Priming as a Moderator of Lateral Attitude Change

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Abstract

The lateral attitude change (LAC) model posits that attitude change toward a focal object generalizes to similar, lateral objects. In two experiments (total $N = 331$), the authors tested the hypotheses that (1) priming a particular lateral object would increase generalization of attitude change to that (vs. another) lateral object, and (2) priming a particular attribute of a focal object would increase generalization of attitude change to lateral objects sharing (vs. not sharing) that attribute. The method used for changing focal attitudes was evaluative conditioning (EC); explicit and implicit attitudes were assessed via self-reports and the affect misattribution procedure, respectively. In Experiment 1, where pictures of dinosaurs were used as attitude objects and one of two lateral objects was primed, EC unexpectedly produced a trend toward a contrast effect on implicit focal attitudes. However, in line with Hypothesis 1, this contrast pattern generalized to implicit attitudes toward the primed (vs. non-primed) lateral object. In Experiment 2, where social groups were used as attitude objects and one of two attributes (gender or age) was primed, no effects of EC on focal attitudes were found. Additional analyses using contingency awareness, need for cognition, and preference for consistency as potential moderator variables yielded some interesting effects. Related studies as well as conceptual and methodological implications for LAC are discussed.

Keywords: affect misattribution procedure, evaluative conditioning, explicit attitudes, generalization, implicit attitudes, lateral attitude change, priming

Priming as a Moderator of Lateral Attitude Change

An attempt to change a person's evaluation of one attitude object (focal object) often produces a change of evaluation toward related attitude objects (lateral objects). Such lateral attitude change (LAC) has been conceptualized in a comprehensive model (Glaser et al., 2015) that describes the associative and propositional processes (see Gawronski & Bodenhausen, 2006) involved. It features two types of LAC that are called generalization and displacement. *Generalization* represents a pattern of explicit and implicit attitude change on both focal and lateral objects, whereas *displacement* represents a pattern of explicit attitude change only toward the lateral objects, without any accompanying explicit change on the focal object (for further discussion, see Linne, Glaser, Pum, & Bohner, in press).

In the current paper, we focus on generalization effects and, more specifically, on cognitive variables that are assumed to moderate such effects, as specified in a research proposal on LAC by Glaser and Bohner (2015, p. 9: Experiments 4 and 5). The basic idea guiding our research is that particular associations may be temporarily strengthened by priming, which will affect the size of generalization effects. The first moderator, to be examined in Study 1, is the relative cognitive accessibility of the lateral object: If two lateral objects' associations with a focal object are equally strong, but one lateral object is temporarily more highly accessible than the other, then a stronger generalization effect should be observed toward the more accessible object (Glaser & Bohner, 2015, p. 9). The second moderator, to be examined in Study 2, is the relative accessibility of specific attributes of the focal object: If one of two attributes of a focal object (e.g., age or gender for the attitude object "young women") is situationally more highly accessible, generalization should be stronger toward attitude objects that share the more accessible attribute (i.e., toward young people if age is more salient, and toward women if gender is more salient) (see also Spruyt et al., 2014).

In both studies, we will use evaluative conditioning (EC) as a means to change focal

attitudes. EC consists of pairing a neutral stimulus (which is called the conditioned stimulus or CS) with another stimulus that has an established evaluative meaning or valence (which is called the unconditioned stimulus or US). This causes the valence of the initially neutral CS to change toward the valence of the US. The EC phenomenon has been demonstrated by many studies across various domains (for reviews, see Hofmann et al., 2010; Walther & Langer, 2008).

We will assess both explicit attitudes via self-report and implicit attitudes via the affect misattribution procedure (AMP; Payne et al., 2005). The AMP relies on people's tendency to misattribute evaluative feelings to ambiguous stimuli. In a typical AMP trial, participants see a prime that represents an attitude object, which is followed by an evaluatively ambiguous, novel target (e.g., a Chinese ideograph). Participants are instructed to evaluate only the target and not to be influenced by the preceding prime. However, as people tend to misattribute their evaluative response (which is caused by the prime) to the target, we can use their evaluation of the target as an indirect measure of attitude toward the prime. An attractive feature of the AMP that distinguishes it from other implicit measures is that no categories (i.e., attitude objects) are explicitly mentioned in instructions to participants. Also, compared to other implicit measures, its reliability and discriminant validity are high (Bar-Anan & Nosek, 2014).

In Study 1, we examined whether the priming of one specific lateral attitude object would lead to a stronger generalization effect on the primed object compared to another lateral object. Thus, we hypothesized that an EC effect on a focal object would show stronger generalization to that lateral attitude object which had been primed prior to the EC procedure. Lateral objects had been pilot tested to ensure that they had equally strong associations to the focal object.

Study 1

The attitude objects in Study 1 were pictures of dinosaurs. One focal dinosaur (X) and

two lateral dinosaurs (Y1 and Y2) were used. These had been pilot tested to ensure that all three were of neutral valence at the outset of the experiment, and that each lateral object was perceived as equally similar to the focal object (see Boege et al., 2020).

Method

Participants and Design

120 students were recruited on the campus of Bielefeld University (78 female, 42 male; mean age = 21.1 years, range 18 to 30 years). Participants were randomly assigned to the conditions of a 2 (EC of focal object X: positive vs. negative) x 2 (priming of lateral object: Y1 vs. Y2) design, which resulted in 30 cases per condition. Participants received 4 Euros for their participation.

Procedure

The experiment was conducted on desktop computers in a university lab, using Inquisit 5 for Windows (see http://www.millisecond.com). After providing informed consent, participants completed the priming task, in which one of the two lateral dinosaurs (see Figure 1) was frequently shown. Subsequently, they were subjected to an EC procedure in which the focal dinosaur (see Figure 1) was paired with either positive or negative USs. Then participants' explicit attitudes and implicit attitudes toward the focal dinosaur, the lateral dinosaurs, as well as various distractor stimuli were assessed via rating scales and AMP responses, respectively. Finally, participants completed questionnaires assessing EC contingency awareness, knowledge of the AMP targets, need for cognition, and preference for consistency; they also reported their age, gender, and subject of study. Then they were thanked and debriefed.

Priming

During the priming procedure, participants watched a series of stimuli (consisting of lateral objects Y1 and Y2, various other pictures, and numbers). Their task was to press the space bar whenever a number appeared on the screen. They saw a red "X" whenever they did

not answer within 750 ms in order to guarantee continuing attention. Depending on condition, either lateral object Y1 or Y2 was primed by showing it ten times toward the end of the sequence, whereas the other lateral object was shown only twice.

