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A Psychometric Study of a Trait and State Assessment of Sexual Pleasure – The Amsterdam Sexual Pleasure Inventory

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ABSTRACT

We studied the Amsterdam Sexual Pleasure Inventory's (1.0) psychometric properties. The ASPI, a revised self-report battery designed to measure domains of state and trait sexual pleasure in diverse gender, sex, and relationship populations, is based on a recently proposed conceptual framework of sexual pleasure. We collected quantitative ($n = 1371$) and qualitative data ($n = 637$) using a cross-sectional multi-method design targeting the general (German-speaking) population. After pre-processing, we conducted analyses on a sample of $n = 706$ participants. The theory-based 5-factor exploratory structural equation model and the principal component analyses of the two general exploratory index-scales showed good and acceptable structural validity evidence respectively. Measurement invariance was confirmed separately for male and female participants and for those with sexually functional-scoring and dysfunctional-scoring levels. Coefficient omega indicated that all scales, except those of one facet, showed acceptable to very good internal consistency. The ASPI's convergent and discriminant associations with sexological and psychological constructs demonstrated good overall construct validity. Participants understood the items as intended and felt that the ASPI covered relevant facets of sexual pleasure. The ASPI might help understand how individuals differ in experiencing sexual pleasure and how different contexts enable some people to experience pleasure while disadvantaging others.

Introduction

Sexual pleasure is a core component of sexual health and has gained increasing clinical and research attention in the last 20 years (Jones, 2019; Mitchell et al., 2021; World Association for Sexual Health [WAS], 2019; World Health Organization [WHO], 2002). Sexual pleasure has been defined as “the physical and/or psychological satisfaction and enjoyment derived from solitary or shared erotic experiences, including thoughts, dreams and autoeroticism. [...] The experiences of human sexual pleasure are diverse [...]” (Global Advisory Board for Sexual Health and Wellbeing [GAB], 2016; WAS, 2019) ranging from the experience of physical sensations to the experience of emotional connection and exploration (Fileborn et al., 2017; Goldey et al., 2016; Werner et al., 2023a). Since there is a growing body of sex research that focuses on sexual pleasure, it is of utmost importance to have valid instruments to assess sexual pleasure (Ford et al., 2019, 2021; Gianotten et al., 2021; Jones, 2019; Kantor & Lindberg, 2020; Philpott et al., 2021).


Definitions of Sexual Pleasure

Several definitions of sexual pleasure have been proposed (for a review, see Werner et al., 2023a). So far, none of these definitions has succeeded in defining sexual pleasure precisely enough to

clearly distinguish it from other concepts such as sexual satisfaction (e.g., the GAB definition equates the two concepts), and comprehensively enough to encompass the diversity of sexual pleasure mentioned above. Recently, Werner et al. (2023a) suggested that sexual pleasure can be defined as *the positive feeling induced by the anticipation, attainment, and consumption of rewards during sexual activities*. They proposed that (1) the tendency to experience sexual pleasure depends on (2) an individual's capacities to attain and experience rewards during sexual activities and (3) the availability of sexual activity that offers rewards. Sexual pleasure then encompasses the positive feeling due to rewards (also called *state* components) and the capacities to attain and experience rewards resulting in the tendency to experience rewarding sexual activity (also called *trait* components). Since rewards retrieved from sexual activity can be diverse, Werner et al. (2023a) proposed a taxonomy of rewarding aspects of sexual activity based on a review of the theoretical and empirical literature. The proposed taxonomy can be divided into the hedonic, interpersonal, and intrapersonal domains presented in Table 1. In summary, the framework of sexual pleasure by Werner et al. (2023a) holistically defined sexual pleasure in its multifaceted

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Table 1. Domains and facets of trait and state sexual pleasure and existing self-report measures.

