



An Implicit Measure of Sexual Double Standard Endorsement in Emerging Adults: Reliability and Validity Aspects

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Abstract

Psychometric characteristics were investigated of an Implicit Association Test to assess implicit endorsement of the sexual double standard (SDS-IAT) in emerging adults. The reliability of the SDS-IAT was investigated focusing on internal consistency across different phases of the test. Convergent validity of the SDS-IAT was evaluated against the Scale for the Assessment of Sexual Standards in Youth, an explicit measure of SDS, and against gender investment. Divergent validity was evaluated against the personality characteristics of extraversion, neuroticism, and social desirability proneness. Gendered patterns were examined. Attenuation-corrected alphas demonstrated acceptable internal consistency, with alphas ranging for .65–.70. A modest level of explicit SDS endorsement was found in both female and male participants. In line with their explicit SDS level, a modest level of implicit SDS endorsement was found in male participants, whereas a reverse implicit SDS was found among young women. In agreement with our theoretical expectations, we found low convergent validity in multitrait-multimethod analysis of the SDS-IAT with a measure of explicit SDS endorsement, and with general level of investment in gender ideals. Similarly, divergent validity analysis revealed absence of significant correlations with the conceptually unrelated concepts of extraversion, neuroticism, and social desirability proneness, except for extraversion in female participants. The present findings suggest that implicit SDS endorsement can be assessed using the SDS-IAT. The finding that explicit and implicit SDS approvals differ in young female participants, while they align in young male participants, warrants further research.

Keywords Sexual double standard · Emerging adulthood · Implicit attitudes · Explicit attitudes · Gender differences

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Introduction

Sexual double standards (SDS), originally conceptualized as the divergent evaluation of male and female extramarital sexual relations, have gradually come to be understood as a broader set of normative gender-specific expectations for boys and girls for engaging in romantic and sexual behavior (Crawford & Popp, 2003; Vanwesenbeeck, 2009). A central aspect of the SDS regards sexual assertiveness: boys are expected to be sexually active, dominant, and to take initiative for sexual contact, whereas girls are expected to be sexually reserved, submissive, and passive (Emmerink et al., 2016a, 2016b). The SDS regards a specific application of a more general propensity for investment in gender ideals, briefly referred to as ‘gender investment’, reflecting the extent to which boys and girls, and men and women believe it to be important to adhere to the ideals or standards for their own gender (Sanchez & Crocker, 2005; Wood et al., 1997).

Level of endorsement of the SDS has been found to be associated with the judgement of sexual behavior of both close friends and more distant acquaintances (Marks et al., 2019). Endorsement of (aspects of) the sexual double standard has also been associated with a variety of negative sexual health outcomes (Sanchez et al., 2012). For boys, it has been related to increased rape myth acceptance (Truman et al., 1996), and beliefs that dating violence is acceptable, potentially passing into subsequent sexually violent behavior (Shen et al., 2012). For both boys and girls, SDS endorsement has been related to early sexual initiation (Goncalves et al., 2008; Part et al., 2011) and higher STI/HIV infection risk (Bermudez et al., 2010). Although all young people are susceptible to the potential negative impact of SDS adherence, the impact seems particularly relevant for girls (Sanchez et al., 2012). For them, the sexual passivity associated with SDS endorsement is predictive of experiencing more negative and fewer positive emotions with regard to sex (Emmerink et al., 2016a, 2016b), lower sexual satisfaction (Kiefer & Sanchez, 2007), and higher odds for experiencing sexual problems (Sanchez & Kiefer, 2007).

However, research findings regarding the existence, impact and stability of sexual double standards, as well as the deleterious effects of their endorsement have been equivocal and conclusions based on them vary. For some time now, researchers have argued that the sexual double standard no longer exists (Marks & Fraley, 2005, 2006); that it only exists under certain circumstances, such as when engagement in uncommon types of sexual behavior, including “threesomes”, is evaluated (Jonason & Marks, 2009); or that the SDS is a local construction, differing across ethnic and cultural groups (Crawford & Popp, 2003; Sanchez et al., 2012). Other researchers have reported a reverse sexual double standard (Milhausen & Herold, 1999, 2001; Sakaluk & Milhausen, 2012), by which women judge male sexual behavior more critically than women’s behavior.

Several explanations for these inconsistent findings in previous studies have been suggested, including the use of self-report methods (Crawford & Popp, 2003), of outdated questionnaire measures (Bordini & Sperb, 2013), of predominantly university student samples (Bordini & Sperb, 2013; Emmerink et al.,

2016a, 2016b; Fugère et al., 2008), and the lack of theory-driven empirical research (Zaikman & Marks, 2017).

In particular the use of self-report measures to assess SDS is questionable as it has been shown that these measures suffer from social desirability bias in, for example, studies on sexual topics such as pornography-related self-reports (Rasmussen et al., 2018), or young men's self-reports of their penis size (King et al., 2019). Similarly, self-report instruments for SDS endorsement may also be seriously biased by social desirability demands (Sakaluk & Milhausen, 2012).

