

An Inkblot for Sexual Preference: A semantic variant of the Affect Misattribution Procedure

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in press, Cognition and Emotion

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Abstract

A newly developed Semantic Misattribution Procedure (SMP), a semantic variant of the Affect Misattribution Procedure (AMP), was used in three studies as an indirect measure of sexual interest. Using a known-group approach, homosexual men (Study 1 & 2), heterosexual men (Study 1 to 3) and heterosexual women (Study 3) were asked to guess the meaning of briefly presented Chinese ideographs as “sexual” or “not sexual”. The ideographs were preceded by briefly presented primes depicting male and female individuals of varying sexual maturity. As hypothesized, the frequency of “sexual” responses increased after priming with pictures of individuals of the preferred sex and increasing sexual maturation. The SMP showed satisfactory reliability and convergent validity as indicated by correlations with direct and two indirect measures of sexual interest. In two further studies, the hypothesized pattern was replicated whereas a standard AMP with the identical prime stimuli did not produce this result. The potential usefulness of semantic variants of the AMP is discussed.

Keywords: Affect Misattribution Procedure, sexual preference, indirect measure, semantic priming

The Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005) is a relatively new indirect method for assessing implicit attitudes. Participants are instructed to rate the pleasantness of Chinese ideographs that are briefly displayed (e.g., 75ms) and then masked. The evaluation of the ideographs is influenced by the valence of the preceding primes: positive primes elicit more positive and negative primes more negative evaluations, even if participants are explicitly asked to ignore the primes. Unlike previously used affective priming paradigms of this type (e.g., Murphy & Zajonc, 1993), the paradigm introduced by Payne et al. (2005) tends to produce both robust priming effects at the group level and reliable scores reflecting individual differences. The latter is particularly relevant as one of the most critical issues for most indirect measures is their low reliability in terms of internal consistency (e.g., De Houwer & De Bruycker, 2007; Gawronski, Deutsch, & Banse, in press). One of the few exceptions is the Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998) that owes its frequent usage at least in part to its satisfactory reliability.

Despite its reliance on explicit responses to the Chinese ideographs (as opposed to response interference used by most other indirect measures; Gawronski, Deutsch, LeBel, & Peters, 2008), it has been repeatedly shown that the AMP indeed measures the implicit attitude toward the preceding prime. Payne and colleagues (2005; Experiment 6) showed that the relation between explicit attitudes toward African Americans and the score in a race AMP was moderated by the motivation to control prejudiced reactions. In the same vein, Imhoff and Banse (2009) found stronger correlations between an anti-Semitism AMP and self-reported anti-Semitism in a bogus pipeline condition than a control condition: when participants were led to believe that their attempts to control their prejudiced responses would be detected by a bogus pipeline, their explicit self-ratings correlated more with their indirectly measured AMP score for anti-Semitism. This evidence and its general psychometric properties put the AMP in a prominent position among the numerous indirect measures.

The standard AMP procedure is designed to reflect participants' evaluation of primes as either positive or negative. Payne et al. (2005) postulate that automatic affective reactions to primes are misattributed to the subsequently presented target ideographs. In the present research we sought to investigate whether the AMP instruction can be adapted from a pleasantness evaluation of the ideographs to guessing their semantic content, thus turning it into a measure beyond mere evaluation. Other implicit measures like the IAT have already been shown to be applicable to a broad range of concepts not restricted to mere evaluation (e.g., self-concept IATs; e.g., Asendorpf, Banse, & Mücke, 2002). Preliminary evidence that this may also be possible for the AMP comes from recent findings by Deutsch and Gawronski (2009, Experiment 4). They reported meaningful mean differences in an adapted AMP for assessing animacy vs. inanimacy. However, in such a normative approach based on a main effect, the important issue of how reliably the measure taps into individual and group differences cannot be estimated as individuals cannot be assumed to differ meaningfully and consistently in the extent to which they perceive objects as animate or inanimate. If a semantic adaption of the AMP could be shown to measure *individual differences* in domains other than mere evaluation, the range of applications could potentially be dramatically broadened.

In exploring the boundaries of the AMP, we also sought to address a second issue that is a drawback of the IAT. As the logic of the IAT builds on the comparative strength of associations between two bipolar dimensions, not only the attribute dimension (e.g., good vs. bad) is inherently restricted to two opposites on one dimension. The same restriction is also true for the target concept dimension, i.e. the to-be-evaluated dimension (e.g., Black vs. White). In contrast, the number of prime categories in priming procedures is theoretically infinite and allows mapping single or multiple constructs (e.g., White vs. Black. vs. Asian vs. Hispanic) on a commonly bipolar dimension (e.g., pleasant vs. unpleasant) in a non-relative

manner. We sought to exploit this possibility in a design that allows for the possibility to measure meaningful priming responses to more than three categories.

One potential area of application is the indirect assessment of sexual preference, which has sparked increasing research interest over the last years. Indirect measures offer promising assessment alternatives to self-report instruments both in general sex research (Imhoff, Schmidt, Nordsiek, Luzar, Young, & Banse, in press; Israel & Strassberg, 2009; Snowden, Wichter, & Gray, 2008) and in the domain of forensic psychology (Gress & Laws, 2009; Thornton & Laws, 2009) in which respondents cannot be assumed to report their deviant sexual interests truthfully because such disclosure may be embarrassing, socially undesirable, or have legal implications. In the forensic context, latency-based measures like Viewing Time and the IAT have been successfully used to detect specific sexual interest above and beyond explicit self-reports (Banse, Schmidt, & Clarbour, 2010). With these indirect measures of sexual preference readily available, convergent validity of a new measure can be tested not only against direct self-report measures, but also with respect to conceptually very different indirect approaches.

