

1 A meta-analysis of the reliability of the Sexual Self-Esteem Inventory in Women (SSEI-W)
2 measure

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7 University, Newcastle upon Tyne, UK. The authors thank the authors who responded to
8 queries about their papers using the SSEI-W, and reviewers whose comments helped to
9 improve a previous version. This version: 8-9-2021. This is a preprint of a paper currently
10 under consideration for publication.

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Abstract

14

15 In 1996, Zeanah & Schwarz proposed a new measurement instrument for capturing sexual
16 self-esteem in women (SSEI-W). This 81 item measure is a multidimensional measure,
17 allowing for both the calculation of an overall scale and scores for five subscale components.
18 Since its conception, this measure has been broadly used not just with student samples but
19 also with general population and clinical population samples. Although the measure's
20 reliability was originally validated in a student sample, it has been used broadly in other
21 populations and also in other cultures. Therefore, we examine the reliability based on
22 Cronbach's alpha of the SSEI-W via random effects meta-analyses and explore which aspects
23 could impact the reliability of the scale. Our results showed that while there is substantial
24 heterogeneity, the overall measure shows very good reliability. There was little evidence that
25 sample characteristics impacted the overall reliability of the SSEI-W, though, as expected,
26 shortened versions produced lower reliabilities. Good to very good reliabilities were also
27 found for all the subscales. We discuss directions for further research with the SSEI-W.

28 *Keywords:* Sexual Self-Esteem; Reliability; Cronbach's alpha; Psychometrics

29 Word count: 7,671 (main text, incl. references)

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31 measure

32 **Introduction**

33 Sexuality is an important part of human experience. Early psychological research into
34 sex tended to focus on attitudes toward sex and sexual behaviors (e.g., Kinsey, Pomeroy, &
35 Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953; Robinson, 1976). However, as
36 with many social phenomena, an individual's view of their own sexuality and sexual
37 practices can influence these behaviors. Thus, Zeanah and Schwartz (1996) developed the
38 Sexual Self-Esteem Inventory (SSEI) (review in Zeanah & Schwarz, 2019). Their scale was
39 intended to help clinicians and researchers understand how sexual self-esteem could influence
40 individuals' sexual behaviors and well-being. In the past 24 years since the SSEI was
41 developed, it has been used by researchers not only in a variety of contexts but also in
42 diverse populations. Thus, the goal of the current study was to conduct a meta-analysis on
43 the reliability of the SSEI and its subscales using reliability measures reported for the
44 different populations in these studies.

45 **Sexual Self-Esteem Inventory**

46 The creators of the Sexual Self-Esteem Inventory highlighted the need for such a scale
47 because findings from research on global self-esteem and sexuality were mixed and a general
48 measure of self-esteem may not be sensitive enough to capture differences in sexual
49 self-esteem. In the original paper, they focused on women's sexual self-esteem because there
50 are societal norms about sex that could influence men and women's responses to the
51 measure. In a later review, the authors of the original paper do report an unpublished paper,
52 arguing that the measure can also be used with samples of men (Zeanah & Schwarz, 2019).
53 Based on theory about the factors that influence an individual's view of their own sexuality,
54 the authors proposed five separate domains of sexual self-esteem and created subscales to
55 measure each. The skill and experience subscale measures individuals' ability to please or be

56 pleased by a partner and their opportunities for sexual interactions. The attractiveness
57 subscale refers to an individual's feelings about their own body and their sexual appeal. It is
58 important to note that this subscale refers to one's satisfaction with the body as a whole
59 rather than specific body parts and thus is gender neutral. The control subscale measures
60 how much control individuals feel over their sexual thoughts, feelings, and behavior. The
61 moral judgement subscale refers to whether a person's sexual activities are morally
62 acceptable in their own eyes. Finally, the adaptiveness subscale measures to what extent
63 individuals are satisfied with their sexual relationships because these relationships meet their
64 goals and needs. This five factor model was supported by a principal component factor
65 analysis (Zeanah & Schwarz, 2019). The authors of the original paper found that the SSEI
66 had good convergent validity. They found that the attractiveness, skill/experience, control,
67 and adaptiveness subscales positively correlated with frequency of dating, sexual experience,
68 and relationship commitment. They also found that sexual guilt was positively correlated
69 with the moral judgement subscale and that the number of sexual partners participants'
70 reported was negatively correlated with the control subscale. There was also some evidence
71 for divergent validity. When they examined the correlation between the Rosenberg
72 Self-Esteem Scale, which measures general self-esteem, they found that Rosenberg's
73 Self-Esteem scale was only weakly correlated with the outcome variables, whereas the
74 subscales on the SSEI were moderately correlated with the outcome variables.

75 **SSEI's Use in Research**

76 Since its development the SSEI has proved useful in many different research contexts.
77 SSEI has been particularly helpful in studying the antecedents and consequences of sexual
78 behavior. For example, it has been used to study university age women who engage in
79 "hook-up" culture in the United States and how their sexual self-esteem relates to their
80 sexual practices (Dave, 2011; Evans, 2013; McLeese, 2015). It has also been used to study
81 the consequences of childhood or adolescent sexual assault on adult views on sexuality

82 (Faulkner, 2011; Kelley & Gidycz, 2015; Krahe & Berger, 2017a). The link between SSEI
83 and sexual communication has equally been a topic of interest (Oattes & Offman, 2007;
84 Rosenfeld, 2004). The SSEI has also been used by media researchers, examining why certain
85 people engage with different types of media, such as romance novels (Reese-Weber &
86 McBride, 2015) or dating apps (Tomaszewska & Schuster, 2019). Finally, it has been used in
87 research not directly connected to sex or romantic relationships, for example in
88 understanding how weight loss (Barghi, Ahmadi, & Bahrekhazan, 2017) or the desire for
89 cosmetic surgery (Toussi & Shareh, 2018) influence sexual self-esteem.