Indirect measures of SDS endorsement such as the Implicit Association Test (IAT; Greenwald et al., 1998), tapping into automatic cognitions, may bear advantages over self-report measures (Zapata-Calvente et al., 2019). The IAT has, in its relatively brief history, become known as a psychometrically sound instrument (Cunningham et al., 2001) that is able to capture individuals' implicit associations between semantic categories (Greenwald et al., 1998). Inter-item consistency estimates (split-half correlations or alpha's) of IAT indices were found to range from 0.7 to 0.9 (Cunningham et al., 2001; Nosek et al., 2007), but have been generally found to be somewhat lower than similar estimates of self-report instruments (Cunningham et al., 2001). Across studies, the IAT test-retest reliability was found to be rather stable, with a median $r=0.56$, and to show little variability associated with the length of the retest interval (Mierke & Klauer, 2003; Nosek et al., 2007). With regard to different aspects of construct validity, IAT measures have generally shown relatively low convergence both with other IATs and explicit measures, intended to measure the same constructs. In a meta-analysis a mean effect size of $r=0.24$ was found of the correlations between IATs and explicit self-report measures of the same constructs (Hofmann et al., 2005). These observations seem to imply that implicit and explicit measures, despite their apparent similarity, represent different phenomena. Note that several authors warned that the upper limit of the possible correlations of an IAT with other measures is constrained by the limited reliability of implicit measures and, relatedly, that higher levels of measurement error may result in attenuated estimates of test-retest reliability and of convergent validity (Cunningham et al., 2001; Nosek et al., 2007).

Nevertheless, there is broad agreement in the literature that IAT measurement bypasses introspective self-report (Nosek et al., 2007), in the sense that it can reveal automatic associations with certain stimuli of which the individual may not be aware. This would make IAT measurement less susceptible to demand effects, including socially desirable response tendencies, resulting in more valid measurement. It has also been argued that the IAT is more ecologically valid than other measures of automatic cognition including the divided attention task (Marks, 2008), and more closely resembles sexual evaluation as it occurs in real life, because IAT measurement bypasses more deliberate cognitive processes (Sakaluk & Milhausen, 2012). Considering that the SDS is a stereotype (Vanwesenbeeck, 2011), it can be expected to influence cognition and behavior through more automatic cognitive processes that the IAT taps into, as opposed to more controlled cognitions that can be measured using self-report instruments.

Because automatic and controlled processes interact in social cognitive processing (Cunningham & Zelazo, 2007), assessment of both implicit and explicit

cognitions may be relevant when examining SDS endorsement. Explicit questionnaire measures of SDS endorsement might reflect one's conscious and deliberate endorsement of perceived societal norms, whereas implicit measures might better reflect one's automatic cognitive responses to sexual cues, reflecting the degree to which one has internalized societal norms. The two types of assessment presumably each tap into unique sources of variance, which may or may not overlap (Cunningham et al., 2001; Nosek et al., 2007). Therefore, implicit measurements may provide different and additional information on an individuals' degree of SDS endorsement, complementing the explanatory power of explicit attitudes.

In support of this claim, in a previous study using IAT methodology (Sakaluk & Milhausen, 2012), implicit and explicit measures of SDS endorsement were found to yield divergent findings. Both men and women endorsed the SDS when it was measured using a self-report questionnaire (the Sexual Double Standard Scale; Muehlenhard & Quackenbush, 1996), with men holding a stronger traditional double standard, compared to women. However, when SDS endorsement was measured using an IAT, a relatively gender-neutral evaluation was found among men, and a strong *reverse* sexual double standard among women (Sakaluk & Milhausen, 2012). Specifically, women responded faster when the category 'female' was paired with the attribute 'sexually positive', compared to when it was paired with 'sexually negative'. The findings in this study that were based on the self-report measure thus matched findings from many previous studies (in which self-report measures have also frequently been used), whereas the results from the implicit measure painted a completely different picture. This suggests the existence of a more complex double standard involving different levels of cognitive processing, warranting further research using indirect measurements that tap into automatic cognitive processing.

Note, however, that in the IAT of Sakaluk and Milhausen (2012) the category labels (*male* vs. *female*, and *sexually positive* vs. *sexually negative*) and the word stimuli (e.g., *clean* for sexually positive, and *dirty* for sexually negative) representing them do not refer to behavioral aspects of sexuality which are essential for the sexual double standard. Instead of assessing implicit sexual double standard endorsement, this IAT may thus have assessed the extent to which respondents implicitly associate male or female gender with positive vs. negative sexual experiences. Therefore, the aim of the present study was to investigate a new IAT, which employs category labels and stimuli that are semantically closer to the aspects of behavior that are evaluated in the sexual double standard.

The Present Study

Thus, the rationale of the present study is based on previous conflicting research findings regarding the existence, impact and stability of sexual double standards, the criticism that these inconsistencies may be caused by instrumentation problems (reliance solely on self-report tools and the use of outdated questionnaires), and the suggestion that SDS endorsement could be better measured by using indirect measures of implicit SDS endorsement, for which initial empirical support has been found (Sakaluk & Milhausen, 2012).