Study 1

In close analogy to the AMP, the *Semantic Misattribution Procedure* (SMP) consists of a set of prime pictures that are followed by Chinese ideographs and a pattern mask. In contrast to the standard AMP, participants do not rate the pleasantness of the ideograph but guess the meaning of the ideograph (in this case whether it has a sexual meaning or not). Male and female individuals ranging in sexual maturation from prepubescent children to fully mature adults served as primes that should evoke differential activation of the concept 'sexual' depending on participants' sexual preference. We hypothesized that a) sexually mature adults will generally lead to a stronger activation of the sexuality concept, b) that this

should be particularly pronounced for prime pictures showing sexually mature persons of the preferred sex and c) that nude stimuli will evoke a stronger activation of “sexual” than stimuli in bathing suits. Adopting a known group approach, the SMP is validated with hetero- and homosexual men because these groups have contrasting sexual preferences that are not confounded by sex differences. Previous research has shown that men generally produce clearer patterns and show more category specificity on indirect measures of sexual interest than women (Chivers, Rieger, Latty, & Bailey, 2004; Gress & Laws, 2009).

Method

Participants. A sample of 35 heterosexual and 24 homosexual men was recruited using posters and via online forums for a study on sexual attractiveness. Participants were informed that the experiment would involve measures of sexual interest, including photographs depicting explicit nudity, that they could withdraw from participation at any time without disadvantage, and that all data were collected anonymously. Written informed consent was obtained prior to the experiment. Participants received 5 Euro (approximately \$6 US) for participation. The age of participants ($M = 24.76$ years, $SD = 5.22$) was independent of sexual orientation, $t(57) = 1.52, p > .10$.

Stimuli and Materials. The target stimuli were selected from the Not Real People (NRP) picture Set (Pacific Psychological Assessment Corporation, 2004). This picture set includes images of male and female individuals belonging to five categories of sexual maturation (corresponding to the typology of Tanner, 1978) either in bathing suits or nude. Sexual maturation ranged from clearly prepubescent individuals (Tanner 1) to clearly sexually mature individuals (Tanner 5). This allowed testing whether this relatively fine-grained differentiation of increasing sexual maturation could also be picked up by the SMP. The procedures are described in the order that they were presented to study participants.

Semantic Misattribution Procedure. Participants were instructed to intuitively guess the meaning of the Chinese ideographs (sexual meaning, e.g., “orgasm” vs. no sexual meaning, e.g., “river”) without allowing the primes to bias their decisions. More specifically participants were informed that although we assume them not to know the actual meaning of the ideographs we were interested in how well they could tell by intuition whether an ideograph has a sexual connotation or not. Paralleling the instruction provided by Payne et al. (2005) participants were further warned that the ideograph were preceded by short real life images and that they should try their absolute best not to let the real-life images bias their intuition about the meaning of the ideographs. The primes were presented for 75ms, followed by a blank screen for 125ms, and the Chinese ideographs for 750ms (corresponding to the paradigm of Exp. 4 in Payne et al., 2005). Then a monochromatic noise mask was presented on the screen until participants completed their ratings by pressing either the left response key (“sexual meaning”) or the right response key (“no sexual meaning”). The SMP consisted of 160 trials in which all 80 primes (40 clothed, 40 nude) were displayed once in two consecutive blocks, followed by 80 randomly chosen Chinese ideographs taken from the original set used by Payne et al. (2005).

Viewing Time Measure. Participants were instructed to rate the sexual attractiveness of 20 individuals (two target stimuli per Sexual Maturation x Sex combination) on a rating scale (1 “sexually not attractive” to 5 “sexually very attractive”), while their response time was recorded unobtrusively. Previous research has shown a robust effect of longer latencies for sexually preferred targets (Imhoff et al., in press) and incremental validity of viewing time scores above and beyond self-reports (Banse et al., 2010).

Implicit Association Test. An IAT (Greenwald et al., 1998) was adapted to assess implicit sexual preference for men versus women (Banse et al., 2010). Five words were used for the two attribute categories “sexually exciting” (orgasm, erotic, exciting, lustful, sensual)

and “not exciting” (boring, indifferent, dull, unexciting, bland). For the target category, five pictures of clothed men and women were used from the same picture set as the primes in the SMP. The critical blocks 3 (unexciting/male vs. sexually exciting/female) and 5 (unexciting/female vs. sexually exciting/male) consisted of 80 trials each. This relatively large number of trials was chosen to have a maximally reliable measure of individual differences.

Explicit Sexual Interest Questionnaire. The ESIQ (Banse et al., 2010), consisting of 40 items about sexual fantasies and behaviors, was used as a measure of explicit sexual interest. Participants had to indicate whether or not they have engaged in the described sexual fantasies or behaviors regarding individuals of the four target categories: men, women, prepubescent boys, and prepubescent girls.

Results

The frequency of “sexual” responses to Chinese ideographs was averaged according to the type of prime picture and subjected to a 2 (Target Sex) x 5 (Target Sexual Maturation) x 2 (Participant Sexual Orientation) mixed-model ANOVA. It was predicted that the frequency of assuming a sexual meaning for Chinese ideographs would increase in both homosexual and heterosexual respondents after priming with individuals of the preferred target sex and with increasing target sexual maturation. This pattern was confirmed by the significant Target Sex x Sexual Orientation interaction, $F(1, 57) = 26.30, p < .001, \eta_p^2 = .32$, and further qualified by the three-way Target Sexual Maturation x Target Sex x Sexual Orientation interaction, $F(4, 54) = 3.10, p < .03, \eta_p^2 = .19$. In addition, the tendency to guess sexual meaning generally increased with increasing Target Sexual Maturation, $F(4, 54) = 8.60, p < .001, \eta_p^2 = .39$, and was stronger after priming with nude as compared to non-nude stimuli, $F(1, 57) = 7.55, p < .01, \eta_p^2 = .12$. The nudity effect was only qualified by an interaction with Target Sex,

indicating a greater effect of nudity for female stimuli, $F(1, 57) = 4.17, p < .05, \eta_p^2 = .07$, independent of sexual orientation.