Evaluative Conditioning

Two conditioned stimuli (CSs) were used in the EC procedure: a dinosaur (focal object X) and a butterfly (to be inversely conditioned). In the positive (negative) EC condition, the dinosaur was presented with four positive (negative) pictures, whereas the butterfly was presented with four negative (positive) pictures (USs). The CSs were each presented next to the positive or negative US for a duration of 2000 ms, with an intertrial interval of 500 ms. In each condition, each CS was paired with each of the appropriate USs twice. To reduce demand awareness, additional picture-pairings of geometrical shapes with numbers and other items (e.g., a chair) as well as a simple task (participants were asked to press the space bar whenever a triangle appeared) were introduced. In total, the EC procedure consisted of 24 (8 positive, 8 negative, 8 distractor) trials. All USs and distractor stimuli of Study 1 are shown in Figures 1 to 5.

Explicit Attitudes

To assess explicit attitudes, participants were asked to rate all stimuli (the focal dinosaur X, the lateral dinosaurs Y1 and Y2, the butterfly, and several distractor items) separately in a randomized order on a scale ranging from 1 = *very bad* to 9 = *very good*.

Implicit Attitudes

To assess implicit attitudes, an AMP (Payne et al., 2005) was used. In the AMP, the focal and lateral dinosaurs as well as control stimuli were used as primes, each being shown briefly before a Chinese ideograph (the target). Participants were asked to ignore the primes and to focus on and respond only to the Chinese symbol in each trial by deciding whether it appeared rather negative or positive to them (pressing "E" for negative and "I" for positive). In each trial, participants saw a fixation cross for 250 ms, then a prime for 75 ms, then a blank

screen for 125 ms, then the target for 100 ms, and finally a random pixel mask that remained on screen until the participant entered a response. The inter-trial interval was 250 ms. After 18 practice trials, implicit attitudes were assessed over 96 test trials. Half of these were control trials, whereas the other half featured the pictures of focal and lateral dinosaurs, which were each shown 16 times as primes. The proportion of positive responses for each prime served as an index of implicit attitude.

AMP Check, Contingency Awareness, and Suspicion Check

To ensure that the Chinese symbols used as targets in the AMP were ambiguous, participants were asked to indicate whether they are able to read Chinese symbols (1 = *yes*, 2 = *a little*, 3 = *no*). This led to the exclusion of one case where the answer was "yes" from all analyses involving AMP scores. To assess contingency awareness, participants were shown the focal attitude object (X) and asked to rate whether the pictures always displayed shortly after it were positive or negative, on a scale ranging from 1 = *certainly negative* to 7 = *certainly positive*. Finally, to assess general suspicion, participants were asked to write down what they thought the experiment was about. No participant guessed the hypotheses of the study.

Need for Cognition and Preference for Consistency

Participants completed German versions of a 14-item Need for Cognition (NFC) scale (Keller et al., 2000; item example: "Abstract thinking does not appeal to me" – reverse-coded) and a 16-item Preference for Consistency (PFC) scale (Heitland & Bohner, 2010; item example: "I'm uncomfortable holding two beliefs that are inconsistent."). For both scales, responses were made on a scale from 1 = *do not agree at all* to 7 = *totally agree*. After reverse-coding where appropriate, item responses were averaged to form an NFC score (Cronbach's alpha = .80) and a PFC score (Cronbach's alpha = .81).

Results

Explicit and Implicit Focal Attitudes

A 2 (EC) x 2 (priming) between-subjects ANOVA on explicit attitudes toward the focal dinosaur showed no effect of EC, all $F < 1$; the overall mean was 5.08 ($SD = 2.05$). A similar ANOVA on implicit attitudes also showed no significant effects, but a weak trend toward a main effect of EC that was opposite to our prediction, $F(1, 115) = 2.34$, $p = .129$, $\eta^2 = .020$. When the focal dinosaur was paired with positive USs, participants' implicit attitudes toward it tended to be less positive ($M = .556$, $SD = .185$) than when it was paired with negative USs ($M = .610$, $SD = .198$). Although this marginal contrast effect was unexpected and small, we went on to analyze whether it would generalize to lateral attitudes.

Explicit and Implicit Lateral Attitudes

To examine the effects of EC and priming on lateral attitudes, we conducted 2 x 2 mixed-model ANOVAs with EC as a between-subjects factor and priming status of lateral object (primed vs. non-primed) as a within-subjects factor. The ANOVA on explicit lateral attitudes revealed no significant effects, all $F < 1$. The ANOVA on implicit lateral attitudes showed a weak trend toward an interaction effect of EC and priming status, $F(1,115) = 2.51$, $p = .116$, $\eta^2 = .021$: The primed lateral object tended to elicit more positive AMP responses in the negative-EC condition ($M = .597$, $SD = .181$) than in the positive-EC condition ($M = .530$, $SD = .179$), whereas the AMP responses for the unprimed lateral object did not differ between the negative-EC condition ($M = .555$, $SD = .188$) and the positive-EC condition ($M = .538$, $SD = .173$). Thus, the previously observed trend toward a contrast effect of EC on implicit attitudes toward the focal object generalized to implicit attitudes toward the primed lateral object.

Moderation by Preference for Consistency

To explore the role of PFC as a potential moderator, PFC group was added as a factor, based on a median split ($Md = 4.94$): low-PFC ($M = 4.32$) vs. high-PFC ($M = 5.41$).

Explicit and Implicit Focal Attitudes. A 2 (EC) x 2 (priming) x 2 (PFC group) between-subjects ANOVA on focal explicit attitudes yielded a trend toward an interaction

effect of EC and PFC group, $F(1, 112) = 2.72$, $p = .102$, $\eta^2 = .024$, with a pattern of means suggesting an EC effect in the predicted direction for low-PFC participants ($M = 5.60$, $SD = 1.69$ vs. $M = 5.12$, $SD = 2.01$), and a contrast effect for high-PFC participants ($M = 4.40$, $SD = 2.43$ vs. $M = 5.21$, $SD = 1.91$). A similar ANOVA on focal implicit attitudes also yielded a marginal interaction effect of EC and PFC group, $F(1, 111) = 3.83$, $p = .053$, $\eta^2 = .033$, but opposite in direction to the explicit effect just reported: There was a trend toward a contrast effect of EC for low-PFC participants ($M = .515$, $SD = .186$ vs. $M = .633$, $SD = .199$), and no EC effect for high-PFC participants ($M = .598$, $SD = .177$ vs. $M = .583$, $SD = .196$). A mixed-model ANOVA using z-standardized implicit and explicit focal attitudes as levels of a within-subjects factor, and EC and PFC group as between-subjects factors, strongly confirmed the opposite trends on implicit and explicit attitudes, $F(1, 115) = 8.44$, $p = .004$, $\eta^2 = .068$ for the three-way interaction, all other $p > .12$. The overall pattern suggests that participants high in PFC may have consciously resisted being influenced by the EC procedure, whereas low-PFC participants formed associations opposite to the valence of EC stimulus pairings.