Domain	Trait ^b Facets	Existing Measures	State Facets	Existing Measures
Hedonic Domain	Arousal Enjoyment The tendency to enjoy sensual stimulation and its psychophysiological consequences.	No existing measures	Sensual Pleasure Level of experienced pleasure through sexual stimulation and its psychophysiological consequences.	EMSEXpleasure ^e , B.E.S.T Scale ^f , two unnamed Pleasure Scales ^{g,h}
Interpersonal Domain	Bonding Enjoyment The tendency to experience and enjoy the bonding-related rewards of sexual interactions.	No existing measures	Bonding Pleasure Level of experienced (pleasure through) feelings of closeness, affection, safety, and security during sexual interactions.	B.E.S.T Scale, SPS ⁱ
	Interaction Enjoyment The tendency to enjoy pleasuring and being pleased by a sexual partner (i.e., enjoying the sharing of pleasure).	No existing measures	Interaction Pleasure Level of pleasure experienced during sharing pleasure and from interaction with a sexual partner.	B.E.S.T Scale, SPS
Intrapersonal Domain	Enjoyment-related Self-Efficacy The tendency to be confident and competent about engaging in pleasurable sexual activities.	FSSI ^c	Pleasure-related Mastery Level of experienced mastery in creating pleasurable sexual activities.	No existing measures
	Enjoyment-related Self-Worth The tendency to evaluate oneself as sexually worthy and deserving of positive sexual experiences.	FSSI	Pleasure-related Validation Level of perceived worthiness to experience positive sexual experiences and experienced self-validation during sex.	No existing measures
General Domain ^a	Sexual Experience Enjoyment The tendency to enjoy various sexual activities.	Pleasuremeter ^d	General Sexual Pleasure Level of recently experienced pleasure related to different sexual activities.	EMSEXpleasure, SPS

^aNot part of the sexual pleasure framework of Werner et al. (2023a). ^bNote that Werner et al. (2023a) further differentiated traits into loose traits (tendency) and strict traits (capacity); here, we focus on traits as tendencies since we expect self-report measures like the ASPI to assess tendencies to experience pleasure more than capacities to experience pleasure (see Werner et al., 2023a, for more detail). ^cFemale Sexual Subjectivity Inventory by Horne and Zimmer-Gembeck (2006). ^dThe Pleasuremeter by Castellanos-Usigli and Braeken van Schaik (2019). ^eMale Sexual Pleasure Scale by Siegler et al. (2018). ^fBody, Emotions, Sensations, Touch/Trust (B.E.S.T.) Scale by Beckmeyer et al. (2021). ^{g,h}Unnamed scales by Jozkowski et al. (2016) and Vigil et al. (2021). ⁱSexual Pleasure Scale by Pascoal et al. (2016).

nature and thereby provided a framework to conceptualize and assess this multifaceted concept.

What Makes Sexual Pleasure Unique?

While sexual pleasure has been recognized as a multidimensional construct that encompasses more than the experience of orgasm (Fahs & Plante, 2017; Tiefer, 2004), previous studies have often operationalized it solely in terms of physiological arousal and climax. This measurement focus may overlook the diversity across individuals and contexts in what makes sex pleasurable (Fileborn et al., 2017; Goldey et al., 2016; Kleinplatz et al., 2009). For some individuals in some contexts, low sensual pleasure might be particularly distressing and cause sexual dysfunction (van Lunsen et al., 2012) while for others low bonding pleasure might cause sexual distress, requiring a different focus on how to make sex more rewarding. The lack of a consensus on how to define and measure sexual pleasure can impede the development of effective interventions to promote and enhance sexual pleasure (Cambon et al., 2019).

Furthermore, defining sexual pleasure as the positive feeling induced by rewarding sexual activities allows differentiating sexual pleasure from sexual satisfaction. Sexual satisfaction has often been conflated with pleasure since satisfaction has been operationalized either in terms of indicators of sexual pleasure (e.g., Laumann, 1994) or in terms of positive affect (e.g., Sprecher & Cate, 2004). However, the affect in satisfaction is said to result from evaluating rewards as well as costs (Lawrance & Byers, 1995), with the final balance depending on what one thinks one deserves (McClelland, 2010). Satisfaction could result from the lack of expectations of rewarding sex or the absence of costly sex (Laan et al., 2021), depending on

one's learned expectations (McClelland, 2010), while pleasure necessitates rewarding sex.