The present study aimed to evaluate the internal consistency, and the convergent and divergent validity of a new implicit association test (the SDS-IAT), that is aimed to measure implicit endorsement of the SDS. Gender is included in the analyses as it is a crucial factor in the study of SDS endorsement. Data were collected in a community sample, in order to avoid investigating a sample exclusively comprised of university students. As to the investigation of the validity of the SDS-IAT, its convergent validity will be evaluated against explicit SDS endorsement using questionnaire data, and against general gender investment. Based on previous meta-analytic data (Hofmann et al., 2005), a limited effect size ($0.20 > d > 0.30$) is expected of the correlation between the SDS-IAT and explicit SDS endorsement. Also, a limited effect size is expected of the correlation between the SDS-IAT and gender investment. Divergent validity will be examined against social desirability, and against aspects of personality, also using questionnaire data. This decision was based on research showing that IAT attitudes were significantly related to self-reported measures of corresponding constructs, but not to social desirability and to other personality traits that are considered unrelated (Nosek et al., 2007; Slabbinck et al., 2013; Vecchione et al., 2017). Limited effect sizes are expected of the correlations between the SDS-IAT scores and social desirability, and the personality traits of extraversion and neuroticism.

The new IAT was based on a relatively broad definition of SDS endorsement as ‘the degree to which an individual’s attitude reflects a divergent set of expectations for boys and girls, in that boys are expected to be relatively more sexually active, assertive, and knowledgeable and girls are expected to be relatively more sexually reserved, passive, and inexperienced’ (Emmerink et al., 2016a, 2016b).

The development of an IAT typically begins with the selection of target and attribute categories and their labels, aiming to represent the concepts of interest. Next, stimuli are selected that serve as exemplars of these conceptual categories (Brenner et al., 2019; De Houwer, 2001; Fazio & Olson, 2003; Nosek et al., 2007). Therefore, the concepts of interest for the new SDS-IAT are: gender (male, female) and two opposing classes of sexual behavior (‘sexually active’ versus ‘sexually passive’). The selection of category labels and stimuli in this study will be further reported in the Methods section.

Regarding the terminology of the relevant constructs in the field of IAT assessment, we follow Moors et al. (2010), and will (1) use the term ‘automatic’ when the underlying cognitive process is addressed; (2) use the term ‘indirect’ when referring to the assessment procedure; and (3) speak about ‘implicit’ when referring to the association between the concepts of interest and the instruments that are used to measure them, including the IAT.

Method

Design

A cross-sectional study was conducted. Participants completed questionnaires and performed online computer tasks in a single session.

Sample

Sexually active, heterosexual, emerging adults between the age of 18 and 25 in the general community were eligible for participation. Good command of the Dutch language was required. Based on these inclusion criteria, a convenience sample of 159 participants was taken. Participants resided in the Netherlands or in Flanders, Belgium. They were recruited by undergraduate psychology students of the Open University of the Netherlands in their circles of acquaintances by sending out personal invitations by email. Because of the distance education system of the university, the geographical distribution of the participant's places of residence was wide. After removing data of participants who did not complete the IAT, 134 participants remained. Based on a sexual orientation question, data of three gay men ("only or mostly attracted to men"), two bisexual men ("attracted both to men and women"), one lesbian woman ("only attracted to women"), four bisexual women, and ten participants who were uncertain of their sexual orientation or did not wish to share this information, were removed from data analysis in order to assure sample's specificity in terms of sexual orientation. Data of one participant was removed because the extreme number of invalid responses to both IATs (30%) made the researchers doubt the sincerity of the respondent's participation. Finally, data of two participants were removed who reported remarkably high lifetime numbers of sexual partners for people in their age category, respectively 50 and 36. The final sample retained for data analysis consisted of 111 heterosexual emerging adults ($N_{\text{female}} = 75$ [67.62%], $M_{\text{age}} = 22.1$, $SD_{\text{age}} = 1.9$).

Procedure

Ethical approval was obtained from the Utrecht University Ethics Committee (filed under reference FETC-14024; Vanwesenbeeck). To reduce bias due to social demands, participants completed the questionnaires and performed the computer tasks in the comfort of their own home using an online research platform. Online assessment of the IAT has been found to produce robust findings that do not differ from assessments in a lab setting (Houben & Wiers, 2008; Nosek et al., 2002). Participants first completed either the SDS-IAT or an IAT assessing implicit sexual assertiveness. Data from the latter IAT will not be reported here. The order of both IATs was randomly assigned by the computer. After completing the IATs, participants completed the questionnaires of the study in a fixed order. Completing the study took about 30 min. After finishing the final task, participants received an email with a debriefing message and a digital gift voucher of 10 euros.

Instruments

Demographics

Participants indicated their age, gender (closed question with 2 answering options: female, male), lifetime number of sexual partners and sexual orientation (on a five-point scale ranging from '1 = exclusively attracted to men' to '5 = exclusively attracted to women'). Respondents were considered sexually active if the reported lifetime number of partners question was 1 or higher.