Explicit and Implicit Lateral Attitudes. A 2x2x2 mixed-model ANOVA on lateral explicit attitudes with EC and PFC group as between-subjects factors, and priming status of lateral object (primed vs. non-primed) as a within-subjects factor yielded no remarkable effects, all $p > .17$. A similar ANOVA on lateral implicit attitudes yielded a significant three-way interaction, $F(1, 115) = 4.65$, $p = .033$, $\eta^2 = .039$. Follow-up univariate ANOVAs run separately for the primed and non-primed lateral objects showed no effects for the non-primed object, all $F < 1$, but did show a significant main effect of EC *for the primed object*, $F(1, 115) = 4.17$, $p = .043$, $\eta^2 = .035$, that was qualified by a significant interaction effect of EC and PFC group, $F(1, 115) = 5.00$, $p = .027$, $\eta^2 = .042$: Whereas high-PFC participants appeared to be unaffected by EC ($M = .590$, $SD = .164$ and $M = .583$, $SD = .162$ for positive and negative EC, resp.), low-PFC participants showed a contrast pattern ($M = .471$, $SD = .176$ and $M = .609$, $SD = .198$ for positive and negative EC, resp.). Thus, when the level of participants' PFC

was taken into account, the pattern of implicit attitudes toward the primed lateral object (but not the non-primed lateral object) matched the pattern of implicit attitudes toward the focal object, suggesting that LAC may have occurred at an associative level.

Moderation by Need for Cognition

To explore the role of NFC as a potential moderator, NFC group was added as a factor, based on a median split (*Md* = 5.15): low-NFC (*M* = 4.59) vs. high-NFC (*M* = 5.83).

Explicit and Implicit Focal Attitudes. A 2 (EC) x 2 (priming) x 2 (NFC group) between-subjects ANOVA on focal explicit attitudes yielded only a (theoretically uninteresting) main effect of NFC group, $F(1, 112) = 8.54$, $p = .004$, $\eta^2 = .073$: High-NFC participants evaluated the focal dinosaur more positively ($M = 5.64$, $SD = 2.11$) than did low-NFC participants ($M = 4.56$, $SD = 1.87$); for all other effects, $F < 1$. A similar ANOVA on focal implicit attitudes yielded only a marginal interaction effect of EC and NFC group, $F(1, 111) = 3.58$, $p = .061$, $\eta^2 = .031$: Low-NFC participants showed a contrast pattern of EC ($M = .510$, $SD = .200$ and $M = .631$, $SD = .199$ for positive and negative EC, resp.), whereas high-NFC participants appeared unaffected by EC ($M = .602$, $SD = .159$ and $M = .586$, $SD = .198$ for positive and negative EC, resp.).

Explicit and Implicit Lateral Attitudes. A 2x2x2 mixed-model ANOVA on lateral explicit attitudes with EC and NFC group as between-subjects factors, and priming status of lateral object (primed vs. non-primed) as a within-subjects factor yielded a significant three-way interaction, $F(1, 116) = 5.19$, $p = .025$, $\eta^2 = .043$. For the primed lateral object, a follow-up univariate ANOVA yielded a marginal interaction effect of EC and NFC group, $F(1, 116) = 3.21$, $p = .076$, $\eta^2 = .027$: Low-NFC participants showed a contrast pattern of EC ($M = 4.67$, $SD = 1.83$ and $M = 5.56$, $SD = 1.79$ for positive and negative EC, resp.), whereas high-NFC participants showed a pattern in line with EC condition ($M = 5.90$, $SD = 2.23$ and $M = 5.50$, $SD = 2.05$ for positive and negative EC, resp.). For the non-primed lateral object, a follow-up univariate ANOVA yielded only a marginal main effect of NFC group, $F(1, 116) = 2.98$, $p =$

.087, η^2 = .025: High-NFC participants evaluated the non-primed dinosaur more positively (*M* = 5.66, *SD* = 2.15) than did low-NFC participants (*M* = 5.02, *SD* = 1.92).

A similar 2x2x2 mixed-model ANOVA on lateral implicit attitudes did not yield any significant effects, all $p > .13$. Overall, then, we may tentatively conclude that NFC moderated effects of EC on implicit attitudes toward the focal object as well as on explicit attitudes toward the primed lateral object in a parallel fashion. For both dependent variables, low-NFC participants exhibited contrast effects of EC, whereas the pattern for high-NFC participants was more in line with the EC valence. This may suggest that more extensive thinking is a requirement for EC effects to occur. In the next section, we test this possibility more explicitly by examining EC contingency awareness as another potential moderator variable.

Moderation by Contingency Awareness

Overall, participants' valence ratings of the USs shown with the focal dinosaur were better than chance (positive EC condition: *M* = 4.43, *SD* = 1.37; negative EC condition: *M* = 3.60, *SD* = 1.56), $t(118) = 3.10$, $p = .002$, $d = 0.57$. To explore the role of CA as a potential moderator, participants were classified as high-CA if their CA ratings matched their EC condition (i.e., were greater than 4 in the positive EC condition or less than 4 in the negative EC condition); otherwise, they were classified as low-CA.

CA group was then used as an additional factor in ANOVAs on focal and lateral explicit and implicit attitudes, following the same procedure as in the previous analyses. Although these ANOVAs yielded some theoretically uninteresting trends, none of the effects jointly involving EC condition and CA group were significant, all $p > .17$. Thus, contingency awareness did not moderate any effects of EC.

Discussion

The data of Study 1 yielded some support for the hypothesis that attitude generalization is moderated by relative accessibility of the lateral object. At least on an

implicit level, the trend toward an effect of EC on focal attitudes generalized more strongly to the primed (vs. non-primed) lateral attitude object. It remains unclear, however, why these focal and lateral trends were opposite to the valence of EC. Also, the initial analyses yielded no effects of EC on explicit attitudes toward either focal or lateral objects.

Exploratory analyses using, in turn, PFC, NFC, and CA as potential moderators showed some additional suggestive patterns. Whereas CA did not contribute any moderation of EC effects, both PFC and NFC did. The contrast pattern on implicit focal attitudes tended to be more pronounced for people who were low in PFC or low in NFC. Given that NFC and PFC not strongly correlated, $r(118) = -.156$, $p = .088$, these moderation patterns may reflect different underlying processes that are not yet well understood. Interestingly, similar moderation patterns of PFC and NFC were also found on attitudes toward the *primed lateral* object, but for PFC this was true at an implicit level and for NFC at an explicit level. Although, again, we have no explanation for why these somewhat divergent moderating effects emerged, they both suggest that LAC may have occurred for people low in PFC or NFC. These tentative implications warrant further investigation.

The absence of clearer EC effects might have been the result of unusual features of our EC procedure. US and CS pictures were presented side by side instead of in sequence; also, distractor pictures and a simultaneous additional task were used. Furthermore, the trend toward a contrast effect of EC could have been caused by USs that were too extreme, thereby inducing a comparison of CS to US rather than a valence transfer (cf. Unkelbach & Fiedler, 2016). To sum up, while some evidence for accessibility-based generalization was found, the results are very mixed and offer only tentative and qualified support for LAC in general.