A Note on Sexological States and Traits

Following the interactionist perspective within personality psychology (Schmitt & Blum, 2020), Werner et al. (2023a) argued that individual differences in the tendency to experience state sexual pleasure are a function of individual differences in the capacity to experience sexual pleasure and differences in the contextual likelihood to encounter rewarding sexual situations. Differentiating between state and trait conceptualizations and operationalizations of affective responses has been influential in understanding other affective responses, such as anxiety (Spielberger, 1972, 1983) and sexual desire (Dawson & Chivers, 2014). For instance, Frankenbach et al. (2022) similarly differentiated between state and trait sexual desire and reported on a (bias-corrected) medium-sized gender difference in trait sexual desire based on a comprehensive meta-analysis, with men reporting relatively higher trait sexual desire. Dawson and Chivers (2014) also reported that cis men and cis women differ, on average, in their reporting of trait sexual desire, i.e., the tendency to experience desire across situations, but that they do not differ in the level of self-reported desire in response to standardized sexual stimuli. Thus, it appears crucial to differentiate between more trait-like and state-like conceptualizations and operationalizations of a concept to assess constructs comprehensively, and to consider these distinctions as part of a spectrum for a more nuanced construct understanding, as illustrated in Figure 1. Conclusions about a sexological concept can differ depending on the conceptualization and operationalization of the construct.

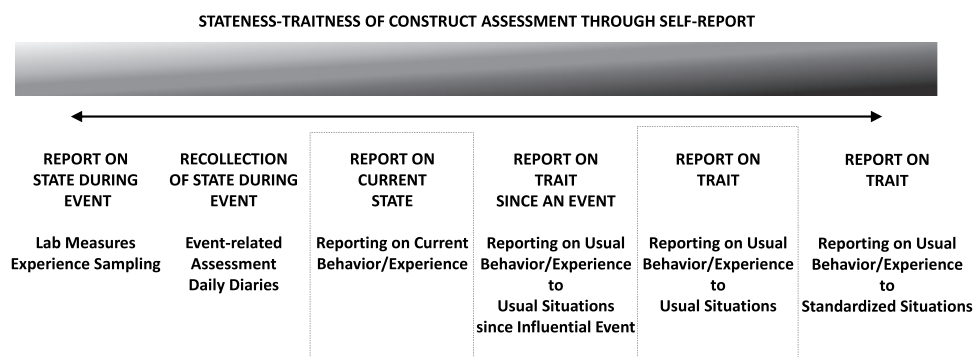


Figure 1. State and trait self-report measurement.

Note. The figure only refers to self-report measures during different research settings and relating to different reference time-frames, and not to different measurement instrument techniques. The two boxes indicate which state and trait level the ASPI and similar questionnaires likely assess.

Being able to assess individual differences across more state-like and trait-like operationalizations of sexual pleasure might aid in pinpointing the source of individual differences in sexual pleasure. For instance, certain groups of individuals might report low state sexual pleasure in combination with average or high trait sexual pleasure, or vice versa. Such response patterns would suggest that the current experience of sexual pleasure is lowered or heightened because of contextual factors, rather than a diminished or increased capacity to experience sex as pleasurable per se (Laan et al., 2021; van Anders et al., 2021). Depending on the source of individual differences, clinical interventions would need to be structured differently, focusing either on changing capacities and/or the context (Barlow, 2010; Brotto & Velten, 2014).

Existing Measurement Instruments of Sexual Pleasure

All currently existing measurement instruments of sexual pleasure have proven useful and informative and represent major steps in positive sexology (Milhausen et al., 2019; Rosen & Bachmann, 2008). However, since we lacked a shared holistic conceptual understanding of sexual pleasure, this lack is reflected in available measurement instruments. To our knowledge, there are six self-report measurements and one clinical interview that directly address sexual pleasure: the Female Sexual Subjectivity Inventory (FSSI) by Horne and Zimmer-Gembeck (2006), the Sexual Pleasure Scale (SPS) by Pascoal et al. (2016), the Male Sexual Pleasure Scale (EMSEXpleasure) by Siegler et al. (2018), the Body, Emotions, Sensations, Touch/Trust (B.E.S.T.) Scale by Beckmeyer et al. (2021), two unnamed scales by Jozkowski et al. (2016) and Vigil et al. (2021), and the Pleasuremeter by Castellanos-Usigli and Braeken van Schaik (2019). In Table 1, we present which facets suggested by the taxonomy of sexual pleasure seem to be captured by currently available instruments.