Follow-up group-wise analyses revealed a linear trend of Target Sexual Maturation for the preferred stimulus sex for heterosexual, $F(1, 34) = 15.24, p < .001, \eta_p^2 = .31$, as well as for homosexual respondents, $F(1, 23) = 13.78, p < .001, \eta_p^2 = .38$. Interestingly, such a linear trend of stimulus sexual maturation was also significant for the non-preferred sex category for both heterosexual, $F(1, 34) = 7.60, p < .01, \eta_p^2 = .18$, and homosexual respondents, $F(1, 34) = 6.32, p < .02, \eta_p^2 = .22$. Although somewhat weaker, stimuli of the non-preferred sex also elicited more “sexual” responses with increasing sexual maturity.

Reliability. To test whether participants reacted to the relevant prime categories (sexually mature targets) in a consistent way, individual effect scores were calculated. To this end the average frequency of “sexual” responses after male primes was subtracted from the average frequency after female primes for trials with sexually mature targets (Tanner 4 and 5) for each block separately. The internal consistency of the difference score based on two effect scores was $\alpha = .66$. The two blockwise effect scores were averaged to create the SMP index of sexual preference¹.

Criterion Validity. To estimate the SMP’s ability to differentiate between the two groups with contrasting sexual preference the individual effect scores were included in a binary logistic regression with sexual preference as criterion. Results showed 81.4% of the respondents were correctly classified, $\chi^2(8) = 32.27, p < .001, Nagelkerkes R^2 = .57$, corresponding to an area under the curve (AUC) of .90 in a receiver-operator-characteristic (ROC) analysis with the predicted probabilities from the regression as decision criterion.

Convergent Validity. To create a comparable index of sexual interest across all three indirect and the direct measures, an index of sexual preference for women over men was

calculated for each measure. In analogy to the measure created for the SMP as reported above, the same sexual interest index was calculated for the Viewing Time measure. The mean latencies for trials with male individuals of the Tanner classes 4 and 5 were subtracted from the corresponding female primes, $\alpha = .67$. For the IAT, no transformation was necessary because the Women-Men IAT is inherently a relative measure of sexual preference. The d-score was calculated following Greenwald, Nosek, and Banaji (2003) except that only trials in which participants gave correct answers were included, $\alpha = .92$. The corresponding difference scores for explicit self-report scales also showed satisfactory reliability, $\alpha = .99$. The SMP index of sexual preference for women over men showed convergent validity as indicated by significant and substantial correlations with both indirect measures based on Viewing Time and the IAT, as well as with the direct measure of relative sexual preference (all $r > .40$, see Table 1). Furthermore, all indirect measures were significantly intercorrelated and highly correlated with the explicit measure. The unusually high explicit-implicit correlations (particularly for the IAT, $r = .93$) most likely result from the research design: as a sampling strategy we recruited two known groups with contrasting sexual preferences, thereby creating a bipolar distribution of (explicit and most likely also implicit) sexual interest. Previous research has found comparably high correlation for a sampling of homosexual and heterosexual men (between $r = .72$ and $r = .80$; Snowden et al., 2008).

Discussion

The SMP was found to be a reliable and valid measure of interindividual differences in sexual preference. The convergent validity of the SMP was indicated by significant and substantial positive correlations with one direct and two conceptually different indirect measures of sexual preference. So far, very few studies have shown a comparably high convergent validity of three conceptually different indirect measures. Furthermore, the SMP showed good criterion validity in a known group study with contrasting sexual preferences. For hetero- and

homosexual men, prime stimuli of the preferred sex were followed by more “sexual” responses with increasing prime stimulus sexual maturation. Interestingly and similar to Viewing Time measures (Imhoff et al., in press), a similar but weaker linear sexual maturity effect also emerged for the non-preferred sex, suggesting that the adulthood of primes seems to be automatically associated with sexuality even if the stimulus sex does not correspond to the sexual preference of the participant. This may be due to either a greater personal automatic association of the non-preferred with sex (“Even though my sexual preference is directed primarily at women, I still find sexually mature persons more sexual than children”). Alternatively, this effect may also reflect general knowledge that the target is, or is not, a person for whom sexuality is relevant. Our data do not allow disentangling the two alternative interpretations. In both cases, a lack of either linear sexual maturation effect could be informative for assessing deviant sexual interest in children. If the first explanation is true this trend would imply an at least equally strong association of the concept sexual with children as with adults. If the latter explanation based on general knowledge is true, a lack of an effect of sexual maturation for pedophiles might reflect a cognitive distortion containing the belief that sex is relevant for children.

Are the results of Study 1 really specific for sexual interest? As an alternative, it is conceivable that sexually preferred primes may evoke more pleasant feelings and these feelings of pleasantness may lead participants to guess an ideograph has a sexual meaning – as sexuality is generally seen as pleasant. The question thus is whether the SMP is indeed a different or at least a better measure than a standard AMP. To address this question, we conducted a second study with hetero- and homosexual men in which all participants completed a similar SMP as in Study 1 as well as a standard AMP with identical primes.