Study 2

As planned in our research proposal, we set out to test a different kind of moderation by priming (see Glaser & Bohner, 2015, p. 9: Experiment 5) in Study 2. Specifically, we hypothesized that attitude generalization effects would be stronger if a particular attribute that

the lateral object shared with the focal object had previously been primed. The stimuli in Study 2 were pictures of people representing four groups: young women, old women, young men, and old men. The attributes to be primed were age and gender. Also, based on the discussion of Study 1, we used an EC procedure with sequential (instead of simultaneous) stimulus presentation.

Only after Study 2 had been conducted, we became aware of a very similar study conducted by Spruyt et al. (2014; Expt. 1) that tested the same main hypothesis and even used almost identical stimulus materials. However, they manipulated attention to one of two stimulus attributes *during* the EC procedure, whereas we did so by presenting different stimuli from the target categories in a priming task that *preceded* the EC procedure. With their simultaneous priming method, Spruyt and colleagues had found evidence for selective attitude generalization along the attended-to dimension at an explicit level, but not at an implicit level. Our Study 2 may be thus understood as a conceptual replication of their study using a different method that allowed for a clearer separation of priming and conditioning, which might be useful in producing implicit-level effects as well.

Method

Participants and Design

A total of 211 participants were recruited on the Bielefeld University campus (123 women, 87 men, 1 diverse; mean age = 22.10, age range: 16 to 40 years). Participants were randomly assigned to the conditions of a 2 (priming: age vs. gender) x 2 (EC valence: old positive / young negative vs. old negative / young positive) x 2 (focal stimuli: old women & young men vs. young women & old men) design, which resulted in 25 to 28 cases per condition.

The setup of Study 2 conditions is shown in Table 1. The concept of age was primed in Conditions 1, 3, 5, and 7; the concept of gender was primed in Conditions 2, 4, 6, and 8. In all conditions, participants evaluated twelve pictures of target persons, of which six served as

focal stimuli and six served as lateral stimuli. Only three of the six focal stimuli were used as conditioned stimuli in the EC. In Conditions 1 to 4, pictures of old women (OW1-6) and young men (YM1-6) served as focal stimuli, whereas pictures of old men (OM1-6) and young women (YW1-6) served as lateral stimuli. In Conditions 1 and 2, OW1-3 were conditioned positively, and YM1-3 were conditioned negatively. In Conditions 3 and 4, OW1-3 were conditioned negatively, and YM1-3 were conditioned positively. Conditions 5 to 8 mirrored the design of Conditions 1 to 4, with focal and lateral categories reversed. Thus, in Conditions 5 and 6, OM1-3 were conditioned positively, and YW1-3 were conditioned negatively. In Conditions 7 and 8, OM1-3 were conditioned negatively, and YW1-3 were conditioned positively.

Materials and Procedure

The experiment was presented on desktop computers using Inquisit 5 for Windows (see http://www.millisecond.com). After providing informed consent, all participants worked on the experimental tasks in the same order as described below. First, they performed the priming task.

Priming and Stimuli. Participants in the age priming conditions were instructed to decide repeatedly whether a person depicted on screen was older or younger than 50 years, while participants in the gender priming conditions were instructed to decide whether the person depicted was a woman or a man, by pressing one of two keys – letter "E" for "young" ("woman") and "I" for "old" ("man"). They then viewed 80 black and white pictures of old (over 70 years of age) and young (under 30 years of age) men and women (see Appendix A) in a randomized order. All pictures of persons were retrieved from the Minear Park Face Database (Minear & Park, 2004). Participants learned that they had 750 ms for their response in each trial, and a red "X" was displayed for 300 ms if a participant responded too slowly or pressed the wrong key. In the top left corner, the word "young" ("woman"), and in the top

right corner, the word "old" ("man") were continuously displayed on screen to remind participants of which category was assigned to which response key.

Evaluative Conditioning. Then participants completed the EC procedure. Crossing the *EC valence* and *focal stimuli* factors yielded the following conditions (see Table 1): positive EC of old women and negative EC of young men (Conditions 1 and 2), negative EC of old women and positive EC of young men (Conditions 3 and 4), positive EC of old men and negative EC of young women (Conditions 5 and 6), negative EC of old men and positive EC of young women (Conditions 7 and 8). From each stimulus category, three pictures were used as CSs in the EC procedure (OW1-3, YM1-3, OM1-3, YW1-3; see Appendix B), and three further pictures were only used in attitude assessment (OW4-6, YM4-6, OM4-6, YW4-6; see Appendix C). Four distractor stimuli were used as further CSs; these were black and white pictures of a hat, a shoe, a stool, and a chair (D1-4; see Appendix D).

USs were taken from the International Affective Picture System (Lang et al., 1999) and an Internet search. The focal objects in each condition were paired with the same USs (see Appendix E), which were either three positive (a flower field, a beach, a lake) or three negative pictures (rubbish in a landscape, an animal carcass, skulls). There were four additional USs that were only shown in combination with the distractor stimuli, two positive (grassland, a waterfall) and two negative (mould, cigarettes; see Appendix D).

Overall there were 30 trials, as each CS was shown three times; thus, there were 18 critical trials and 12 distractor trials. In each trial, the CS was displayed for 1500 ms, followed by a blank screen for 100 ms, followed by the US for 1500 ms. The inter-trial interval was 1500 ms.

Explicit Attitudes. After the EC procedure, explicit attitudes were assessed by showing participants one stimulus at a time (OW1-6, YM1-6, OM1-6, YW1-6, and the four distractors) and asking them to rate it on three 9-point semantic differential scales: *bad – good, unpleasant – pleasant*, and *ugly – beautiful*. These were averaged to form an explicit

attitude index from 1 = *negative* to 9 = *positive* for each stimulus, which was further averaged across the appropriate stimuli from each category (see Results section).

Implicit Attitudes. An AMP (Payne et al., 2005) was used to assess implicit attitudes. The face stimuli were used as primes, each being shown briefly before a Chinese ideograph (the target). Participants were asked to ignore the face stimuli and to focus on and respond only to the Chinese symbol in each trial by deciding whether it appeared rather negative or positive to them (pressing "E" for negative and "I" for positive). Presentation times and inter-trial interval were the same as in Study 1. First, there were 27 practice trials using as primes the 24 face stimuli (OW1-6, YM1-6, OM1-6, YW1-6) and a neutral grey rectangle, which was presented three times. The subsequent test sequence consisted of 135 trials. Fifteen were used as control trials where the neutral grey rectangle was the prime. Each face stimulus was presented five times, resulting in 120 critical trials. The percentage of positive reactions for each prime, aggregated across prime categories as appropriate, was used as an indicator of implicit attitudes.