Implicit SDS Endorsement

An IAT (Greenwald et al., 1998) was designed to measure implicit SDS endorsement (SDS-IAT). Target category labels were 'male' versus 'female', and attribute category labels were 'sexually active' versus 'sexually passive'. Stimulus words were presented in the middle of the screen. Words representing the target categories were Dutch male (i.e. Bram, Tim, Rob, Jan) and female names (i.e. Emma, Lieke, Julia, Roos). Words representing the 'sexually active' attribute category were 'sexual', 'exciting', 'experienced', and 'daring' (translated from the Dutch words 'seksueel', 'opwindend', 'ervaren', 'uitdagend'). Words representing the 'sexually passive' attribute category were 'biding', 'reserved', 'cautious', 'modest' (translated from the Dutch words 'afwachtend', 'terughoudend', 'voorzichtig', 'bescheiden'). Male and female names were taken from a list of common Dutch names. Only names that the researchers judged to be non-ambiguously male or female were chosen. Target words associated with the 'sexually active' versus 'sexually passive' attribute categories were chosen based on pretesting among 200 participants (50% female), who were presented 20 words per attribute. Words that had the strongest associations with the attribute labels, and did not show gender differences, were selected. The labels of the target and attribute categories were permanently visible in the upper-left and -right corners of the screen. After a correct response, the next stimulus was

Table 1 Sequence of Trial Blocks in the IAT-SDS

Block	No. of trials	Function	Items assigned to left-key response	Items assigned to right-key response
1		16 Attribute practice	Sexually Active (8)	Sexually Passive (8)
2	16	Practice	Sexually Active (4) + Male	Sexually Passive (4) + Female
3	48	Test	(4)	(4)
4	16	Practice	Sexually Active (12) + Male	Sexually Passive (12) + Female
5	48	Test	(12)	(12)
			Sexually Active (4) + Female	Sexually Passive (4) + Male (4)
			(4)	Sexually Passive (12) + Male
			Sexually Active	(12)
			(12) + Female (12)	

For half the subjects, the positions of Blocks 2 and 3 are switched with those of Blocks 4 and 5, respectively

IAT-SDS Implicit Association Test for Sexual Dual-Standard Endorsement

presented after a 250 ms interval. After an incorrect response, a red X appeared that replaced the stimulus and remained on the screen until the correct key was pressed.

The SDS-IAT was organized in five blocks, see Table 1 for details. To familiarize participants with the procedure, the SDS-IAT started with a practice run of 16 trials presenting only stimuli from the target category (gender: ‘male’ versus ‘female’; block 1). Next was a practice block of 16 trials (block 2) in which both target and attribute stimuli were presented, followed by a test block of 48 trials (block 3). In these two blocks, one of two possible combinations of target and attribute categories (female + sexually passive; male + sexually active) were mapped on the response keys (‘z’, and ‘m’ on a QWERTY keyboard). In the final blocks, a practice (block 4) and a test block (block 5), including the same numbers of trials, the reverse combination was presented (male + sexually passive; female + sexually active). Two versions of this SDS-IAT were made. They differed in the order of presentation of blocks 2+3 and 4+5, thus allowing to investigate potential order effects. Random allocation ensured that half of the participants started with each version.

Explicit SDS Endorsement

To assess explicit SDS endorsement the Scale for the Assessment of Sexual Standards in Youth (SASSY) was used (Emmerink et al., 2017). The SASSY contains 19 items and was designed as a multifaceted measure of SDS endorsement suitable for young people, contributing to a single underlying factor. An example item is ‘Sometimes a boy should apply some pressure to a girl to get what he wants sexually’. Answers were given on a 6-point scale ranging from ‘1 = Completely disagree’ to ‘6 = Completely agree’. In previous research good reliability was found among Dutch adolescents ($\alpha=0.90$; Emmerink et al., 2017) and young adults (Study 1 $\alpha=0.88$, Study 2 $\alpha=0.89$; Emmerink et al., 2017). In the present study a Cronbach’s α of 0.85 indicated good internal consistency. A mean score was calculated of all items. Higher scores represent higher level of SDS endorsement.

Gender Investment

Gender investment was assessed using two questions: “How important is it for you to be similar to the ideal man/woman?” and “To what extent is being similar to the ideal man/woman an important part of who you are?” (Good & Sanchez, 2010). Answers were given on a ten-point scale from ‘1 = not important at all’ to ‘10 = very important’. The mean score of the two items was used in the analyses. Scores on both questions correlated significantly ($r_{\text{women}}=0.43, p<0.001$; $r_{\text{men}}=0.30, p<0.05$).

Personality characteristics The Eysenck Personality Questionnaire (revised, short version (EPQ-R); Eysenck & Eysenck, 1975; Dutch adaptation: Sanderman et al., 1991) is a 48-item self-report questionnaire for the measurement of the traits of psychoticism, neuroticism, extraversion and social desirability. For the present study extraversion, neuroticism, and social desirability (‘lie scale’) were used. The possible range of subscale scores is 0–12. Higher scores represent stronger personality traits. In previous research satisfactory reliability was found for all factors (Cronbach’s α between 0.69 and 0.86), except for the psychoticism dimension among Dutch men (Cronbach’s

$\alpha=0.62$) (Sanderman, Eysenck, and Arrindell 1991). In the present sample Cronbach's α 's were found to range from 0.67 (Social Desirability) to 0.83 (Extraversion), indicating satisfactory reliability.

Statistical Analysis

The D600 algorithm of Greenwald et al., (2003) was employed to calculate scores of implicit SDS endorsement. Only test block data were used. Reaction times (RTs) below 400 ms were discarded and those higher than 2500 ms were replaced with 2500 before calculation of the mean RTs. Error trial RTs were replaced with the mean RT of the participant's correct responses in the same block in which the error occurred plus a 600 ms penalty. The D600 index score was calculated as the difference score between the mean RTs, divided by the pooled standard deviation with the exception of the attribute practice block. A negative SDS-IAT score reflects higher implicit SDS endorsement with stronger associations between "male" and "sexually active" and between "female" and "sexually passive". Inversely, a positive SDS-IAT score reflects endorsement of a reverse SDS. Scores close to 0 reflect absence of a dual sexual standard in either direction.

