., 2008) and we believe it provides a strong test of the memory consolidation theory. At this stage of the research program, our goal is not to retest the underlying causes (time versus sleep) of memory consolidation processes. Rather, the goal is to integrate and extend memory consolidation constructs with social psychological phenomena. There is no reason to believe 24 h versus 48 h would produce different results, though timing, and the role of sleep, remain important variables to test in future studies.

Our memory consolidation model is based on three basic ideas. Over time, memory traces become more integrated with long-term memory structures, more accessible for ease of retrievable, and more readily generalized to new information. The two experiments presented here tested primarily the ways in which consolidated memories generalize to new social targets. In Experiment 1, we found that negative, but not positive, group information generalized to other members of the same group after a time delay. In Experiment 2, we found that negative ingroup information generalized to evaluations of the self after a time delay.

Experiment 2 also tested the accessibility concept. Participants were asked if they recalled versus simply knew the target information presented. The idea is that as information becomes more consolidated, it is recalled in a less conscious recall fashion and responded to as simply part of their basic knowledge. We found little evidence to support this hypothesis. Respondents responded similarly to our questions at the 4 h delay as at the 48 h delay.

The experiments reported here are consistent with and extend our previous findings. Enge et al. (2015) found that negative information is particularly potent when associated with a relevant outgroup. Over time, participants demonstrated better implicit memory for negative outgroup and positive ingroup traits. These findings support the hypothesis that memories are consolidated in a self-serving manner. In Experiment 1, we extended these findings by testing how negative and positive information is used to make judgments about members of the same group. These groups were not self-relevant. Therefore, unlike in Enge et al., participants' judgments were not affected by a perceived ingroup or outgroup status. Consistent with Enge et al., participants relied more on negative information when making judgments about members of the same group, but only at the long delay test. In Experiment 2, we extended these findings by investigating how negative and positive group information is generalized to one's self. Consistent with Enge et al. (2015) and with the maintenance of a positive ingroup identity, positive information was readily applied to the self, regardless of time of test. Enge et al. found that memory for negative ingroup information remained consistent over time, but did not test how negative ingroup information affects judgments about one's self. Experiment 2 therefore investigated how negative ingroup information is applied to the self. This study showed that generalization of negative information to the self was bolstered by a time delay. This result suggests that engaging the self concept affects the processing of negative ingroup information.

Previous research on mnemic neglect also supports that engaging the self concept affects recall of self information. In these studies, participants demonstrate poorer recall memory for negative self traits compared to positive self traits on short term memory tasks (Sedikides et al., 2016). This effect is found to occur when negative self-information is central (i.e., important to one's self concept), threatening, and unchangeable. In Experiment 2, participants learned negative and positive information about their group and a competing outgroup. Thus, learned trait information was group, rather than self, specific. Further, the negative group traits were specifically chosen to be non-threatening and ambiguous. For example, while the trait "arrogant" is objectively less positive than the trait "warm", it may subjectively be construed as positive ("I am arrogant because I am smarter than them."). Such ambiguously negative traits may be more amenable to integration into one's self concept in the long term compared to trait information that clearly threatens one's positive self-concept. This is an empirical question for future research.

If negative traits become more incorporated into the self-concept over time, then this might produce behavior consistent with those negative traits. If so, it may be that negative traits evaluatively shift to be perceived as more positive when they are embodied by the ingroup. This may help to explain how negative behaviors (criminality; terrorism; bullying) can be committed by the ingroup or one's self, while one's positive ingroup identity and commitment can remain intact. Those negative behaviors can be consistent with a positive social identity if they are reconstrued as positive. Future research will benefit from investigating this hypothesis.

Overall, negative information appears to be more heavily relied upon when making judgments about social targets. In Experiment 1, inferences regarding members of the same group were based on negative, but not positive, information over time. In Experiment 2, judgments about the self reflected an increase on negative, but not positive, ingroup traits. This is also consistent with multiple phenomena. Groups seem to polarize over time. Over time, one might become a political conservative, for example, because one wants a smaller government. The stereotype of conservatives might be "cold" and over time, people may take on "cold" characteristics simply because they associate strongly with the group – even the negative group traits. Similarly, political liberals might over time self-describe as bleeding hearts, despite the fact they became liberals because they were concerned about marriage equality (as one potential example). Over time, individuals take on even the negative group traits. That does, however, take time. Presumably, one associates oneself with the group, and that implicit association leads one to associate the self with the traits.

Our model also predicts that negative group evaluations should become more accessible after time. In Experiment 1, target evaluations did not become more negative over time, as predicted. This is consistent with findings in Enge et al., who found trait evaluation generalizations, but not group valence effects over time. This is potentially important. Both sets of studies, however, used similar methodologies. It is possible that the lack of strong evaluative valence effects is due to the particular experimental paradigm. Future research will test more clearly if group evaluations also take time to generalize to new targets.

Typically, social psychological research finds a positivity bias towards one's self and ingroup. Our results are also consistent with that idea. In Experiment 1 there was a marginal effect of positive group information on judgments regarding members of the same group at the short delay test. Further, participants in Experiment 2 rated themselves more highly on positive outgroup traits at the short delay test. This pattern of results is consistent with many single session studies that demonstrate a positivity bias. Although positive information may be more immediately salient and remembered in the short term, consolidation tends to benefit negative information. This effect can only be uncovered with experimental methodologies that test memory for information over more than one time point.

Social cognitive research often studies memory associated person perception processes. Our research reported here suggests, however, that memory consolidation takes time and that memory is selective. The effects demonstrated in the present experiments emerged only after a time delay. To fully test how newly learned information impacts judgments about ourselves and others, this information must have time to become integrated with long-term memory structures. This requires testing participants over multiple sessions. Memory tests using single experimental designs produce a limited knowledge set of how memory works. There are few labs specifically testing the effects of long-term memory within these forms of controlled experimental paradigms (Forscher et al., 2017). Once one utilizes true memory processes beyond the single session, one identifies new and important directions for research.

Open practices

Cleaned data files and accompanying SAS programs for data analysis are publicly available at: https://data.mendeley.com/datasets/xyx2x7hhtm/1.

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