Study 2

A second study was conducted with hetero- and homosexual male participants to a) replicate the basic effect found in Study 1, and b) to test whether the change from pleasantness (standard) AMP to the semantic SMP did indeed turn the task into a more specific or better measure of sexual preference rather than prime pleasantness. We hypothesized that both the AMP and the SMP should show the highest scores (pleasantness or sexual meaning respectively) for adult targets of the preferred sex, as sexual attraction is most likely correlated with pleasantness. However, if the adaptation of the AMP to assess semantic meaning is successful (and not just a complicated form to tap into merely evaluative processes), the SMP should reflect sexual interest better than the AMP.

Method

Participants. Hetero- and homosexual men were recruited for an online study via special interest forum and newsgroups. The final sample consisted of 139 men ranging in age from 17 to 70 years ($M = 33.86$, $SD = 14.24$; 7 missing values).

Misattribution Procedures. The complete NRP picture set (clothed) was divided in Set A and Set B, each containing four exemplars for each Target Sexual Maturation (5) x Target Sex (2) combination. One set was used for each of the two misattribution procedures and each stimulus was presented twice. Both sets were counterbalanced across both misattribution procedures. The SMP was essentially the same as in Study 1 and consisted of 80 trials in which each stimulus of one subset was presented twice. For the AMP, only the task changed. Instead of guessing whether the Chinese ideograph had a sexual meaning, participants were asked to rate whether the ideograph was more or less pleasant than the average ideograph.

Explicit Sexual Preference. Two items were created to tap into sexual interest. Participants were asked to indicate the degree to which their sexual behavior and their sexual fantasies were directed towards men or women using a scale ranging from 1 (“exclusively directed at men”) to 5 (“exclusively directed at women”).

Procedure. The study was conducted online and participants were led to a website where they had to click on a link to start the experiment. Participants first completed one of the misattribution procedures before completing the second task and filling in the short explicit measure of sexual interest. Presentation of variants of the misattribution procedure was counterbalanced across the whole sample.

Results

Preliminary analyses. The two explicit sexual preference items were highly correlated, $r = .96$, and thus combined to a single measure. Six participants fell in the mid-range of the scale between 2 and 4, indicating a bisexual orientation; they were excluded from further analyses. The remaining 66 homosexual and 67 heterosexual participants did not differ in age as a function of their sexual orientation, $t(124) = 1.09, p = .28$. In the next step, data from both misattribution tasks were screened for zero standard deviations. Three participants always pressed the same key in the SMP and eight participants did so in the AMP. These participants' data were removed from all further analyses that included the task in which their data showed no variance. To test for potential order effects, an omnibus ANOVA with the between-subjects factors Participant Sexual Orientation (homosexual vs. heterosexual) and Task Order (AMP first vs. SMP first) and the within-subject factors Target Sexual Maturation (Tanner categories 1 to 5), Target Sex (male vs. female) and Task (AMP vs. SMP) was conducted. The order factor significantly interacted with the three-way interaction of Target Sex by Participant Sexual Orientation by Task $F(1, 120) = 4.49, p = .04, \eta_p^2 = .04$. This effect indicates that the difference between the two tasks to detect the hypothesized interaction of target sex and participant's sexual orientation was dependent on the task order. As this indicated that the first task had an influence on the second task, only the first task was analyzed for each participant².

Semantic Misattribution Procedure. For participants who completed the SMP first, the 2 (Target Sex) x 5 (Target Sexual Maturation) x 2 (Participant Sexual Orientation) mixed-model ANOVA replicated the results from Study 1 (Figure 2, Panel A & B). The hypothesis that “sexual” responses will be most frequent after primes depicting adults of the preferred sex was confirmed by an interaction of Participant Sexual Orientation by Target Sex, $F(1, 60) = 47.26, p < .001, \eta_p^2 = .44$, that was further qualified by Target Sexual Maturation, $F(4, 57) = 3.45, p = .01, \eta_p^2 = .20$. In addition, a main effect of Target Sexual Maturation, $F(4, 57) = 7.95, p < .001, \eta_p^2 = .36$, indicated that the general tendency to guess a sexual meaning was greatest for sexually mature targets. Unlike in Study 1, the linear effect of Target Sexual Maturation for the non-preferred sex was only significant for homosexual participants, $F(1, 29) = 4.89, p = .04, \eta_p^2 = .14$, and not for heterosexual participants, $F < 1$.

In analogy to Study 1, the reliability of the SMP was estimated by splitting the trials with sexually mature primes in two halves (odd stimulus numbers vs. even stimulus numbers) for male and female targets. Then, two individual effect scores were calculated as in Study 1 (response to male primes of Tanner category 4 and 5 subtracted from the response to female primes of Tanner category 4 and 5). These two individual effect scores proved to form a marginally reliable scale, $\alpha = .69$ and were thus averaged to create a final effect score indicating the relative frequency of “sexual” vs. “non-sexual” after post-pubescent female targets vs. post-pubescent male targets. To test for convergent validity with the explicit measure of sexual preference this score was correlated with the explicit sexual preference and expectantly showed a good convergent validity, $r = .60, p < .001$.

Affect Misattribution Procedure. A mixed-model ANOVA for the participants who completed the AMP as their first task (Figure 2, Panel C & D) including the factors 2 (Target Sex) x 5 (Target Sexual Maturation) x 2 (Participant Sexual Orientation) yielded only a significant interaction of Participant Sexual Orientation and Target Sex, $F(1, 64) = 20.52, p <$

.001, $\eta_p^2 = .24$, not qualified by any higher-order interaction. This effect reflected a general tendency to judge the Chinese ideograph as more pleasant when they were preceded by primes of the preferred sex, independent of the sexual maturity of the individual in the prime. Whereas sexually mature primes generally evoked more “sexual” responses in the SMP, they did not produce a higher frequency of “pleasant” responses in the AMP.