The internal consistency of the SDS-IAT was calculated by measuring the split-half reliability by correlating D600 scores of the even trials with the odd trials within each block. Because the D600 indices are calculated as difference scores, its reliability is impacted by the sampling error in both its constituent parts, decreasing when the correlation between those parts increases. Given the unlikelihood that the correlation between constituent parts is zero, the reliability of the D600 requires a correction for this error-attenuation (Cohen et al., 2014) to compensate for the error in opposing blocks, and the correlation between the blocks.

Differences between men and women were examined. We evaluated whether there were order effects (both in the order of both IATs, and within IAT opposing block order), or effects of the number of errors on the implicit and explicit scores. These variables were controlled for in the regression analyses in case they showed significant effects in the preliminary analyses. Convergent and divergent validity were investigated in a multitrait-multimethod approach by, firstly, inspecting the bivariate correlations in the female and male subsamples of the SDS-IAT with instruments measuring both neighboring and unrelated constructs on SDS-IAT scores. Additionally, to control for method-related confounders and to examine gender effects, a hierarchical multiple regression analysis was conducted with SDS-IAT scores as criterion variable. All variables in the theoretical model were standardized before entering the regression analysis. Analyses were carried out using IBM SPSS™, Version 24.0. Reliability analysis and correction for attenuation was performed using R (R_Core_Team, 2021). A general alpha-threshold of 5% was used to determine significant findings.

Table 2 Demographic characteristics and sexual variables

	Men (M(SD); %)	Women (M(SD); %)
Age	21.8 (1.9)	22.2 (1.9)
Education Level		
Lower	10.5	2.2
Intermediate	66.7	60.7
Higher	22.9	37.1
Relationship Status ^a		
Single	38.2	29.2
Dating	20.0	6.3
Committed Relationship	40.0	62.5
Married	1.8	2.1
I Feel Sexually Attracted		
Only to Men	9.1	69.8
Mostly to Men	1.8	24.0
Both to Men and Women	3.6	4.2
Mostly to Women	10.9	0.0
Only to Women	72.7	1.0
Don't know (yet)	0.0	1.0
Not Disclosed	1.8	0.0
Open for a New Relationship		
Not at all	32.7	40.6
A Little Bit	36.4	20.8
Positive	14.5	15.6
Very Much	19.4	22.9

^a($\chi^2(3) = 10.0, p < .02$)

Results

Demographic features of the sample and scores on sexual variables are shown in Table 2. Mean ages and education level of female and male participants were not significantly different. Level of openness for a new relationship was not different between male and female participants. However, compared with male participants, female participants more often reported being in a committed relationship ($\chi^2(1) = 6.93, p < 0.01$).

Internal Consistency

Calculation of the split-half reliability for the practice trials yielded a $\alpha = 0.87$; for the test trials $\alpha = 0.95$; for combined practice and test trials $\alpha = 0.95$. After correction for attenuation, we found $\alpha = 0.65$ for the practice trials, $\alpha = 0.70$ for the test trials, and $\alpha = 0.67$ for combined practice and test trials.

Method-Specific Determinants of Implicit Sexual Double Standard Endorsement

To examine order effects on implicit SDS endorsement a two-way ANOVA was performed with SDS-IAT scores as the dependent variable and order of presentation of both combinations of target and attribute categories within the SDS-IAT and order of presentation of both IATs (See Procedure) as independent factors. A significant main effect of within-IAT presentation order was found ($F(1,108) = 11.2, p = 0.001$). Response latencies were smaller when the combination of “female” + “sexually passive” and “male + sexually active” was presented first, compared with the reverse presentation order. Presentation order of both IATs was not significant ($p > 0.05$). For further analyses, data of both IAT orders were collapsed. In male participants, SDS-IAT scores were significantly correlated with number of valid IAT responses ($r = 0.36, p < 0.05$). Higher number of valid responses was associated with lower implicit SDS endorsement. This correlation was not significant in female participants. In order to determine whether within-IAT presentation order, and number of valid IAT trials could be treated as true covariates it had to be shown that they were not covariant with other predictors of implicit SDS endorsement. Bivariate correlations of these factors with explicit SDS endorsement, gender investment, extraversion, neuroticism, and social desirability were calculated separately in male and female participants. No significant correlations were found, except for within-IAT order and extraversion ($r = .31, p = 0.006$) in female participants. Within-IAT presentation order, and number of valid IAT trials were therefore controlled for in further analyses as covariates.