90 Not only has the SSEI been used to answer varied research questions, it has also been
91 used in diverse populations. The SSEI has been translated into multiple languages and used
92 in several different countries including Iran, Germany, Poland, Chile, and Turkey.
93 Furthermore, the scale has been used in both clinical samples and nonclinical samples.
94 Clinical samples include teens in treatment for mental health issues (Swenson, Houck,
95 Barker, Zeanah, & Brown, 2012), women in treatment for sexual violence induced PTSD
96 (Bornefeld-Ettmann et al., 2018), and women in treatment for depression (Krahe & Berger,
97 2017b). The scale has also been used with diverse non-clinical samples, such as sex-workers
98 (Shareh, 2016), men who sleep with men who are HIV positive (Pando, 2015), and women
99 who struggle with weight issues (Barghi et al., 2017; Jafari, Khodarahimi, & Rasti, 2016).
100 Additionally, it continues to be used with university student samples: the population on
101 which it was originally tested and validated. The original authors of the scale state that
102 gender, age, and other sociodemographic variables could potentially influence how
103 participants interpret the items and view each factor of sexual self-esteem included in the
104 SSEI. For example, researchers who used a population of men who sleep with men found
105 that they had higher scores on perceived attractiveness than heterosexual female college
106 students, but lower scores than heterosexual male college students (Pando, 2015). Thus, it
107 would seem pertinent to re-examine the reliability of the scale based on diverse samples from
108 around the world to examine if the reliability systematically varies according to

109 socio-demographic attributes of the sample.

110 **Commonly reported measures of reliability**

111 The reliability of a scale can be defined as how consistently a scale measures a specific
112 construct, either over time or across all items in the scale (Cronbach, 1951). In the seminal
113 paper describing Cronbach's alpha (α), Cronbach wisely points out that reliability over time
114 and across items are useful for different purposes. Reliability over time is more concerned
115 with stable constructs that we do not expect to change over time within individuals, while
116 reliability across items is about measuring a core construct. Therefore, the use of one form of
117 reliability over another depends on one's research question. Sexual self-esteem is posited to
118 change over time as individuals receive positive or negative feedback (Zeanah & Schwarz,
119 1996), thus a measure of internal reliability is most appropriate, rather than test-retest
120 reliability. Cronbach's α measures internal reliability by calculating the mean of all possible
121 split-half correlations. This means that the items are split in half in all possible
122 combinations and correlated and thus Cronbach's α can be interpreted similarly to a
123 correlation, even though the mathematical derivation is different. Scores closer to 1 indicate
124 higher internal consistency. Perhaps due to the ease of interpretation and simplicity of
125 calculation, Cronbach's α is the most frequently reported measure of reliability for scales in
126 psychology (Dunn, Baguley, & Brunsten, 2014), even though it is not without strong
127 limitations (e.g., Schmitt, 1996; Sijtsma, 2009). Due to it being commonly reported, we have
128 decided to use Cronbach's α as our measure of reliability in the current meta-analysis, in
129 hopes that studies, where the SSEI was used, will at minimum have reported Cronbach's α .

130 When the scale was originally developed, the researchers calculated Cronbach's α for
131 each subscale rather than for the total scale. For the Skill and Experience subscale made up
132 of 18 items, Cronbach's α was reported as .93. For the 17 item attractiveness scale,
133 Cronbach's α was .94. The 16-item control subscale was slightly less consistent with a
134 Cronbach's α of .88. The moral judgement subscale, consisting of 19 items, had a Cronbach's

135 α of .85. Finally, the 15-item adaptiveness subscale had a Cronbach's α of .90. Thus, the
136 items in each subscale are strongly interrelated and the individual subscales demonstrate
137 good internal consistency.

138 In our investigation, we hope to see similarly high values for Cronbach's α , however,
139 there are several factors that can influence α . The most important is the strength of
140 correlations between items, which is the measure of internal consistency that is of interest.
141 The second is the dimensionality of a scale. Essentially, Cronbach's α treats variability due
142 to items correlating with uncorrelated subscales as error, thus scales with subscales that are
143 weakly or uncorrelated tend to have lower α 's. This may be why the authors of the original
144 SSEI only reported α for each individual subscale. Finally, α can be influenced by the
145 number of items in the scale (up to 19 items) (Cortina, 1993). This becomes evident if we
146 consider that the effect of one bad item (weakly correlated with other items), is watered
147 down when it is combined with more items that are strongly correlated. Thus, the more
148 items in the scale, the higher our standard for a good value of α should be. Inversely, in
149 studies using a short form of the SSEI, we expect slightly lower α values.

150

Current study

151 Our aim was to verify the reliability of the Sexual Self-Esteem Inventory and examine
152 its reliability in diverse populations from around the world. We followed the PRISMA
153 guidelines to gather studies that had used the SSEI, based on the criteria that they had used
154 at least one of the SSEI subscales and reported Cronbach's α . We used Cronbach's α as a
155 measure of reliability and conducted a random effects meta-analysis (Vacha-Haase, 1998) to
156 estimate an overall reliability value for the measure.

Method

Data collection

The study was registered on the Open Science Framework (OSF) and follows the PRISMA guidelines where applicable. PRISMA is a set of evidence-based guidelines/items which aids in the reporting of meta-analyses and systematic reviews (Moher, Liberati, Tetzlaff, & Altman, 2010). We deviate in some cases from this form as the PRISMA guidelines are designed for randomised controlled trials, rather than the study of reliability. The PRISMA Flow Chart used to select studies can be seen in Figure 1.