Contingency Awareness. As in Study 1, participants first indicated whether they had noticed anything conspicuous in the presentation of pictures during the EC task. Then, each of the six CSs was shown individually, and participants were asked to rate whether the picture always displayed shortly after it was positive or negative, on a scale ranging from 1 = *certainly negative* to 7 = *certainly positive*. Ratings were averaged across the stimuli from each category (e.g., separately across YM and OW) and then aggregated into a single CA score ranging from 1 to 7, where higher values represented greater contingency awareness.

Need for Cognition and Preference for Consistency. The same 14-item scale as in Study 1 was used to assess NFC (Cronbach's alpha = .82), and a somewhat extended 18-item scale was used to assess PFC (Cronbach's alpha = .83).

AMP Check and Suspicion Check. To ensure that the Chinese symbols used as targets in the AMP were ambiguous, participants were asked to indicate whether they knew

the meaning of the symbols (*none*; *a few*; *most of them*; *all of them*). To assess general suspicion, participants were asked to write down any ideas they had about the aim of the study.

Finally, participants were thanked and debriefed. They received 4 Euros for their participation.

Results

Suspicion Check and AMP Check

None of the participants reported a correct suspicion about the study's purpose. A few participants had a vague idea about the EC sequence or about the priming, but none reported anything specific that would have required excluding their data from analysis. One participant indicated knowing most of the Chinese symbols in the AMP; this case was not included in analyses of implicit attitudes.

Focal Explicit Attitudes

To test effects of EC and priming on focal explicit attitudes, two separate mixed-model 2 (EC valence) x 2 (priming) x 2 (stimulus category) ANOVAs with repeated measurement on the last factor were conducted within each level of the *focal stimuli* factor (i.e., separately within Conditions 1 to 4 and Conditions 5 to 8). Dependent variables were the averaged ratings regarding those three stimuli that had been used in the EC procedure. In each of these analyses (see Tables 2 and 3 for condition means), a focal effect of the EC procedure would be reflected in an interaction effect of EC valence and stimulus category. However, neither of these effects was significant, both $F < 1$. Also, the priming manipulation did not affect explicit focal attitudes, either alone or in interaction with any of the other factors, all $p > .12$. As can be seen in Tables 2 and 3, attitude ratings were slightly above the scale midpoint in all cells, without any distinctive pattern.

Focal Implicit Attitudes

Analogous 2x2x2-ANOVAs were conducted for focal implicit attitudes (see Tables 4 and 5 for condition means). In neither of these analyses was the interaction effect of EC valence and stimulus category significant, both $F < 1$. For the conditions where old women and young men were the focal stimuli (Conditions 1 to 4), a marginal but theoretically uninteresting main effect of priming emerged, $F(1, 101) = 3.12$, $p = .081$. No other effects were found, all $F < 1$. As can be seen in Tables 4 and 5, the AMP judgments were moderately positive overall.

Taken together, the null findings regarding explicit and implicit attitudes toward focal stimuli lead to the conclusion that the EC procedure was not successful in changing attitudes at either the associative or the propositional level. Additional analyses, not reported here in detail, where all six stimuli from each focal category were used (including those not used in EC), yielded comparable null results for tests of the EC valence by stimulus category interaction, all $p > .29$.

Lateral Explicit Attitudes

Although the pattern of focal attitudes suggested that the EC procedure was unsuccessful, we nonetheless proceeded to analyze the pattern of lateral attitudes, again performing separate mixed-model ANOVAs within each level of the *focal stimuli* factor. Table 6 shows the condition means of explicit lateral attitudes toward OM1-6 and YW1-6 for the conditions where old women and young men were the focal stimuli (Conditions 1 to 4). Table 7 shows the condition means of explicit lateral attitudes toward OW1-6 and YM1-6 for the conditions where old men and young women were the focal stimuli (Conditions 5 to 8). Lateral attitude change along the primed category, in line with our theorizing, would be reflected in an interaction effect of stimulus category, priming, and EC valence. Specifically, we had hypothesized that in conditions where age (gender) was primed and where focal old (female) people were conditioned positively and young (male) people negatively, lateral old (female) people would be evaluated more positively than young (male) people. The

hypothesized interaction effect did not reach significance in either of the two analyses, both $F < 1$.

Some theoretically less interesting effects emerged. There were significant main effects of stimulus category in each analysis; overall, attitudes toward female stimuli were more positive than attitudes toward male stimuli (see Tables 6 and 7), $F(1, 101) = 33.77$, $p < .001$, $\eta^2 = .251$ and $F(1, 102) = 18.39$, $p < .001$, $\eta^2 = .153$, respectively. Furthermore, in those conditions where old men and young women were the focal stimuli (Conditions 5 to 8), an interaction effect of stimulus category and EC valence emerged, $F(1, 102) = 6.76$, $p = .011$, $\eta^2 = .062$. When OM were conditioned negatively and YW positively, attitudes toward OW were more positive ($M = 5.74$, $SD = 0.70$) and attitudes toward YM were less positive ($M = 5.11$, $SD = 0.85$) than when OM were conditioned positively and YW negatively (OW: $M = 5.48$, $SD = 0.81$; YM: $M = 5.33$, $SD = 0.79$). This effect was independent of the priming condition and thus does not speak to our hypotheses; for all other effects, $p > .10$.

Lateral Implicit Attitudes

2x2x2-ANOVAs were conducted for lateral implicit attitudes. As can be seen in Tables 8 and 9, the mean AMP judgments were again positive overall. The hypothesized interaction effect of stimulus category, priming, and EC valence did not reach significance in either ANOVA, both $F < 1$. Apart from a marginal main effect of priming in the conditions where old women and young men were the focal stimuli (Conditions 1 to 4), $F(1,101) = 3.53$, $p = .063$, suggesting more positive AMP scores under age priming than under gender priming (see Table 8), no further effects emerged, all $p > .17$.

Moderation Analyses

Although the main analyses showed no evidence for the hypothesized effects of EC on either explicit or implicit focal and lateral attitudes, we reasoned that EC effects might have been present for participants high in CA, and, based on assumptions of the LAC model on moderation, that lateral effects may be stronger at high levels of NFC or PFC. Therefore, we

conducted additional analyses using contingency awareness, need for cognition, and preference for consistency, respectively, as additional independent variables. Overall, the CA score was well above chance level (M = 5.00, SD = 1.27), $t(210) = 11.47$, $d = 0.79$. However, none of the moderation analyses yielded any diagnostic results in terms of the hypotheses tested. Therefore, they will not be reported in more detail.

Discussion

In Study 2, the EC procedure did not produce any effects on explicit or implicit focal attitudes. Therefore, the conditions for testing hypotheses about attitude generalization were not met. Although EC effects are reported to be generally strong (Hofmann et al., 2010), we were unable to reproduce such effects with pictures of human faces as attitude objects. Considering that Spruyt et al. (2014, Expt. 1), with a very similar design and stimuli, did find focal and lateral effects at the explicit level, it seems that the stimuli used and the EC procedure per se were suitable for testing LAC effects.