Gender Differences

The mean scores and standard deviations across gender of the core variables are presented in Table 3. Young men’s mean SDS-IAT score was negative; their implicit associations of ‘male’ with ‘sexually active’ and ‘female’ with ‘sexually passive’ were stronger than the associations of ‘male’ with ‘sexually passive’ and ‘female’ with ‘sexually active’, reflecting implicit endorsement of the sexual double standard. Young women, on the other hand, were found to have a positive mean

Table 3 Means and standard deviations among young men and women

	Young men (n = 36)		Young women (n = 75)		95% confidence interval	
	M	SD	M	SD	Lower	Upper
Implicit SDS Endorsement (IAT-SDS)***	-.16	.40	.08	.34	-.39	-.10
Explicit SDS Endorsement (SASSY)	2.29	.69	2.21	.55	-.16	.32
Gender Investment	6.46	1.53	6.71	1.29	-.80	.30
Extraversion (EPQ-R)*	9.25	2.60	8.01	2.96	.10	2.39
Neuroticism (EPQ-R)*	4.11	2.94	5.68	3.23	-2.83	-.31
Social Desirability (EPQ-R)*	4.64	2.22	5.71	2.41	-2.01	-.12

Participants whose data were used in main analyses; * $p < .05$; ** $p < .01$; *** $p < .001$

SDS-IAT score, indicating an implicit endorsement of a reverse double standard; their implicit associations of ‘female’ with ‘sexually active’ and ‘male’ with ‘sexually passive’ were stronger than the associations of ‘female’ with ‘sexually passive’ and ‘male’ with ‘sexually active’. This gender difference was statistically significant ($t(109)=3.32$, $p<0.001$, $d=0.66$). One-sample t-tests were conducted to further examine whether the separate mean scores on the SDS-IAT for young men and women were also significantly different from zero, which was the case both for young men ($t(35)=-2.41$, $p=0.021$, $d=-0.4$) and young women ($t(74)=2.10$, $p=0.039$, $d=2.35$). No significant gender differences were found on the explicit sexual double standard measure (SASSY; $t(109)=0.68$, $p=0.5$). The mean SASSY score was below the midpoint of the scale, indicating that participants endorsed the SDS to a limited extent. Also, no significant gender differences were found on gender investment ($t(109)=0.89$, $p=0.38$). Female participants were found to score lower than male participants on the Extraversion subscale of the EPQ-R, and

Table 4 Hierarchical linear regressions of gender, explicit SDS endorsement, gender investment, extraversion, neuroticism, and social desirability on implicit SDS endorsement, and moderation by the interactions with gender

	<i>B</i>	SE	Beta	<i>t</i>	<i>p</i>	95% CI	
<i>Step 1</i> $R^2 = .08$, $F(2, 107) = 4.94$, $p = .009$							
(Constant)	-.354	1.728	.291	-.205	.838	-3.779	3.071
Within-IAT Presentation Order	.219	.071	.002	3.096	.003	.079	.359
Number of Valid IAT trials	.000	.012		.017	.987	-.024	.024
<i>Step 2</i> R^2 Change = .13, $F(6, 101) = 2.74$, $p = .017$							
(Constant)	.165	1.690	.245	.098	.922	-3.188	3.518
Within-IAT Presentation Order	.185	.072	-.027	2.564	.012	.042	.328
Number of Valid IAT trials	-.003	.012	.353	-.293	.770	-.027	.020
Gender	.286	.078	-.071	3.653	.000	.131	.441
Explicit SDS Endorsement (SASSY)	-.027	.035	-.005	-.770	.443	-.096	.043
Gender Investment	-.002	.035	.142	-.057	.954	-.070	.067
Extraversion (EPQ-R)	.054	.038	-.004	1.432	.155	-.021	.128
Neuroticism (EPQ-R)	-.001	.036	-.059	-.039	.969	-.073	.070
Social Desirability (EPQ-R)	-.022	.036		-.612	.542	-.094	.050
<i>Step 3</i> R^2 Change = .06, $F(5, 96) = 1.62$, $p = .162$							
(Constant)	.176	1.700	.234	.103	.918	-3.200	3.551
Within-IAT Presentation Order	.176	.072	-.027	2.459	.016	.034	.319
Number of Valid IAT trials	-.003	.012	.370	-.293	.770	-.027	.020
Gender	.299	.083	.384	3.609	.000	.135	.463
Explicit SDS Endorsement (SASSY)	.145	.108	.030	1.340	.183	-.070	.360
Gender Investment	.011	.038	.653	.294	.770	-.064	.086
Extraversion (EPQ-R)	.247	.112	.402	2.198	.030	.024	.471
Neuroticism (EPQ-R)	.151	.109	.325	1.389	.168	-.065	.366
Social Desirability (EPQ-R)	.122	.113	-.500	1.085	.280	-.101	.346
Gender X Explicit SDS Endorsement	-.250	.146	-.074	-1.712	.090	-.540	.040
Gender X Gender Investment	-.056	.075	-.524	-.744	.458	-.205	.093
Gender X Extraversion	-.293	.168	-.433	-1.742	.085	-.626	.041
Gender X Neuroticism	-.236	.158	-.407	-1.493	.139	-.550	.078
Gender X Social Desirability	-.222	.173		-1.285	.202	-.565	.121

higher on the Neuroticism and Social Desirability subscales (all $p < 0.05$). Hierarchical regression analyses revealed that the gender difference on the SDS-IAT score remained significant after controlling for within-IAT presentation order, and number of valid IAT trials ($\beta = 0.353$, $p < 0.001$), see Table 4.