Please insert Figure 1 here

A sample of 213 studies were identified through various databases including Google Scholar (N=99), Scopus (N=50), Sage Publications (N=36) and through inter-library loans (N=28). These papers were identified by searching for articles that cited the original reference (Zeanah & Schwarz, 1996), in any language, regardless of any item modification (though it appears that none of the articles explicitly report modifying individual items). Peer-reviewed articles, PhD dissertations, and Masters theses were included if they met the selection criteria. Of the 213 records identified, 114 (53.52%) were discarded due to these being duplicates which left 99 studies to filter through. One study was excluded due to the paper not being accessible as it was removed from the database. This left 98 studies which were assessed for eligibility, 52 (53%) were excluded as they only referenced the original paper but did not use the scale. Ten of the eligible 46 studies utilised the scale, but did not report the Cronbach α 's required. We contacted these authors where possible to still include these, but were unable to include them in our analyses as we were unable to calculate an α for our analyses. This left 36 studies in the sample. There were two papers derived from the same sample (Krahé & Berger, 2017a, 2017b), we, therefore, included the one with the largest final sample size (N = 2,425 vs. N = 2,251) in our further analysis, but note that these two samples yielded identical estimates for α . These 35 samples represented 13,960

183 participants. Ten of these 35 studies did not report age (in years), the estimated weighted
184 average for age is $M = 25.90$ years ($SD = 8.45$).

185 **Coding of Sample Characteristics**

186 The sample characteristics were coded for each study in which they were present. They
187 included: (a) sample size, (b) mean age, (c) percent female, (d) type of sample: general
188 population, student or clinical, (e) geographical location – where the study was conducted
189 which was coded via ISO codes (three letter codes documenting the country where the data
190 were collected); (f) percent heterosexual (g) percent in a romantic relationship. These were
191 chosen for exploratory purposes and description of the samples. The choice of these sample
192 characteristics is similar to other meta-analyses of reliability (e.g., Graham & Christiansen,
193 2009; Steven V. Rouse, 2007).

194 **Analytical strategy**

195 As Cronbach's α can be straightforwardly interpreted as a correlation coefficient
196 (Bland & Altman, 1997). We apply Fisher's r to z transform for the analyses (e.g., Caruso,
197 2000; O'rourke, 2004), but we transform the values back when reporting in text. Reliabilities
198 were summarised via random effects meta-analyses with a Sidik-Jonkman estimator for τ^2 .
199 We also report other common measures for heterogeneity, i.e. estimates for the between
200 study variation in α , including I^2 , as a crude rule of thumb $>75\%$ is deemed to be an
201 indicator of substantial heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). There
202 are alternative methods to transform α (Bonett, 2002; Hakstian & Whalen, 1976; Rodriguez
203 & Maeda, 2006) or one could also use the raw alpha. We opted for the Fisher's r to z
204 transform as it is more widely employed in meta-analysis and allows us to further examine
205 the consequences of shortening (alternative methods use the number of items in the
206 meta-analyses). Our supplementary analyses showed little difference between any of the
207 transformations on the fundamental conclusions (changes were largely limited to the second
208 decimal of estimates). More generally, simulation studies suggest that different ways of

209 constructing confidence intervals for α tend to yield negligible differences (Romano, Kromrey,
210 & Hibbard, 2010).

211 We report the forest plot with 95% confidence intervals which allow testing whether
212 they fell within Nunnally's (1978) "acceptable" range (.7) for the overall scale in terms of α .
213 For the subscales the forest plots can be found on the [Open Science Framework \(OSF\)](#). We
214 examined publication bias for the overall scale based on a visual check of the funnel plot and
215 Egger's test (Borenstein, Hedges, Higgins, & Rothstein, 2009; Egger, Smith, Schneider, &
216 Minder, 1997). It is important to note that publication bias is but one cause for funnel plot
217 asymmetry (Egger et al., 1997 : 632). For the subscales, these checks for publication bias are
218 reported in full on the [OSF](#). These are not reported here fully in text, in part as the number
219 of studies is problematic (Sterne et al., 2011). Similarly, we report estimates following
220 trim-and-fill procedure (Duval & Tweedie, 2000; Mavridis & Salanti, 2014). This
221 non-parametric procedure first (1) "trims", i.e., removes, the smaller studies causing the
222 funnel plot asymmetry, next (2) it uses the trimmed funnel plot to estimate the true "centre"
223 of the funnel, and finally (3) it then imputes any omitted studies around the centre (filling).
224 However, one should note the limitations of this procedure (e.g., Peters, Sutton, Jones,
225 Abrams, & Rushton, 2007; Simonsohn, Simmons, & Nelson, 2018). Finally, while caution
226 must be used when interpreting fail-safe N's (e.g., Becker, 2005), we also report how many
227 studies would need to be added for the estimated reliability to fall below .5 (Orwin, 1983).

228 We performed a series of exploratory univariate meta-regressions to explore whether
229 the type of sampling (Clinical/Student/General population sample), translation, shortening
230 of the scale (No/Yes), publication year, proportion of female participants, proportion of
231 heterosexual participants and proportion of participants in a relationship could be related to
232 reliability. We used a permutation method with a 1,000 permutations to assess the
233 robustness of these meta-regressions (Good, 2013; Viechtbauer, 2010). In our supplementary
234 analyses on the [OSF](#), we report similar analyses for the subscales. These are not reported in

235 text, as the number of studies for each of these meta-regressions was small and we, therefore,
236 caution against attaching inferences to these. In addition, it is important to bear in mind
237 that meta-regressions are especially likely to yield false positive results when the number of
238 studies is low, there are a large number of candidate predictors, and when heterogeneity is
239 present (Higgins & Thompson, 2004). This applies to all our meta-regressions.

240 All analyses followed the PRISMA guidelines where possible (Moher et al., 2010). The
241 PRISMA guidelines were designed with randomised controlled trials in mind, whereas our
242 focus is on reliability, therefore not all guidelines apply. Our design and core analyses were
243 preregistered on the [OSF](#). On the [OSF](#), we also present sample descriptions for subscales,
244 additional exploratory analyses, and robustness checks (e.g., leave-one-out analysis, changing
245 the estimator of τ^2 , using different transformations for α (Bonett, 2002; Hakstian & Whalen,
246 1976)).

247 The core analyses were conducted in R 4.0.2 (R Development Core Team, 2008), with
248 the packages “meta” and “metafor” (Schwarzer, Carpenter, & Rücker, 2015; Viechtbauer,
249 2010). Our data and script are available from the [OSF](#).