Similar to the SMP, the reliability of the AMP (calculated as described above) was acceptable, $\alpha = .72$. Supporting the notion of high confound between “pleasantness” and “sexual” ratings, the resulting effect score (reflecting the relative frequency of “pleasant” vs. “unpleasant” responses after post-pubescent female targets vs. post-pubescent male targets) correlated significantly with sexual preference, $r = .49$, $p < .001$.

In summary, the ANOVAs replicated the basic effect found in Study 1 for the SMP and did not yield the same results for the AMP due to a less pronounced effect of target sexual maturation in the AMP. Focusing on only sexually mature targets, the responses in the SMP still showed a higher correlation with explicit sexual preference than the AMP. However, the AMP still showed a substantial correlation. This may not be a measurement problem but also due to the fact that pleasantness and sexual attractiveness may strongly overlap in men.

Discussion

Study 2 replicated the SMP effect found in Study 1 for a larger sample. Participants were observed to be most likely to ascribe a sexual meaning to a Chinese ideograph after being primed with post-pubescent targets of the preferred sex. However, these primes also evoked the most frequent evaluation of the Chinese ideograph as pleasant in a standard AMP. Thus, sexual interest in individuals and a general pleasant evaluation of these seem to be highly confounded in men. Even when the – potentially contaminated – second task was ignored, SMP and AMP patterns were relatively similar to each other. However, one important difference concerns the response following primes depicting prepubescent targets.

As expected for our non-pedophilic known groups these clearly evoked the lowest frequency of guessing a sexual meaning in the SMP. This effect of sexual maturation was not found in the AMP (as indicated by the absence of a three-way interaction of Target Sex by Participant Sexual Orientation by Target Sexual Maturation). Thus, only the SMP produced results that are consistent with our hypotheses. This serves as an indication that the SMP is not just an adapted version of the standard AMP that essentially taps into the same construct in a more complicated way.

Study 3

Studies 1 and 2 provided consistent support for the general validity of the SMP as a measure of sexual interest as hetero- and homosexual men clearly differed in their response patterns. Whereas homosexual men were likely to guess that the Chinese ideographs had a sexual meaning after being primed with pictures of men, heterosexual men ascribed sexual meaning to the ideographs after being primed with pictures of women. Additionally, Study 2 provided preliminary evidence that this effect cannot be accounted for by the mere valence of the primes (as the AMP produced a less pronounced pattern across all sexual maturation categories). Despite a descriptively stronger criterion validity for the SMP than the AMP (correlation with explicit sexual interest), a substantial intercorrelation between the SMP and AMP and somewhat similar response patterns also give rise to the assumption that valence and sexual attractiveness may indeed be highly intercorrelated among men. We reasoned that this might be different for women and conducted a third study with heterosexual men and heterosexual women as known groups with contrasting sexual interest. Recent research suggests that women are generally less specific in their sexual response than men, showing subjective and genital sexual arousal to pictures of both men and women (Chivers et al., 2004; Chivers & Bailey, 2005; Chivers, Seto, & Blanchard, 2007). This female non-specificity

effect has also been found for other non-physiological indirect measures like Viewing Time (e.g., Imhoff et al., in press). Therefore, we hypothesized that men would show a more stimulus specific SMP response pattern according to their sexual preference than women

Method

Participants. The sample consisted of 61 men and 57 women who self-identified unambiguously as heterosexual on the ESIQ. Their age ($M = 27.15$ years, $SD = 9.02$) was independent of sex, $t(116) = 1.15, p > .25$.

Procedure. The same misattribution procedures that were employed in Study 2 were employed in Study 3. Participants first completed one of the two misattribution procedures in counterbalanced order. To address the potential contamination of the first to the second task found in Study 2, participants were engaged in a filler task that lasted about 20 minutes. Next, they completed the second misattribution procedure, filled in the ESIQ as in Study 1, were thanked, and were thoroughly debriefed.

Results

In contrast to Study 2, the task order (SMP first vs. AMP first) did not have any significant impact on any of the analyses reported below, and so the task order is not considered further in Study 3. It appeared that the filler task added to Study 3 served its purpose to reduce the contamination of the first task on the second task.

Semantic Misattribution Procedure. Three participants always pressed the same key in the SMP and were excluded from the analysis. For the remaining 115 participants the frequency of “sexual” responses for all ten prime categories was subjected to a 2 (Target Sex) x 5 (Target Sexual Maturation) x 2 (Participant Sex) mixed-model ANOVA. Results show the expected three-way interaction of Target Sex x Target Sexual Maturation x Participant Sex with participant sex as a proxy for sexual orientation as only heterosexual men and women took part in the study, $F(4, 110) = 3.19, p < .02, \eta_p^2 = .10$. As illustrated in Figure 3, this

effect was mainly driven by heterosexual male participants for whom the finding from the first two studies were replicated (Panel A). Women showed a less specific pattern of higher frequency of “sexual” responses after both male and female adults (Panel B). Although this could also be attributed to the measure’s inability to assess sexual interest for women at all, it is in line with the growing literature on female non-specificity in sexual responding.