Convergent and Divergent Validity of the SDS-IAT

SDS-IAT scores did not correlate significantly with the related concept of explicit SDS endorsement, measured using the SASSY, nor with participants' scores on gender investment, see Table 5. In the female subsample, higher Extraversion was significantly associated with stronger implicit endorsement of a reverse SDS ($r = 0.36$, $p < 0.01$, $d = 0.77$). No other significant correlations with conceptually unrelated concepts were found.

Next, hierarchical multiple regression analysis using implicit SDS as dependent variable was performed on data of 111 participants. In the first step, presentation order, and number of valid IAT trials were entered as predictor variables. In the second step, gender, explicit SDS endorsement, Gender Investment, Extraversion, Neuroticism, and Social Desirability proneness were entered. In the third step, the interaction terms of gender and explicit SDS endorsement, Gender Investment, Extraversion, Neuroticism, and Social Desirability proneness were entered. Table 4 shows the results of the regression analysis. The full regression model was significant, $F(13, 96) = 2.79$, $p = 0.002$; see Table 4 for regression statistics. In addition to Presentation Order ($\beta = 0.23$, $p = 0.016$), Gender ($\beta = 0.37$, $p < 0.001$), and Extraversion ($\beta = 0.65$, $p = 0.030$) contributed significantly to the model. The interactions of predictor variables with gender were not significant.

Discussion

This study among heterosexual emerging adults investigated the psychometric characteristics of an Implicit Association Test aiming to measure implicit SDS endorsement. The reliability of the SDS-IAT was examined, and the attenuation-corrected alphas (practice trial 0.65; test trials 0.70; overall 0.67) were within the range of the reliability findings found for other IATs (Cunningham et al., 2001; Nosek et al.,

Table 5 Pearson correlations of implicit SDS endorsement measure using the IAT-SDS

	Young women (N = 75)	Young men (N = 38)
1. Explicit SDS endorsement (SASSY)	-.05	-.23
2. Gender Investment	-.07	.16
3. Extraversion (EPQ)	.36*	-.05
4. Neuroticism (EPQ)	.09	-.20
5. Social Desirability (EPQ)	-.06	-.11

* = $p < .01$

2007). This suggests that the measurement error of the SDS-IAT does not compromise the interpretation of the estimates of validity (Cronbach & Meehl, 1955), even though it sets an upper limit for correlations (Werts et al., 1976). We found that young men and women both scored below the midpoint of the SASSY, reflecting a modest level of explicit endorsement of the SDS. No gender difference was found here. This finding matched the findings in previous studies using the same measure (Emmerink et al., 2016a, 2016b, 2017), as well as in other studies with other explicit SDS measures (Bordini & Sperb, 2013; Crawford & Popp, 2003). However, the present findings did not replicate the gender differences found by Sakaluk and Milhausen (2012), who found that, compared with women, men more strongly endorsed the explicit sexual double standard.

Gender Differences

Whereas the SDS-IAT showed a modest level of implicit SDS endorsement among men that was in line with their explicit SDS level, a reverse implicit SDS was revealed among young women. A reverse implicit double sexual standard implies that the “sexually active” construct is more closely connected with “female” (and “sexually passive” is more closely connected with “male”) at an automatic level of processing. This pattern of findings is partially in line with those of Sakaluk and Milhausen (2012), who also found a reverse SDS in young women on an IAT measure of SDS endorsement, while young men’s IAT responses showed a relatively gender-neutral implicit attitude towards the sexual standard. However, the effect size of the reverse implicit SDS in young women in the Sakaluk and Milhausen study (2012) was larger than in the current study ($M=1.311$ vs. $M=1.081$). The dissimilar findings in both studies might be due to the use of different measures of explicit and implicit attitudes in both studies. Specifically, the SDS-IAT used in the present study used “sexually active vs sexually passive” as on-screen category labels, while the IAT in the study of Sakaluk and Milhausen used “sexually positive vs sexually negative”. The observed dissimilarities might also be due to sampling differences, as the latter study was conducted among university students while the current study cast a wider net among relatives and acquaintances of university students, resulting in a more diverse sample with respect to education level.

But although the relative scores of young women and men in the two studies differed, the results are in the same direction, whilst both studies used different explicit scales and different IATs, which adds to the robustness and credibility of the findings. The repeatedly found gender differences regarding the explicit-implicit discrepancy can be speculated to be the result of multiple factors. If the implicit reverse SDS in young women is a manifestation of a social trend, resulting in the waning of the SDS favoring sexually active and dominant behavior in men, and the emergence of an SDS favoring this sexual behavior in women, these effects might be stronger in a study sample comprising only young adults in the more catalyzing university setting (Bryant, 2003). The trend towards gender-specific double sexual standards, with both young men and young women implicitly associating “being sexually active” with their own gender, and “being sexually passive with the opposite gender, can be

interpreted as providing both genders with a self-serving bias function at an automatic level of processing (Mezulis et al., 2004; Paul et al., 1996), legitimating their own sexually active behavior. However, this implies that young women (also) see themselves as being sexually active and agentic (Klein et al., 2018; Mercer et al., 2013). Note that these findings do not yet reveal anything about the specific types of sexually active behaviors (e.g. socioemotional versus physical) young women and men have in mind, nor about the stage in the sexual interaction in which these behaviors are engaged in. However, the findings indicate once more that stereotypes of male and female sexual behaviors portray an all too simplified picture of a complex social reality. Future research might reveal whether the self-serving bias, or other interpersonal mechanisms, including the actor-observer bias (Jones & Nisbett, 1987; Wilson et al., 1997) might offer relevant explanations for the present findings.