250 Results

251 Qualitative synthesis and sample description.

252 Studies were published between 2002 and 2019. There was some geographical spread
253 among the 35 samples but the majority of samples were from the United States ($k = 18$),
254 followed by Iran ($k = 5$), Germany ($k = 4$) and Canada ($k = 3$). All other countries only
255 contributed a single sample to the dataset (Chile, France, Poland, Portugal, Turkey, UK;
256 Figure 2). Notably, there were no samples from Africa, Australasia, and East Asia. The
257 majority of the samples relied on the original rather than a translated version ($k = 30$, 4
258 translated samples, 1 was a mixture of translated and original). Around half of the samples
259 shortened the original scale ($k = 18$), shortening it to either 35 items ($k = 13$) or fewer items

260 (k=5). Three samples indicated validation of the shortened version used (Bornefeld-Ettmann
261 et al., 2018; Farokhi & Shareh, 2014; Hannier, Baltus, & De Sutter, 2018). The majority of
262 samples were classified as student samples (k = 22), followed by general population samples
263 (k = 8) and the remainder was classified as clinical samples (k = 5). Unsurprisingly the
264 sample was predominantly female (82.86%, weighted average). Six samples have used the
265 SSEI-W in a sample that also contained men and one used an exclusively male sample
266 (Pando, 2015). Of the 35 samples, 21 provided some information on sexual orientation and
267 16 provided some information on relationship status. The majority of participants were
268 heterosexual (87.03%) and roughly half of them were in a relationship (50.96%).

269 **Please insert Figure 2 here**

270 **Overall scale**

271 Of the 35 eligible studies, 27 reported a Cronbach's α for the overall scale, totalling
272 11,223 participants (range: N = 64 to N = 2,425). The estimate from the random effects
273 meta-analysis for α is .90, 95% CI [.88; .92]. Figure 3 shows the forest plot summarizing the
274 meta-analysis. Figure 3 also shows that there is but a single individual study which had an
275 overlapping confidence interval with $\alpha = .7$ (Santos, 2013) which would be considered a low
276 level of reliability. There was, however, substantial heterogeneity, $Q(26) = 804.24$, $p < .0001$,
277 $I^2 = 96.8\%$, $\tau^2 = .08$.

278 **Please insert Figure 3 here**

279 A visual check suggested asymmetry in the funnel plot, this was corroborated by
280 Egger's test ($t(25) = 3.47$, $p = .002$). Using Orwin's fail-safe N procedure (Orwin, 1983), 46
281 studies are necessary to reduce the reliability to .5. A trim-and-fill procedure would add 11
282 studies to the left of the plot (Figure 4). The revised random-effects estimate of α is
283 estimated to be .85, 95%CI [.80; .88] ($Q(37) = 1610.48$, $p < .0001$, $I^2 = 97.7\%$, $\tau^2 = .20$).
284 While adjustment for potential publication bias reduces the estimated reliability the scale is

285 estimated to have good reliability because over 40 additional studies with poor reliability on
286 the SSEI would need to be conducted to reduce the reliability to an unacceptable level.
287 Thus, we can be relatively confident in the high estimations of reliability observed in the 35
288 original studies.

289 **Please insert Figure 4 here**

290 A univariate meta-regression relying on permutation testing (1,000 permutations)
291 suggested that publication year was significantly related to reliability ($Q(1) = 5.87, p =$
292 $.013$). More recent studies tended to have lower reliability ($B = -.03, 95\% \text{ CI: } -.05 - -.01$).
293 Meta-regression also suggested that shortened versions were associated with lower
294 reliabilities ($Q(1) = 6.16, p = .014; (B = -.27, 95\% \text{ CI: } -.48 - -.06)$); however, this is to be
295 expected since longer scales tend to have higher α 's (Cortina, 1993). There was no indication
296 that the type of sample (Clinical/General/Student), Proportion of Women, Proportion of
297 Heterosexual participants, Proportion of participants in a relationship, or translation had a
298 notable effect on the observed heterogeneity of α (Q tests for moderators: all p 's $> .125$).

299 **Subscales**

300 All the estimates for 95% confidence intervals for the reliabilities of the subscales
301 largely overlap, it, therefore, seems that the overall effect is unlikely to be driven by a single
302 subscale or that certain subscales have a much greater reliability than others.

303 **Skill/Experience.** 14 studies comprising 3,693 participants were meta-analysed and
304 yielded an estimate of $\alpha = .85, 95\% \text{ CI } [.81;.87]$. There was substantial heterogeneity, $Q(13)$
305 $= 180.66, p < .0001, I^2 = 92.8\%, \tau^2 = .03$. A visual check suggested no indication of funnel
306 plot asymmetry. The fail-safe N procedure suggested that 18 studies would be needed to
307 reduce the reliability to .5.

308 **Attractiveness.** 16 studies totalling 4,052 participants were meta-analysed and
309 yielded an estimate of $\alpha = .87, 95\% \text{ CI } [.83; .89]$. There was substantial heterogeneity, $Q(15)$

310 = 394.83, $p < .0001$, $I^2 = 96.2\%$, $\tau^2 = .06$. A visual check suggested no substantial evidence
311 for funnel plot asymmetry. The fail-safe N procedure suggested that 23 studies would be
312 needed to reduce the reliability to .5.

313 **Control.** 18 studies containing a total of 5,390 participants were meta-analysed and
314 yielded an estimate of $\alpha = .82$, 95% CI [.79; .85]. There was substantial heterogeneity, $Q(17)$
315 = 281.58, $p < .0001$, $I^2 = 94.0\%$, $\tau^2 = .03$. A visual check suggested no funnel plot asymmetry.
316 The fail-safe N procedure suggested that 20 studies would be needed to reduce the reliability
317 to .5.