In Table 2, we summarize the characteristics of the instruments. First, many of the instruments did not define what kind of pleasure concept is assessed. Second, sexual pleasure is often treated and measured as a unidimensional rather than multidimensional (i.e., diverse) construct. Third, measuring sexual pleasure associated with or derived from sensory experiences does not consider pleasure from other sources, such as

intimacy and affection. Fourth, sexual pleasure is measured as a trait, but not as a state or vice versa. The latter point is also infrequently explicated in the proposed interpretations and uses of the instrument and therefore needs to be inferred from the instructions, items, and response scale. Fifth, many scales focus on partnered sexuality only which precludes insight into pleasure retrieved from solo sex or other types of sexual experience. We conclude that there is no instrument yet that covers all facets of sexual pleasure and assesses the construct in a holistic and inclusive manner. Thereby, existing measurement of sexual pleasure might provide a limited perspective on sexual pleasure which could result in suboptimal assessment and insights in research.

Aim of the Study

In this study, we assessed the Amsterdam Sexual Pleasure Inventory (ASPI 1.0), a revised version of the original ASPI (0.1; Werner et al., 2023b, January 25), which goes beyond existing measurement tools by covering diverse facets of sexual pleasure and assessing sexual pleasure as a state and trait following the taxonomy proposed by Werner et al. (2023a). The ASPI state scales are intended to be interpreted and used such that higher scores indicate more experienced pleasure (in the last two weeks) and the ASPI trait scales are intended to be interpreted and used such that higher scores indicate a greater tendency to experience sexual pleasure in survey research in gender, sex, and relationship diverse populations. The latter is possible since the ASPI is constructed in an inclusive manner and allows for use in populations of diverse sex, gender, and (sexual) relationship types. Inclusivity is particularly important in the context of sex research, as populations have often been excluded or underrepresented in research, partially due to available instruments being limited to use in heteronormative populations (Bradford & Spencer, 2020; Carrotte et al., 2016; Gieles et al., 2022; Mijas et al., 2021).

The aim of this study was to analyze the psychometric properties of the Amsterdam Sexual Pleasure Inventory (1.0) to collect evidence regarding its intended interpretation and use following the “modern validity theory” framework (American Educational Research Association, American Psychological Association, et al., 2014; Santos-Iglesias, 2022). Therefore, our

Table 2. Measurement instruments of sexual pleasure.

Instrument	Authors	Content	Definition of Pleasure	Example	Characteristics
Female Sexual Subjectivity Inventory (FSSI)	Home and Zimmer-Gembeck (2006)	Five components of female sexual subjectivity which contribute to sexual pleasure/wellbeing, rated on a 5-point endorsement scale: sexual body esteem, self-efficacy in achieving pleasure and desire, entitlement to pleasure from self, and from a partner, and sexual self-reflection.	"Sexual pleasure is defined as a sense of well-being derived from the experience of being sexual and, as such, is an essential component of sexual subjectivity" (p. 126).	It's okay for me to meet my own sexual needs through self-masturbation: Not at all true for me (1) to Very true for me (5)	1. Trait 2. Multidimensional 3. Evidence for validity in cis-women 4. Solo and partner sex
Sexual Pleasure Scale (SPS)	Pascoal et al. (2016)	Three items with a 7-point intensity scale capturing the extent to which sexual intercourse, sexual activity in general, and sexual intimacy within one's relationship are perceived as sexually pleasurable in the last four weeks.	No definition provided since the scale "allows individuals to subjectively define pleasure for themselves" (p. 1408).	I find sexual intercourse: Not pleasurable (1) to Very pleasurable (7)	1. State (last four weeks) 2. Unidimensional 3. Evidence for validity in heterosexual partnered individuals 4. Partner sex and intercourse
No name specified	Jozkowski et al. (2016)	Six items leading to a relative frequency score capturing the consistency with which sexual activity was experienced in a certain way and how consistently certain sensations were experienced in the last four weeks.	No definition provided.	Of the time(s) that you had sexual activity with your partner in the past 4 weeks, how many times: was the sexual activity mainly pleasurable and enjoyable?: Number of times:	1. State (last four weeks) 2. Unidimensional 3. Evidence for validity in bisexual and homosexual women 4. Partner sex
Male Sexual Pleasure Scale (EMSEX pleasure)	Siegler et al. (2018)	Twelve items measuring event-level sexual pleasure regarding the use of condoms for men (rating scale and response options are not reported).	No own definition provided. Refer to the following definition in the paper: Sexual pleasure has been described as "the authentic, abiding satisfaction that makes us feel complete as human beings" (p. 1745).	This sex was very pleasurable.	1. State (not specified) 2. Unidimensional 3. Evidence for validity in cis-men 4. Partner sex
Body, Emotions, Sensations, Touch/Trust (B.E.S.T.)	Beckmeyer et al. (2021)	Ten items with a 5-point intensity scale measuring how pleasurable aspects of intimacy with partner, emotions, sexual behavior performed and received, and physical sensations were in the last sexual experiences.	No own definition provided. Refer among others to GAB's working definition of sexual pleasure (p. 1).	The physical sensations you felt: Not at all pleasurable (1) to Extremely pleasurable (5)	1. State (not specified) 2. Unidimensional 3. Evidence for validity in college students (men and women) 4. Partner sex
No name specified	Vigil et al. (2021)	Six non-validated items rated on a 6-point endorsement scale.	"[...] we operationalized sexual pleasure as conscious, positive evaluations of physical sensations during sex, either localized in the genitals or throughout the body" (p. 3).	I felt intense pleasure in my genitals: Not at all true (1) to Completely true (6)	1. State (not specified) 2. Unidimensional 3. Evidence for validity in women who had sex with someone in the previous four weeks and reported that their genitals were stimulated by their partner (i.e., penetrative sex, oral sex, etc.). 4. Partner sex
The Pleasuremeter	Castellanos-Usigli and Braeken van Schaik (2019)	A clinical interview including rating scales to evaluate seven pleasure factors in the last 12 months on a 10-point intensity scale: Physical and psychological satisfaction/enjoyment, Self-determination, Consent, Safety, Privacy, Confidence, Communication/negotiation	No own definition provided. Refer to GAB's working definition of sexual pleasure (p. 314).	From 1 to 10, how much did you enjoy/how satisfied were you with your sexual experiences in the last 12 months?	1. Trait and state 2. Not applicable 3. No evidence for validity 4. Partner sex