Affect Misattribution Procedure. In the AMP, six participants always pressed the same key and were excluded from further analyses, resulting in a sample of 112 participants for the AMP analysis. Subjecting the mean frequency of pleasantness rating for each prime category to the same ANOVA as for the SMP resulted in two significant main effects for Target Sexual Maturation, $F(4, 107) = 4.85, p < .002, \eta_p^2 = .15$, and Target Sex, $F(1, 110) = 20.59, p < .001, \eta_p^2 = .16$. Female primes evoked more “pleasant” responses than male primes and the frequency of pleasantness rating increased with Target sexual maturation. As can be seen in Figure 3, men showed a pattern comparable to their SMP results (Panel C), whereas women rated the ideographs as more pleasant after female compared to male primes for each target sexual maturation category (Panel D). More importantly, the three-way interaction, indicative of a specific sexual interest effect was non-significant, $F < 1$.

SMP specificity. As in the previous studies, a difference score was calculated for each of the two tasks by subtracting the frequency of “sexual” (SMP) or “pleasant” (AMP) responses following post-pubescent male primes (Tanner 4 and 5) from the frequency of those responses after post-pubescent female primes. Effect scores were calculated for both measures as in Study 2 resulting in moderately reliable scores (SMP: $\alpha = .53$; AMP: $\alpha = .46$). Men and women differed in their SMP score, $F(1, 113) = 6.04, p = .01, \eta_p^2 = .05$, as men showed a high frequency of “sexual” responses after female primes, $M = 0.10, SD = 0.27$, whereas women showed no difference, $M = 0.01, SD = 0.17$. Men and women did not differ in their AMP score, $F < 1$. As in Study 2, these two indices were significantly correlated, $r = .38, p <$

.001. The two effect scores were then correlated with a parallel difference score for the ESIQ (fantasies and behavior with women – fantasies and behavior with men). Results showed that the AMP score did not correlate with sexual interest, $r = .07$, $p = .48$, but the SMP score did, $r = .22$, $p = .02$. This was confirmed in a regression analysis when both effects were entered as predictors of sexual interest, only the SMP score reached significance, $\beta = .22$, $p = .03$. Adding the interaction term of the two did not add any incremental value. It seems noteworthy that this correlation (as well as the effects in the ANOVA) is smaller than the one reported for the first two studies. Again, this may be attributed to the fact that heterosexual women's sexual preference is not as specific. Whereas homosexual men clearly form an opposite (explicit and implicit) sexual preference compared to heterosexual men, heterosexual women do show less specificity and resultantly the overall variance is reduced.

Discussion

The results of Study 3 replicated the results of the SMP for heterosexual men: primes depicting adult women were followed by higher frequencies of guessing that Chinese ideographs had a sexual meaning than any other primes. Importantly, the female non-specificity hypothesis derived from recent physiological and cognitive findings was also supported: Women reacted with more “sexual” guesses after primes showing adults of either sex. For the claim of novelty it was important that this “sexual interest” was not just a special application of a more general positive evaluation. It was thus crucial to show incremental validity above and beyond a standard AMP tapping into pleasantness of primes. For men, the same pattern as in Study 2 was found: the somewhat similar results between SMP and AMP suggested that sexual interest and general pleasant evaluation may be confounded in men. In women however, these two paradigms produced clearly distinct results. Whereas the SMP provided data in support of the hypothesized female non-specificity in sexual arousal/interest, the AMP yielded merely a main effect of target sex – in the direction opposite to their

presumed sexual interest. Women judged Chinese ideographs as more pleasant following female primes than following male primes, independent of target sexual maturation.

General Discussion

Our results provide supportive evidence that the SMP can be added to the list of indirect measures of sexual interest. Despite a remarkably high convergent validity of the SMP with two established indirect measures of sexual preference this addition should not be regarded as redundant, because combining conceptually different measurement approaches to profiles of sexual interest has been shown to increase criterion validity in forensic contexts (Banse et al., 2010). Furthermore, any indirect measure may be influenced by numerous personal and contextual factors (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009). Therefore it is questionable to interpret any single indirect measurement as an absolute index of a specific psychological attribute. A solution to this problem lies in the general diagnostic principle of aggregation. Diagnostic conclusions about interindividual differences can be drawn with greater confidence if they are based on several conceptually different, convergent, and valid indirect measures (De Houwer et al., 2009).

The results of the sequence of studies presented here suggest that semantic variants of the AMP could be used for assessing a wider range of semantically defined concepts beyond the domain of attitudes. Until now, the only implicit measure combining good psychometric properties (particularly reliability) and applicability to a large range of constructs was the IAT. Contrary to the IAT, the AMP/ SMP is not restricted to two target categories and their association with one attribute dimension. In the SMP implemented in Study 1, twenty different prime categories (Target Sexual Maturation x Target Sex x Nudity) produced a meaningful pattern of distinct priming effects. To our best knowledge, this level of differentiation has not been reached by any other indirect measure.

The present SMP requires that participants guess the meaning of ideographs instead of evaluating their pleasantness. The nature of this task has therefore shifted from an evaluative to a projective semantic task. However, the present data only provide evidence that the specific sexual-non sexual semantic variant of the AMP produces meaningful results. So far no conclusive evidence exists about the underlying mechanisms. In line with Deutsch and Gawronski (2009), we presume that the SMP primes differentially activate a semantic concept (e.g., sexuality) that in turn influences the guessing of the meaning of Chinese ideographs. For the AMP, Payne et al. (2005) have indicated by the naming of the task that they assume that the affect evoked by the primes will be mistakenly attributed to the ideograph (“If it makes me feel good, it must be visually pleasant”). At present, no data exist to rule out that the SMP effect may also be partially or even entirely driven by affective processes. The primes might evoke feelings (light sexual arousal in the sexual SMP) that are misattributed to the Chinese ideographs (“if it makes me feel excited, it must mean something sexy”). However, it is also conceivable that in both procedures the primes differentially activate a *semantic* concept that will become more accessible and thus increase the likelihood of categorizing the target in a prime-consistent way. These processes are not mutually exclusive and could simultaneously cause priming effects. Clearly, further research is needed to disentangle the specific contributions of these two processes.