In contrast to our null results, Spruyt et al. (2014) also did find clear evidence for selective generalization of explicit attitudes toward those lateral groups that were similar on the primed attribute to the focal group; furthermore, their study yielded a similar pattern, but not quite significant, for implicit lateral attitudes (also measured by an AMP). Spruyt and colleagues' results on evaluative ratings and the AMP were dependent upon participants' CA, but this also cannot explain the difference to our results, as CA measures were well above chance levels in both Spruyt et al. and our own Study 2.

In light of the divergent findings, we should consider two somewhat problematic aspect of using gender and age of persons as attributes defining social groups as attitude objects. Both age and gender are natural and universal categories that are easily processed in person perception (e.g., Zhao & Bentin, 2008) and may be permanently accessible independent of experimental priming. Also, neither gender nor age is neutral in valence to begin with, as people usually evaluate women more positively than men (Eagly & Mladinic,

1989) and often hold negative stereotypes about the elderly (e.g., Haboush et al., 2012). Although randomization and counterbalancing of conditions in our research should have prevented any systematic effects of pre-existing stereotypes, they may nonetheless have increased noise in our data. Based on similar considerations, Spruyt et al. (2014, p. 90) conceptually replicated their first study, now using Gabor patches (abstract patterns that may vary in spatial frequency and orientation) as attitude objects in order to introduce completely novel stimuli and attributes. With these abstract stimuli they found clear evidence for the selective generalization effects at explicit and implicit levels, across two studies (Expts. 2 and 3).

General Discussion

Were conducted two studies designed to test selective generalization effects as predicted by the LAC model (Glaser et al., 2015). Specifically, we had hypothesized that explicit and implicit attitudes toward a focal object would generalize more strongly to a lateral object if this lateral object either was cognitively more accessible than another lateral object (Study 1) or shared an attribute with the focal object that was cognitively more accessible than an attribute shared by another lateral object (Study 2).

Study 1 provided qualified support for selective generalization effects mainly at the implicit level. However, as the direction of attitude change toward both the focal and lateral objects was opposite to the intended effects of our EC procedure, we should interpret these results with great caution. Further studies should thus be devoted to testing the hypothesis of selective attitude generalization to primed versus non-primed objects. Such studies might use different stimuli and rely on different methods of attitude change in order to influence focal attitudes in a strong and reliable way, thus creating more expedient conditions for the study of lateral effects. Such follow-up studies might also take into account individual-difference variables like PFC and NFC, in order to examine further their potential role as moderators of effects at either the explicit or the implicit level.

Study 2 failed to provide conclusive evidence even for focal attitude change, so that a test of downstream effects on the explicit and implicit evaluation of lateral objects remained elusive. However, work by other researchers has more clearly demonstrated that explicit and implicit attitudes toward a focal object may selectively generalize to lateral objects that share a primed attribute (Spruyt et al., 2014). These researchers obtained supportive findings with the same attitude objects and attributes as we had used (Expt. 1), as well as with more abstract objects and attributes (Expts. 2 and 3). Although we had not been aware of Spruyt and colleagues' research when we were planning and conducting our studies, we greatly appreciate their findings and take them as support and encouragement for some of the ideas that have been shaped by the LAC model.

In future studies, we will test more of the postulates and hypotheses that the LAC model has brought forward. In doing so, we will further rely on EC, but will also use other methods of attitude change, including persuasive messages.

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Table 1

Stimuli Serving as Focal and Lateral Attitude Objects and Stimuli Used for Evaluative Conditioning in the Eight Conditions of Study 2

	EC Valence			
	Old positive / Young negative		Old negative / Young positive	
Priming:	Age	Gender	Age	Gender
Focal Stimuli				
	Condition 1	**Condition 2**	**Condition 3**	**Condition 4**
OW&YM	OW/YM focal OM/YW lateral pos. EC: OW1-3 neg. EC: YM1-3	OW/YM focal OM/YW lateral pos. EC: OW1-3 neg. EC: YM1-3	OW/YM focal OM/YW lateral pos. EC: YM1-3 neg. EC: OW1-3	OW/YM focal OM/YW lateral pos. EC: YM1-3 neg. EC: OW1-3
	Condition 5	**Condition 6**	**Condition 7**	**Condition 8**
OM&YW	OM/YW focal OW/YM lateral pos. EC: OM1-3 neg. EC: YW1-3	OM/YW focal OW/YM lateral pos. EC: OM1-3 neg. EC: YW1-3	OM/YW focal OW/YM lateral pos. EC: YW1-3 neg. EC: OM1-3	OM/YW focal OW/YM lateral pos. EC: YW1-3 neg. EC: OM1-3

Note. OW = old women; YM = young men; OM = old men; YW = young women; pos. EC = Stimuli used as CSs paired with positive USs in evaluative conditioning; neg. EC = Stimuli used as CSs paired with negative USs in evaluative conditioning.

Table 2

Means and Standard Deviations of Explicit Focal Attitudes Toward Old Women (OW1 to OW3) and Young Men (YM1 to YM3) by EC Valence and Priming in Study 2 (Conditions 1 to 4)

	EC Valence			
	OW positive / YM negative		OW negative / YM positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OW	5.49 (0.95)	5.35 (1.30)	5.72 (1.32)	5.52 (1.24)
YM	5.59 (1.12)	5.58 (0.85)	5.75 (0.91)	5.58 (0.99)

Note. Mean ratings of focal target stimuli on a scale from 1 to 9. Higher values represent more positive attitudes. Standard deviations in parentheses.

OW = old women; YM = young men.

Table 3

Means and Standard Deviations of Explicit Focal Attitudes Toward Old Men (OM1 to OM3) and Young Women (YW1 to YW3) by EC Valence and Priming in Study 2 (Conditions 5 to 8)

	EC Valence			
	OM positive /YW negative		OM negative / YW positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OM	6.02 (0.77)	5.48 (0.80)	5.86 (0.94)	5.68 (0.79)
YW	5.75 (1.09)	5.56 (1.13)	5.56 (0.94)	5.72 (0.90)

Note. Mean ratings of focal target stimuli on a scale from 1 to 9. Higher values represent more positive attitudes. Standard deviations in parentheses.

OM = old men; YW = young women.

Table 4

Means and Standard Deviations of Implicit Focal Attitudes Toward Old Women (OW1 to OW3) and Young Men (YM1 to YM3) by EC Valence and Priming in Study 2 (Conditions 1 to 4)

	EC Valence			
	OW positive /YM negative		OW negative / YM positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OW	63.21 (20.20)	56.05 (19.50)	61.03 (21.22)	57.87 (18.83)
YM	62.96 (17.38)	50.62 (24.76)	61.28 (23.33)	57.33 (23.33)

Note. Percentage of positive AMP responses to focal target stimuli. Standard deviations in parentheses.