318 **Moral Judgement.** 13 studies comprising 3,663 participants were meta-analysed
319 and yielded an estimate of $\alpha = .80$, 95% CI [.75; .85]. There was substantial heterogeneity,
320 $Q(12) = 109.21$, $p < .0001$, $I^2 = 89.0\%$, $\tau^2 = .04$. A visual check suggested no substantial
321 evidence for funnel plot asymmetry. The fail-safe N procedure suggested that 13 studies
322 would be needed to reduce the reliability to .5.

323 **Adaptiveness.** 14 studies totalling 3,693 participants were meta-analysed and
324 yielded an estimate of $\alpha = .80$, 95% CI [.76; .83]. There was substantial heterogeneity, $Q(13)$
325 = 125.28, $p < .0001$, $I^2 = 89.6\%$, $\tau^2 = .02$. A visual check suggested no substantial indication
326 for funnel plot asymmetry. The fail-safe N procedure suggested that 15 studies would be
327 needed to reduce the reliability to .5.

328 Discussion

329 In the current meta-analysis of the Sexual Self-Esteem Inventory for Women (SSEI-W),
330 we analyzed 35 studies conducted in 10 different countries with varied populations. The α
331 for the overall scale showed good reliability or interrelatedness of items, even after
332 accounting for potential publication bias. Each subscale also showed good reliability in terms
333 of α which suggests that the inventory can be used with confidence in whole or in part.
334 Interestingly, there is little evidence to show that sample characteristics, translations, or
335 modifications (shortened forms) to the SSEI-W have a substantial impact on estimated

336 reliability. Thus, while the scale has not been validated in these populations, researchers can
337 expect the α for this measure to be similar across diverse populations. Though one should
338 bear in mind that α captures only one aspect of the reliability of the scale, as measured by
339 the interrelatedness of the items, and not its validity in measurement across groups. As we
340 elaborate below, future work would benefit from validating the SSEI-W in different cultures
341 and establishing measurement equivalence. This will then also open a path to examine the
342 role for the broader study of cultural variables (e.g., Hofstede, 2001) in explaining variation
343 in reliability (see [ESM](#)).

344 Interestingly, we did observe that there was substantial heterogeneity in our
345 meta-analyses of α 's. Apart from the length of the inventory used (complete versus short
346 form), none of the other sample characteristics robustly explained the heterogeneity in
347 reliability between the studies. However, such heterogeneity in reliability is to be expected as
348 measurement error or variation in methods can cause such variability (Higgins et al., 2003).

349 Although our analyses do not provide direct evidence of the validity of the scale, the
350 articles on which our reliability analyses are based do provide evidence for some aspects of
351 validity of the scale, specifically criterion validity. For example, when a patient group of
352 women who had experienced sexual or relationship violence was compared to a healthy
353 control group, researchers found that women who had experienced sexual violence had lower
354 sexual self-esteem and indeed scored lower on all five subscales than the control group
355 (Bornefeld-Ettmann et al., 2018). In a similar study, women who had experienced childhood
356 sexual abuse had lower scores on the SSEI than a control group and sexual self-esteem, as
357 measured with the SSEI, partially mediated the relationship between past abuse and
358 revictimization (Van Bruggen, Runtz, & Kadlec, 2006). Higher scores on the SSEI have also
359 been linked to better sexual communication in intimate relationships (Oattes & Offman,
360 2007). These studies thus provide evidence for the criterion validity of the SSEI in clinical
361 samples, specifically of women who have experienced abuse. One possible valuable use of the

362 SSEI could be to help clinicians better understand what areas of sexual self-esteem they can
363 target to help patients improve their sexual experiences and relationship quality.

364 More evidence of the usefulness of the scale can be seen in research looking at changes
365 over time in scores on the SSEI. In one study on sexual self-esteem and cosmetic surgery in
366 which women completed the SSEI before and after undergoing cosmetic surgery, their scores
367 were higher post-surgery, suggesting that sexual self-esteem can change over time and that
368 certain interventions can be efficacious at improving sexual self-esteem (Esmalian Khamseh
369 & Nodargahfard, 2020). In another study looking at adolescent sexual self-esteem and sexual
370 experiences over a 9 month period, researchers found that compared to their baseline scores,
371 adolescents who had engaged in their first sexual experience during the study period had
372 increased scores on the subscales of skills/experience and moral judgement after their first
373 sexual experience (Swenson et al., 2012). Thus, we can see further evidence for the criterion
374 validity of the SSEI when it has been used longitudinally to examine how life events can
375 influence levels of sexual self-esteem. Therefore, when combined with the reliability analyses
376 presented in the current study, the findings in previous studies which utilize the SSEI
377 provide preliminary evidence for the reliability and validity of the scale and its use as a
378 multidimensional measure of sexual self-esteem. It should be noted, however, that further
379 tests of validity are necessary (Finch & French, 2018; Hussey & Hughes, 2020), as, for
380 example, there has been no follow-up work on test-retest reliability and measurement
381 invariance. Most papers reported just the internal consistency of the scale, and while a five
382 factor structure was supported in the initial validation (Zeanah & Schwarz, 2019),
383 subsequent work has not thoroughly examined support for its five factor structure (factorial
384 validity). In sum, a truly valid measure should do much more than exhibit a “good”
385 Cronbach’s α (e.g., Borsboom, 2005; Finch & French, 2018; Hussey & Hughes, 2020; Markus
386 & Borsboom, 2013) and we call for more research on measurement of the SSEI.