Is the SMP/AMP an implicit measure? Payne et al. (2005) could demonstrate that the motivation to control prejudiced reactions moderated the relation between explicit and implicit attitudes toward Blacks vs. Whites. This dissociation would not be possible if the AMP assessed only explicit attitudes. However, it cannot be excluded that in the standard AMP or in the SMP, some participants, at least some of the time, do not respond to the Chinese ideographs, but directly to the primes themselves, thus producing a partially explicit measure. By explicitly instructing participants to do their best to ignore the primes we ensured

that the SMP can be referred to as an indirect measure. The remaining question is whether it does measure a psychological attribute that can be referred to as implicit (i.e. automatically activated and outside of deliberate control). The samples in the current study were chosen as contrasting known groups that should have no interest in denying their actual sexual interest. Thus, the SMP scores were highly correlated with explicit sexual preference. A more critical test of the implicitness of the measure will have to be conducted in forensic settings in which denial and dissimulation of deviant sexual interest can be expected if assessments are part of legal proceedings. Previous research has shown that combinations of conceptually different indirect measures of sexual interest add incremental validity in predicting pedophilic interest above and beyond self-report. Another research line could build on the dissociation between explicit and implicit sexual interest as assumed by (psychodynamic) conceptions of homophobia (as a latent but denied attraction to gay sex; e.g., Freud, 1936). Adams, Wright, and Lohr (1996) found that highly homophobic men showed greater sexual arousal (as indicated by tumescence) when watching gay sex videos compared to less homophobic men (other researcher have failed to replicate this with more cognitive measures like the IAT; Meier, Robinson, Gaither, & Heinert, 2006). Further research has to reveal whether the SMP for sexual interest is indeed a valid procedure to produce such fascinating dissociations.

One major limitation of the present studies is the focus on sexual interest. In current research conducted by Imhoff (2010, July) participants had to guess whether the ideograph was either marking a term from the animal kingdom (e.g., paw, nest, fish) or from human realms (e.g., hand, house, human). The responses were affected by the preceding primes (animal faces vs. Gypsie faces vs. German faces) showing a dehumanization effect for Gypsie faces. More importantly, the frequency of guessing an animal-related connotation after Gypsie primes was negatively correlated with the ascription of uniquely human emotions to this social group, a process called *infrachumanisation* (e.g., Leyens, et al., 2000), but not with a

feeling thermometer. In contrast, the frequency of evaluating the ideograph as pleasant following the same primes in a standard AMP did not correlate with the infrahumanisation measure but with a feeling thermometer. Future research may find other domains in which a semantic misattribution procedure might prove useful.

In summary, the SMP proved to be a valid and reliable indirect measure of male sexual interest that is promising for sex-related research. Semantic variants of the AMP may open an avenue for assessing a wide range of non-evaluative constructs such as stereotypes, self-concept, motives, or personality. Future research has to elucidate the extent to which priming effects of the standard and modified misattribution procedures are determined by affective or semantic processes.

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Footnotes

- 1 As this index describes the critical difference between male and female sexually mature primes that also drives the interaction effect in the ANOVA, it was screened for outliers (mean frequency of „sexual“ responses for each sexual interest group \pm 3SD). One participant was identified as outlier. Eliminating his data did not alter the results. Identical procedures were employed also for Studies 2 (2 outliers) and 3 (4 outliers) with the same results.
- 2 As this means that there was only one measurement (either SMP or AMP) for each participant, the two could not be directly compared. If there had been no order effect, the unique contribution of the SM, the AMP and their interaction to predict sexual interest could have been estimated. Despite the order effect such analyses were conducted as control analyses. These analyses test the incremental specificity of the SMP rather conservatively as the AMP was strongly contaminated by the previous SMP for half of the participants. Results showed that both the SMP, $\beta = .35, p < .001$, and the AMP, $\beta = .25, p < .001$ independently predicted sexual interest but not their interaction. However, due to the order effect this result is difficult to interpret.

Table 1

Intercorrelations between Indirect and Direct Measures of Sexual Preference for Women over Men in Study 1

Measure	Viewing Time	IAT d	ESIQ
SMP	.41**	.64**	.53**
Viewing Time		.69**	.71**
IATd			.93**

Note: SMP (Semantic Misattribution Procedure), Viewing Time, IAT d (Implicit Association Test) and ESIQ (Explicit Sexual Interest Questionnaire) indices are difference scores reflecting sexual preference for women over men.

** = $p < .01$.

Figure Captions

Figure 1. Mean Frequencies of "sexual" Responses as a function of Sexual Orientation, Target Sex and Target sexual maturation (Tanner 1 to Tanner 5) in Study 1.

Figure 2. Mean Frequencies of "sexual" Responses in SMP (Panel A & B) and "pleasant" responses in AMP (Panel C & D) as a function of Participant Sex, Target Sex and Target sexual maturation for hetero- and homosexual men in Study 2.

Figure 3. Mean Frequencies of "sexual" Responses in SMP (Panel A & B) and "pleasant" Responses in AMP (Panel C & D) as a function of Participant Sex, Target Sex and Target sexual maturation for heterosexual men and women in Study 3.