The table only includes those instruments that directly address sexual pleasure with more than one item and not as part of another scale, e.g., a desire or satisfaction scale. For instance, we excluded the Quality of Sexual Experience Scale (QSE) by Sanders et al. (2013). Single item pleasure scales are usually bipolar or unipolar rating scales ("unpleasant/unpleasant" to "pleasurable/pleasant") in combination with intensity markers ("not at all" to "very") or frequency markers ("never pleasurable" to "always pleasurable") which either ask about sex in general or different kinds of sexual activities, and with respect to different time periods or events. We also excluded questionnaires which assess motives to have sex as these do not assess the experience of or tendency to experience pleasure but reasons to have sex.

study assessed (1) whether the ASPI could be scaled according to the structure in Table 1; (2) whether this structure holds in different groups and whether resulting scores are comparable between groups (male and female and sexual dys/function); (3) whether the resulting scores can be interpreted to assess state and trait sexual pleasure rather than other constructs, (4) which are not influenced by irrelevant background differences but are sensitive to relevant individual differences; and (5) whether the ASPI scales encompass the relevant diverse facets of sexual pleasure and include items that are understandable to intended participants. For this purpose, we examined the factor structure, its invariance and the scores' reliability (regarding 1 and 2), as well as construct and content validity evidence (3 and 4) and present qualitative data on item comprehension and content coverage (5).

Method

Development of the Amsterdam Sexual Pleasure Inventory (ASPI 1.0)

Step 1: Development and Validation of the ASPI 0.1

The items of the original version of the ASPI (called Amsterdam Sexual Pleasure Index 0.1) were generated in 2013 by two experts in the field (both sexologists, of which one was a psychologist and the other a medical doctor) following a combination of the intuitive rational and inductive internal method (Oosterveld & Vorst, 1996; Oosterveld et al., 2019; Werner et al., 2023b, January 25). Items were then reviewed and revised in collaboration with a panel of psychologists, sociologists, anthropologists, and medical doctors, all of whom were engaged in sex research. The ASPI 0.1 took the multifaceted nature of sexual pleasure into account but lacked a conceptual framework. Furthermore, the phrasing of the questionnaire and items was based on a trait conception of pleasure only. Item generators assured that the questionnaire was phrased such that it was broadly applicable and inclusive.