387 **Limitations**

388 There are several limitations to the current meta-analysis. First, we were unable to
389 retrieve the reliabilities for ten studies that had used the SSEI, even after contacting the
390 corresponding authors, but we attempted to adjust for this via use of a fail-safe N analysis.
391 For all of the analyses (on the entire scale and the subscales), the fail-safe N analysis
392 suggested that between 13 and 46 studies would need to be added to reduce the Cronbach's
393 α to an unacceptable level, but note the limitation of these techniques (e.g., Becker, 2005).
394 A second shortcoming is that we only examined one aspect of measurement: reliability with
395 Cronbach's α , a measure which in itself is limited in capturing reliability (e.g., Dunn et al.,
396 2014; Sijtsma, 2009). A good measure should do more than just exhibit a high α (e.g., Finch
397 & French, 2018; Flake & Fried, 2020; Hussey & Hughes, 2020). For example, in our case it
398 should exhibit the same five factor structure in each study and across populations. This
399 should be tested using confirmatory factor analysis (e.g., Loehlin & Beaujean, 2017) and
400 measurement equivalence (e.g., Vandenberg & Lance, 2000) to determine, for example, if we
401 are measuring the same five factor construct in a clinical vs. a student sample. This is next
402 to other aspects, such as, for example, test-retest reliability over time (e.g., Finch & French,
403 2018). Third, most samples were collected from Western, Educated, Industrialized, Rich and
404 Democratic ("WEIRD") populations (Henrich, Heine, & Norenzayan, 2010). Most samples
405 are also based on students, a wide-spread issue for social psychology and more broadly the
406 social sciences (e.g., Arnett, 2008; Peterson, 2001; Pollet & Saxton, 2019; Schultz, 1969;
407 Sears, 1986). There were, however, several samples from Iran and other non-English
408 speaking countries and some samples from clinical populations. The reliability and validity
409 of the scale should be examined further in such diverse samples. Finally, many authors
410 collapse the SSEI into a single score rather than treating it as separate subscales in a
411 multi-dimensional measure, as the original creators of the inventory intended. This could
412 potentially cause problems because some subscales may not be correlated. One example is
413 the experience and the moral judgement subscales. Some individuals may have many sexual

414 experiences, but not feel morally satisfied with their actions. Thus, we suggest that in the
415 future researchers should use the subscales separately and make specific predictions about
416 each of these based on previous research.

417 **Future directions**

418 Similar to most work in personality and social psychology (Hussey & Hughes, 2020),
419 most papers reported Cronbach's α but provided only limited information on other aspects
420 of measurement, for example, factorial validity. There are thus several future directions that
421 could result from our synthesis. First, it would be interesting to examine measurement
422 equivalence in clinical versus student samples. For example, do the factors correlate in
423 similar ways in each of these populations? To answer this question, the inventory will need
424 to be utilized in more clinical studies and in clinical studies with larger samples. A second
425 population of interest is men. The current study revealed that there are relatively few
426 studies that have used the SSEI in studies with men, perhaps unsurprising considering that
427 it was originally validated on a sample of women, although the measure does not appear to
428 have gendered items. Men's sexual self-esteem is an understudied topic in the literature.
429 Although some studies have examined sexual self-esteem in men who have sex with men, and
430 how this relates to their sexual practices (Kvalem, Træen, & Iantaffi, 2016; Stokes &
431 Peterson, 1998; Træen et al., 2014) little research on heterosexual men's self-esteem has been
432 conducted (for one example, see Ménard & Offman, 2009). The five dimensions on the SSEI
433 could provide insight into men's views of their sexual self-esteem and how it is associated
434 with various antecedents and outcomes, similar to the ways in which it has been used in
435 research on sexuality in women. A study validating the scale with a representative sample of
436 men, could be a valuable next step for researchers interested in studying men's sexual
437 self-esteem. Next to these two directions, further work is needed to address other aspects of
438 validity of the scale.

Conclusion

439

440 The SSEI is an important and useful measure for researchers interested in human
441 sexuality. It captures an individual's own view of their sexual practices, attractiveness,
442 control in sexual interactions, moral judgements about their sexuality, and the adaptiveness
443 of their sexual practices. Such information may be key in understanding both adaptive and
444 risky sexual practices for clinicians, researchers, and public health officials. Our meta-analysis
445 shows that the SSEI has good reliability in terms of Cronbach's α and both the short and
446 long-forms can be used as translations in different countries and in diverse populations.

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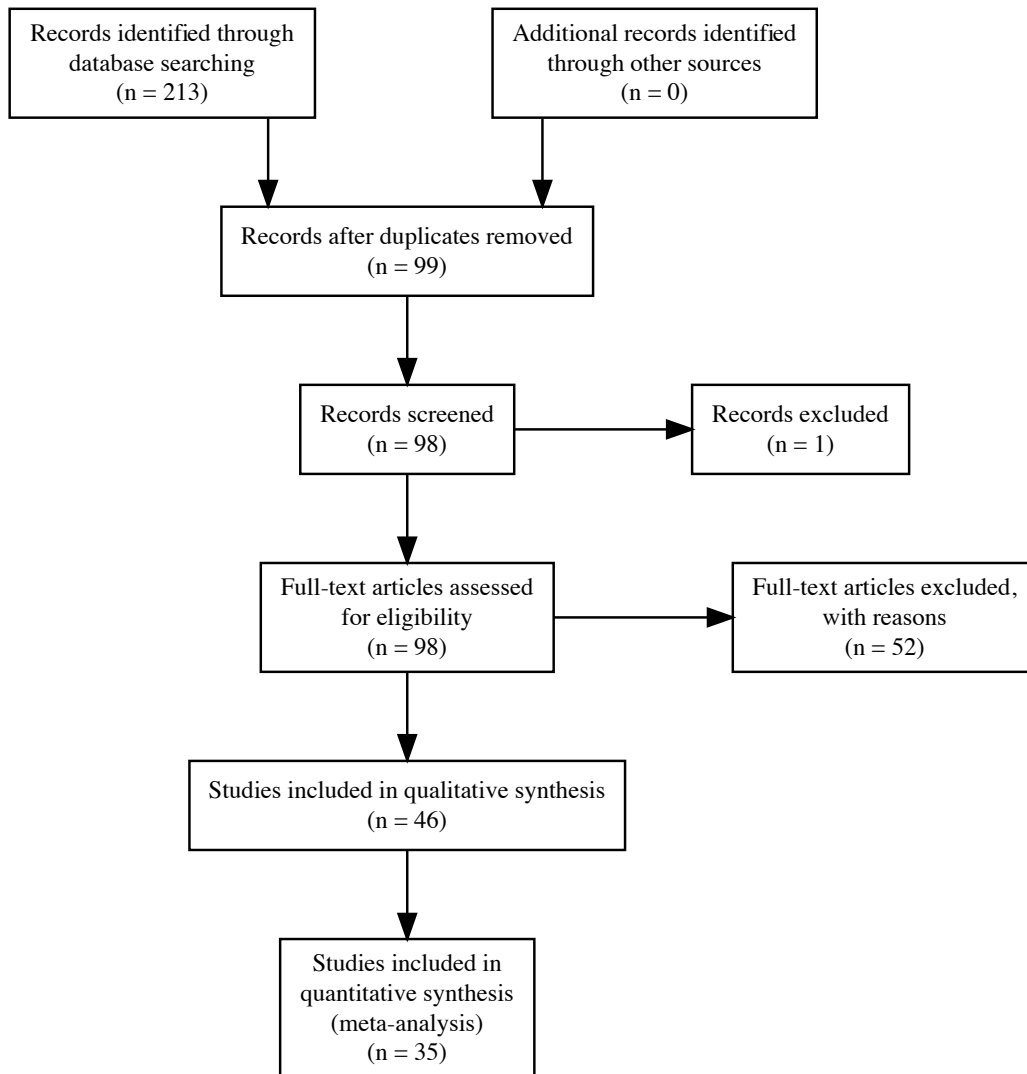