Figure 1

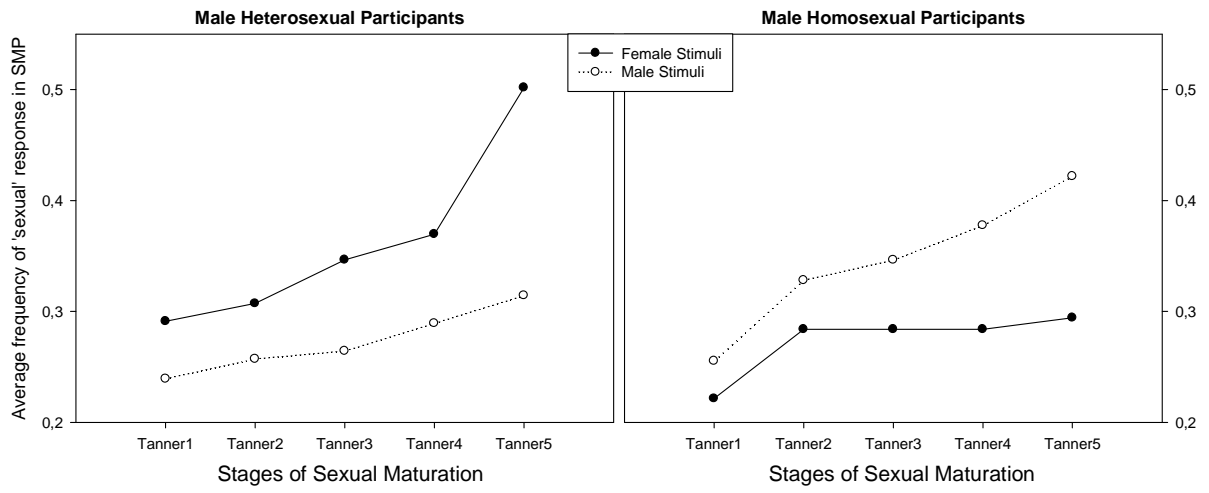


Figure 2

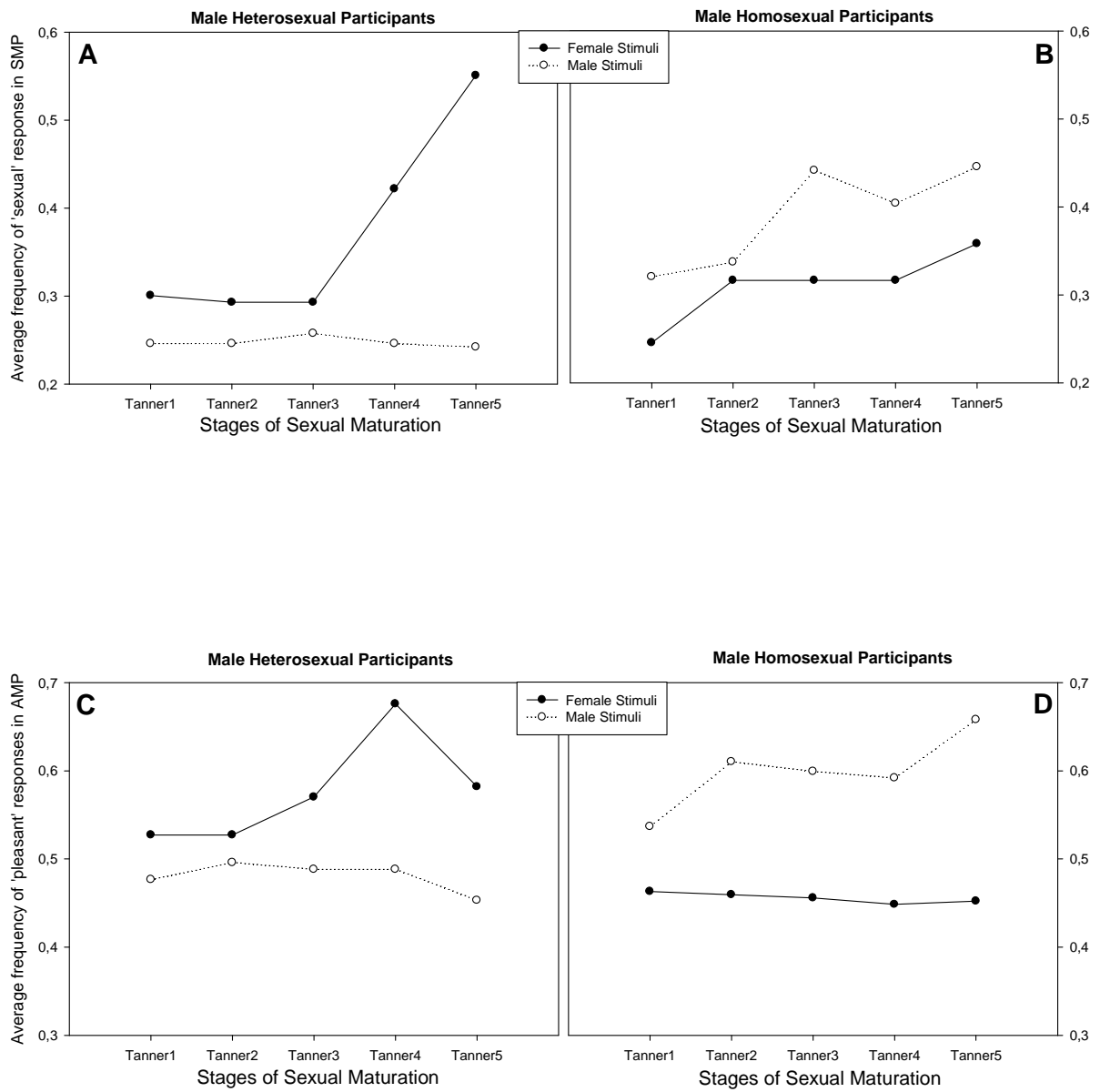


Figure 3