Method-Related Effects

Implicit SDS endorsement was found to be affected by presentation order of the two combinations of target and attribute categories within the SDS-IAT, which were counterbalanced in this study. Specifically, response latencies were smaller when the combination of “female” + “sexually passive” and “male + sexually active” was presented first, compared with the reverse presentation order. Similar order effects of within-IAT presentation of the two combinations of targets and attributes have also been found in previous research (Aberson & Beene, 2007; Mannarini & Boffo, 2014; Mierke & Klauer, 2003; Sakaluk & Milhausen, 2012). Presentation order is said to be the most commonly observed method-specific factor affecting IAT effects (Greenwald & Nosek, 2001). In general, the paired categories that are presented first during IATs yield stronger associations (Greenwald et al., 1998; Schnabel et al., 2008). Explanations for this finding consider the residual costs of task switching; tasks requiring cognitive effort enhance interference with subsequent tasks (Mierke & Klauer, 2003; Nieuwenhuis & Monsell, 2002). Method-related variance may have an impact on the psychometric properties of the SDS-IAT. It contaminates the estimates of inter-item consistency and retest reliability and decreases the convergent validity of the IAT (Mierke & Klauer, 2003). Mierke and Klauer (2003) demonstrated that method-specific variance was reduced most effectively by computing IAT scores using the D measures for scaling IAT effects in units of standard deviations, while excluding very brief and very long reaction latencies (Greenwald, Nosek, and Banaji 2003), as we did in the present study. Implicit SDS endorsement was also found to be affected by number of valid IAT responses. Higher number of valid responses was associated with lower implicit SDS endorsement. This contaminating effect has also been found in studies using other IATs (Mannarini & Boffo, 2014). However, in a study on faking behavior in IAT performance, intentional error commission was found to be an unsuccessful faking strategy (Röhner et al., 2013). It can therefore be recommended for future research using the SDS-IAT to check potential sources of method-specific variance and to control for such factors in the statistical approach.

Explicit-Implicit Discrepancy

With regard to the convergent validity of the SDS-IAT, no significant correlations were found with a measure of explicit SDS endorsement, nor with general level of investment in gender ideals. Convergent validity with self-report measures measuring identical constructs, including explicit SDS endorsement, was not only expected to be low, based on previous meta-analytic data (Hofmann et al., 2005), but also on theoretical grounds. Theoretical accounts of implicit attitudes postulate the existence of separate information-processing modes (Greenwald & Banaji, 1995) and, consequently, responses on measures that tap into these different processes, will inherently demonstrate low convergence (Cunningham et al., 2001).

Investigation of the divergent validity, by conducting correlation analysis of SDS-IAT scores with scores on the conceptually unrelated concepts of extraversion, neuroticism, and social desirability proneness, showed that these constructs were largely independent: the correlations were not significant, except for Extraversion that correlated significantly, with a moderate effect size ($r=0.36$), in female participants. However, when method-related factors (order of presentation and number of valid IAT responses) were controlled for in regression analysis, this moderating effect of gender was lost. The absence of a significant association of implicit SDS with social desirability is similar to the results of Sakaluk and Milhausen (2012). The SDS-IAT was thus found to show adequate divergent validity with non-neighboring constructs.

Strengths, Limitations, and Implications of the Present Study

The present study aimed to further validate an implicit association test for measuring implicit endorsement of the sexual double standard. It was conducted among a sample of heterosexual emerging adults with a significant diversity of education and background. The results may help to investigate the impact of the sexual double standard in a changing world and across cultures.

The use of a convenience sample recruited among relatives and acquaintances of university students resulted in a skewed distribution of participants favoring women and more highly educated individuals. The demographic characteristics of the female and male subsamples differed: female participants were more often in a committed relationship than male participants. This gender difference cannot easily be explained. In the present sample, for instance, percentage of participants reporting that religion was important to them was not found to differ between female and male participants, nor between participants reporting being in a committed relationship vs. being single or dating.

Future psychometric studies of the SDS-IAT should address the stability of this measure by examining its test–retest reliability. Furthermore, the implicit aspects of the SDS should be compared across cultures, as well as in longitudinal research designs, to examine the relevance and pervasiveness of this aspect of gendered sexual attitudes under different cultural conditions.

Conclusion

Taking note of these limitations, the measurement of implicit aspects of SDS endorsement may be fruitfully pursued using the SDS-IAT. We expect that future studies using the SDS-IAT can aid in disentangling the different levels of cognitive processing concerning SDS endorsement. A notable finding in the current study was that young women adhere to a reverse implicit SDS. This could indicate an important social trend that warrants further study.

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Data Availability The data are available at: https://osf.io/3bsem/?view_only=1f0b4ec634494743a765922d0c4f89df.

Declarations

Conflict of interest The authors have no conflicting interests to declare.

Ethical Approval The study was approved by the ethical review board of Utrecht University.

Consent for Publication Consent for publication was requested in the informed consent text.

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