Figure 1. PRISMA flow chart.

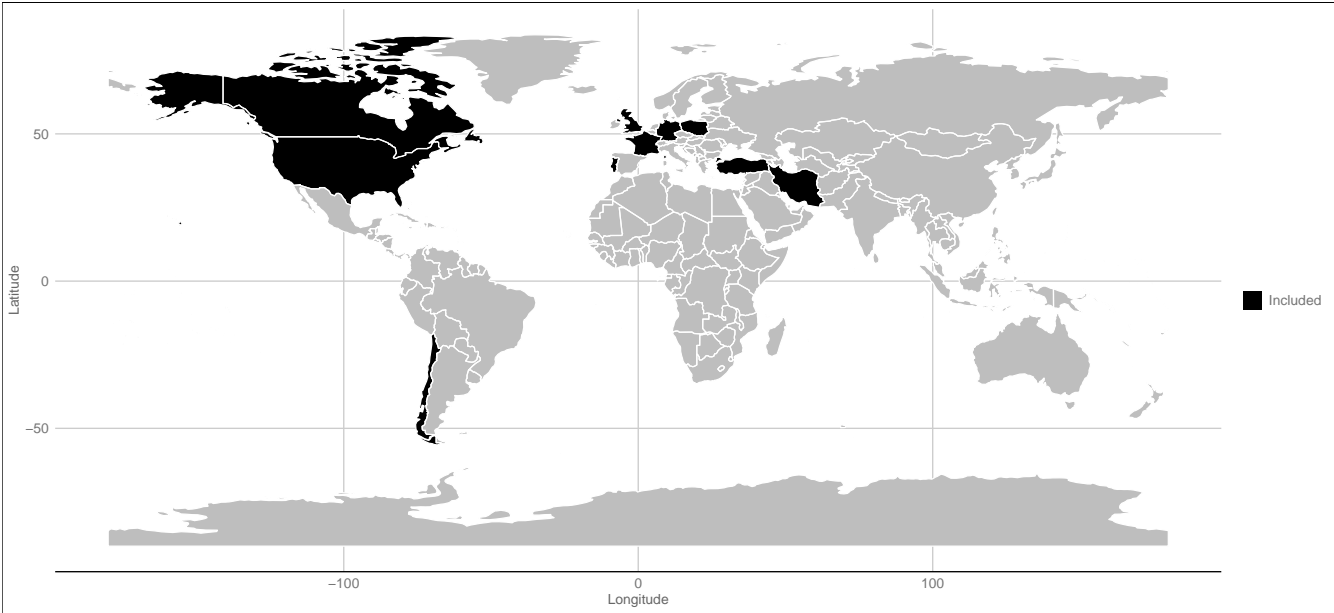


Figure 2. Map with geographical distribution of studies.