OW = old women; YM = young men.

Table 5

Means and Standard Deviations of Implicit Focal Attitudes Toward Old Men (OM1 to OM3) and Young Women (YW1 to YW3) by EC Valence and Priming in Study 2 (Conditions 5 to 8)

	EC Valence			
	OM positive /YW negative		OM negative / YW positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OM	55.56 (22.57)	57.28 (13.62)	50.26 (16.25)	55.73 (16.65)
YW	54.32 (19.72)	55.56 (19.30)	57.44 (18.96)	53.60 (19.67)

Note. Percentage of positive AMP responses to focal target stimuli. Standard deviations in parentheses.

OM = old men; YW = young women.

Table 6

Means and Standard Deviations of Explicit Lateral Attitudes Toward Old Men (OM1 to OM6) and Young Women (OW1 to OW6) by EC Valence and Priming in Study 2 (Conditions 1 to 4)

	EC Valence			
	OW positive /YM negative		OW negative / YM positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OM	5.26 (1.04)	4.77 (0.66)	5.21 (0.91)	5.06 (1.00)
YW	5.57 (0.54)	5.44 (0.85)	5.69 (1.03)	5.80 (0.77)

Note. Mean ratings of focal target stimuli on a scale from 1 to 9. Higher values represent more positive attitudes. Standard deviations in parentheses.

OW = old women; YM = young men; OM = old men; YW = young women.

Table 7

Means and Standard Deviations of Explicit Lateral Attitudes Toward Old Women (OW1 to OW6) and Young Men (OM1 to OM6) by EC Valence and Priming in Study 2 (Conditions 5 to 8)

	EC Valence			
	OM positive /YW negative		OM negative / YW positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OW	5.55 (0.78)	5.42 (0.84)	5.75 (0.68)	5.73 (0.74)
YM	5.43 (0.70)	5.23 (0.87)	5.07 (0.87)	5.15 (0.84)

Note. Mean ratings of focal target stimuli on a scale from 1 to 9. Higher values represent more positive attitudes. Standard deviations in parentheses.

OM = old men; YW = young women; OW = old women; YM = young men.

Table 8

Means and Standard Deviations of Implicit Lateral Attitudes Toward Old Men (OM1 to OM6) and Young Women (YW1 to YW6) by EC Valence and Priming in Study 2 (Conditions 1 to 4)

	EC Valence			
	OW positive /YM negative		OW negative / YM positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OM	60.86 (16.37)	53.09 (16.66)	60.26 (17.91)	54.67 (21.32)
YW	61.60 (20.11)	52.59 (17.86)	63.08 (21.93)	60.00 (19.46)

Note. Percentage of positive AMP responses to lateral target stimuli. Standard deviations in parentheses.

OW = old women; YM = young men; OM = old men; YW = young women.

Table 9

Means and Standard Deviations of Implicit Lateral Attitudes Toward Old Women (OW1 to OW6) and Young Men (YM1 to YM6) by EC Valence and Priming in Study 2 (Conditions 5 to 8)

	EC Valence			
	OM positive /YW negative		OM negative / YW positive	
Priming	Age	Gender	Age	Gender
Stimulus Category				
OW	55.56 (20.69)	54.69 (14.86)	54.87 (16.23)	55.29 (14.44)
YM	64.20 (18.25)	56.79 (15.04)	52.95 (15.18)	58.53 (13.41)

Note. Percentage of positive AMP responses to lateral target stimuli. Standard deviations in parentheses.

OM = old men; YW = young women; OW = old women; YM = young men.

Figure 1

Focal Stimulus X (Left) and Lateral Stimuli Y1 and Y2 Used in Study 1

Figure 2

Stimulus That Was Conditioned Inversely to Stimulus X in Study 1

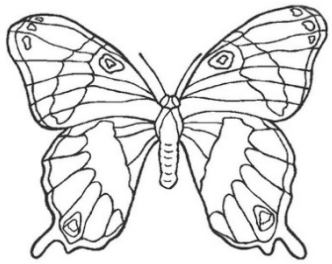


Figure 3

Negative Unconditioned Stimuli Used in Study 1




Figure 4

Positive Unconditioned Stimuli Used in Study 1

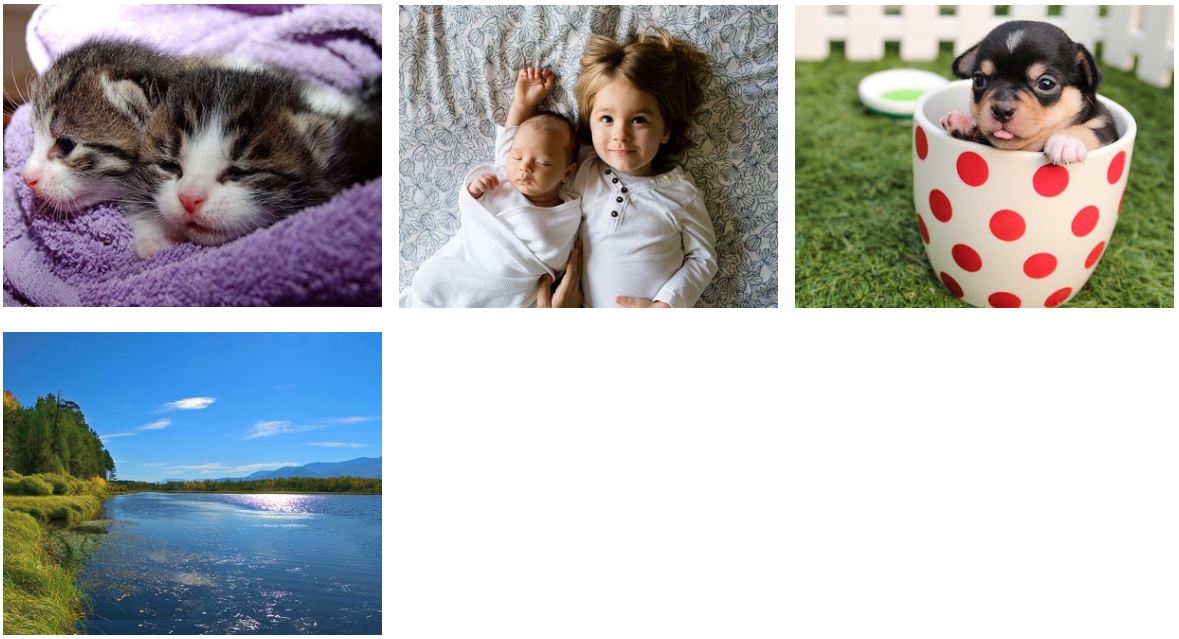
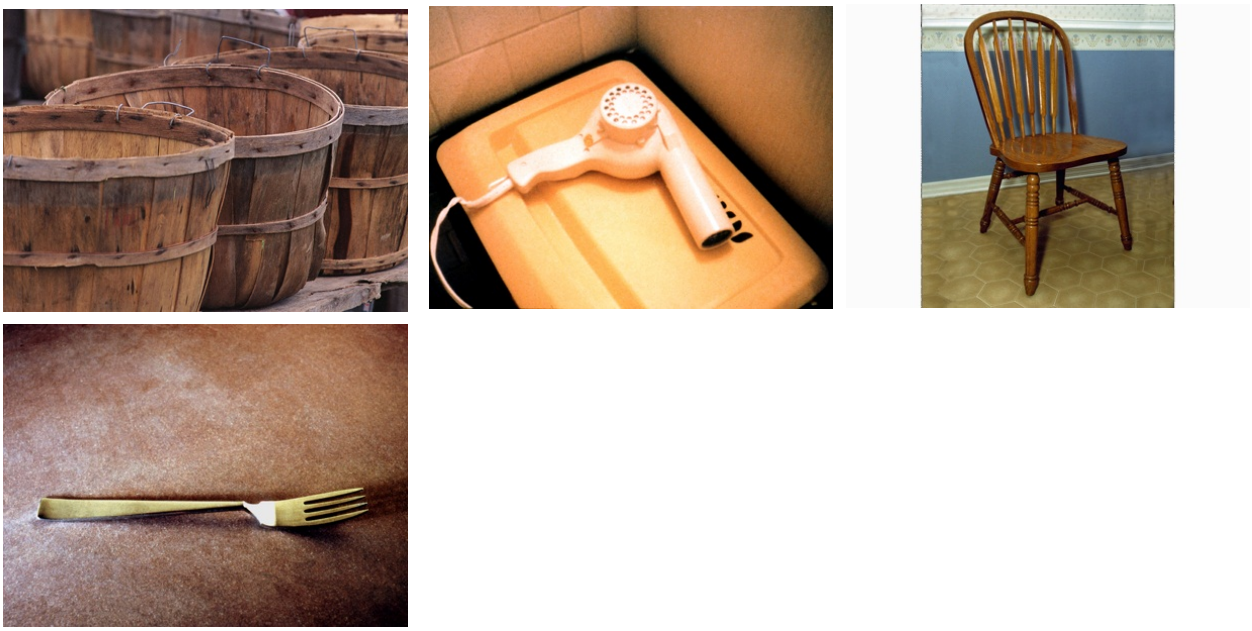