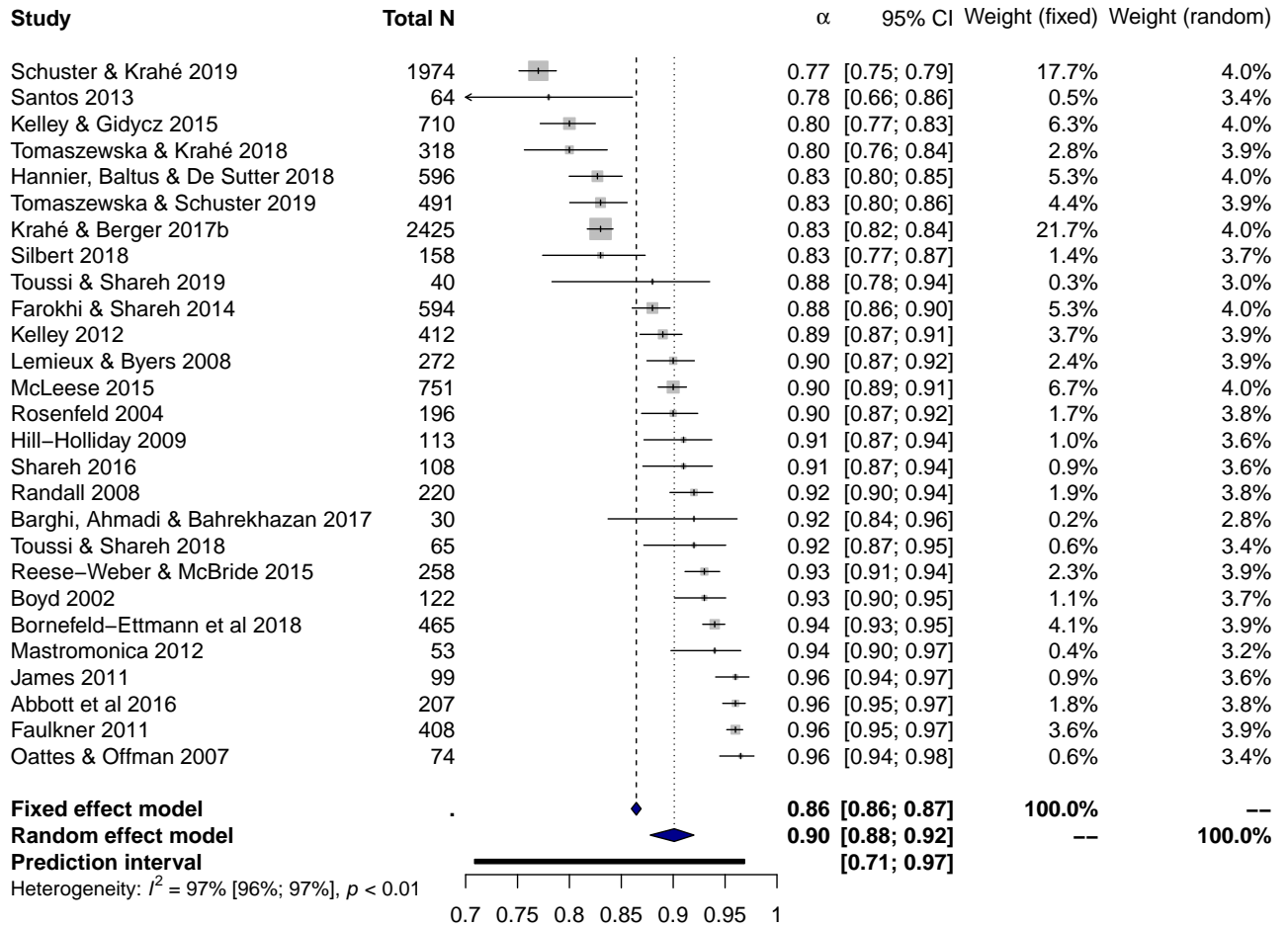


Figure 3. Forest plot (effects and 95% CI) for the overall reliability of the SSEI-W.

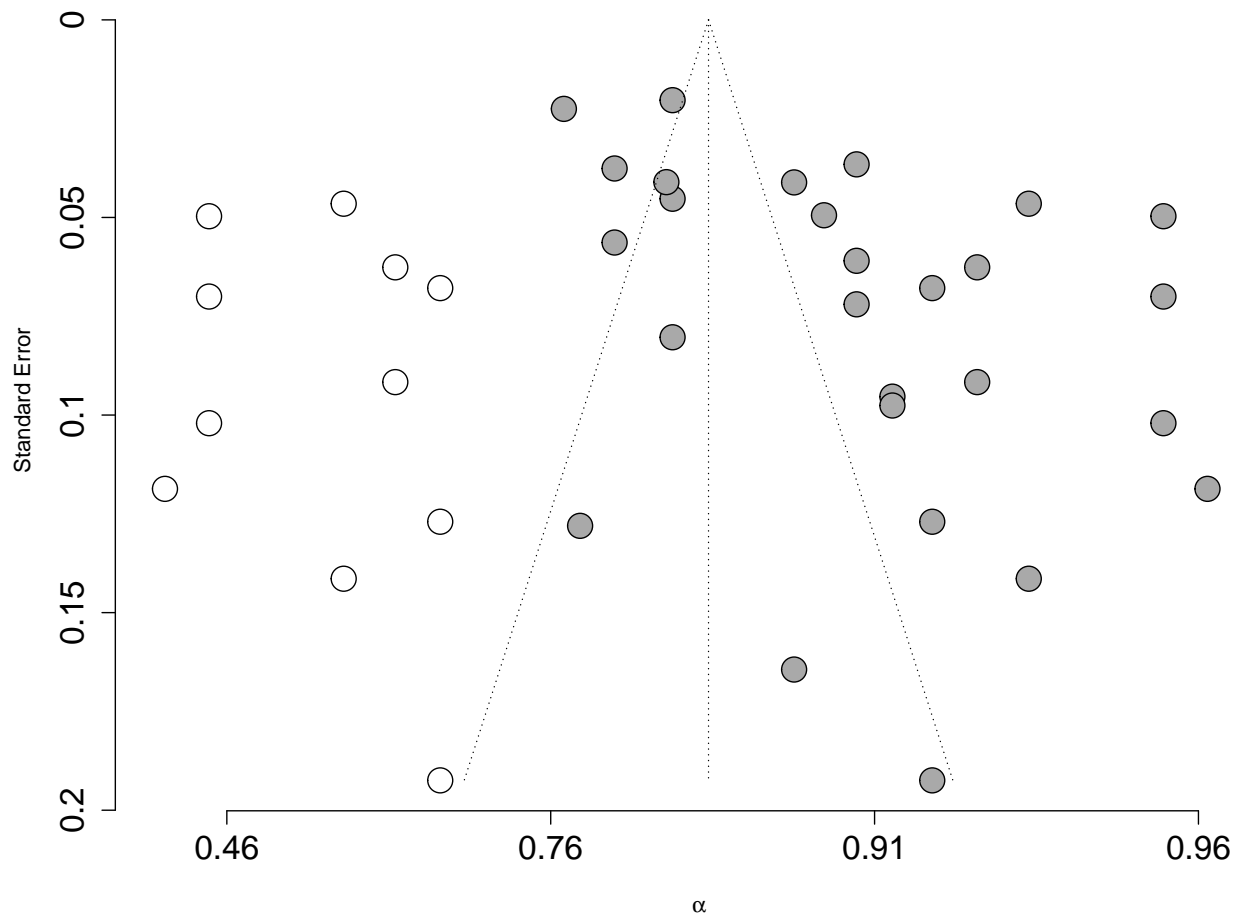


Figure 4. Funnel plot with studies (grey circles) and trim-and-fill estimates added (open circles) for the overall reliability of the SSEI-W.