Figure 5

Distractor Stimuli Used in Study 1



Appendix A: Pictures Used as Priming Stimuli in Study 2

Appendix B: Pictures Used as Conditioned Stimuli in Study 2

(OW = Old Women; YW = Young Women; OM = Old Men; YM = Young Women)

OW1 

OW2 

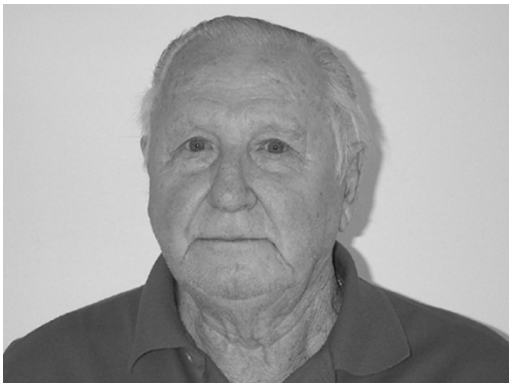
OW3 

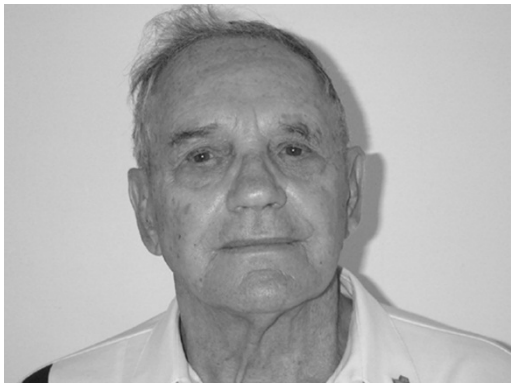
YW1 

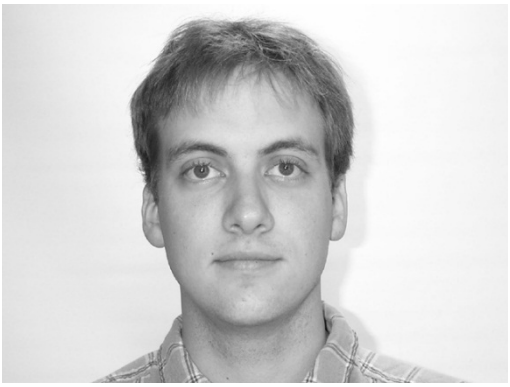
YW2 

YW3 

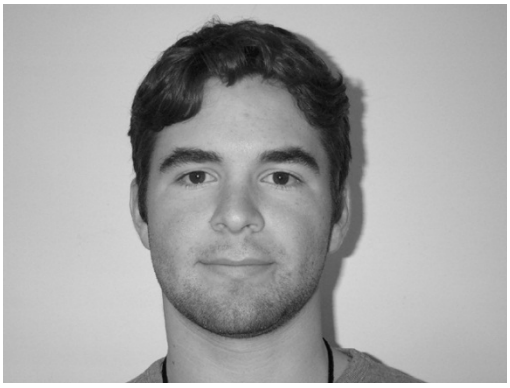
OM1 

OM2 

OM3 

YM1 

YM2 

YM3 

Appendix C: Pictures Not Used as Conditioned Stimuli in Study 2

(OW = Old Women; YW = Young Women; OM = Old Men; YM = Young Women)

OW4 

OW5 

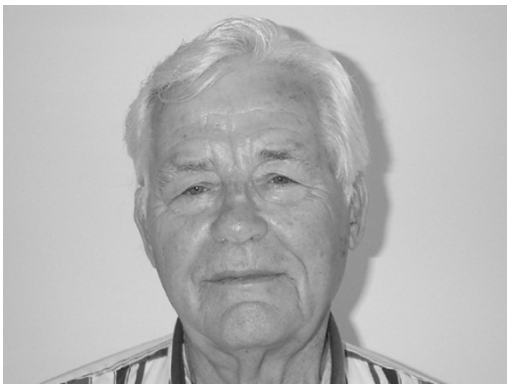
OW6 

YW4 

YW5 

YW6 

OM4 

OM5 

OM6 

YM4 

YM5 

YM6 

Appendix D: Pictures Used as Distractor Stimuli in Study 2

Figure D1

Conditioned Distractor Stimuli

Figure D2

Positive Unconditioned Distractor Stimuli

Figure D3

Negative Unconditioned Distractor Stimuli

Appendix E: Pictures Used as Unconditioned Stimuli in Study 2

Figure E1

Positive Unconditioned Stimuli

Figure E2

Negative Unconditioned Stimuli