The ASPI 0.1 was then examined in a psychometric validation study (Werner et al., 2023b, January 25). Results suggested that the ASPI 0.1 and its five preliminary scales showed acceptable but improvable psychometric qualities, and the authors recommended further revision of the ASPI scales. The study information and this original version of the questionnaire are available on the OSF (Werner et al., 2023b, January 25) and the original version has been used in previous research (Gieles et al., 2022; Klein et al., 2022).

Step 2: Item Revision and Generation for ASPI 1.0

A team of three experts in the field, one of which was involved in the item generation of the original ASPI, adapted the items to have all items follow phrasing guidelines (e.g., no double negation, no implicit assumptions, most important idea at the end; Moosbrugger & Kelava, 2007; Oosterveld & Vorst, 1996; Oosterveld et al., 2019) and to have the items better cover the state and trait domains described in the framework of Werner et al. (2023a). During item revision and generation, item generators followed a combination of two deductive methods: the construct method and the facet method (Guttman, 1954,

1965b cited in Landsheer & Boeije, 2010; Oosterveld, 1996; Oosterveld & Vorst, 1996; Oosterveld et al., 2019) to assure that items represented each construct facet specifically yet comprehensively (e.g., items should become increasingly specific in terms of sexual behaviors and experiences, with the most general items referring to one's sex life and the most specific to tactile or visual stimulation; trait items focus on *self*-evaluation while state items focus on *experience* evaluation). As a result, items were retained (e.g., "I love it when my erogenous zones are being touched;," sufficiently specific for Arousal Enjoyment), items were deleted (e.g., "I feel good when I'm naked;," confounded with Body Image), items were rephrased (e.g., "My sexual pleasure is irrelevant [instead of 'of no importance'];," easier negation) and new items were generated (e.g., "I understand what I need in order to enjoy myself sexually;," sufficiently specific to Enjoyment-related Self-Efficacy).

The differentiation of the trait and state sections and their respective items was implemented through three aspects (DeCastellarnau, 2018; Franzen, 2019; Menold & Bogner, 2015): (a) different item structure and item phrasing, (b) different response scales, as well as (c) different introductions. Trait items (a) ask if respondents tend to experience pleasurable sexual activity by asking about the tendency to experience rewarding sexual activity, (b) are rated on a 6-point Likert-scale from strongly disagree (1) to strongly agree (6), and (c) the introduction of the trait section emphasizes that respondents should answer items thinking about how they generally experience sexual activities. State items (a) ask about the intensity of pleasure associated with different rewards during sexual activities of the last two weeks, (b) are rated on a 6-point Likert-scale from not at all (1) to a great extent (6), and (c) the introduction of the state section emphasizes that respondents should answer items thinking about their sexual experiences in the last two weeks. Furthermore, verb tense was carefully selected to ensure consistency, with present tense used to assess traits and past tense used to capture states experienced within the previous two weeks (Giles et al., 2020; Stone & Shiffman, 2002).

Step 3: Translation in Three Languages

The ASPI 1.0 and its successors should be usable in cross-cultural research, which is why item generators aimed the ASPI 1.0 to be translatable into other languages. During item generation, they therefore assured that the phrasing could be forth-and-back translated into different languages and started with the languages they spoke fluently (German, English, Dutch). Final forth-and-back translation was done in collaboration with native speakers of all three languages.

Step 4: Think Aloud Assessment for ASPI 1.0

To ensure that the generated items were understandable and measured their intended construct validly in terms of face validity, item generators conducted independent Think Aloud sessions with German-speaking individuals who had no background in psychology nor sexology. These individuals were asked to read the items and express their thoughts out loud as they did so. This procedure enabled the item generators to assess whether the items captured the intended meaning and understanding of the constructs (Phillips, 2014).

Step 5: ASPI 1.0 Pilot Study

In 2020, we piloted the ASPI 1.0 by collecting qualitative data on item comprehension. This pilot was conducted as part of a project in a seminar at the University of Bern. The project group administered the ASPI 1.0 online to 43 participants, and at the end of the survey, participants were asked a series of open-ended questions to gauge their comprehension of the items, including whether they found the statements understandable, whether any of the phrasing was confusing, and whether they felt that any items were redundant or missing. Participants were also asked to provide overall feedback on their impression of the questionnaire. The feedback indicated that while the items were generally clear and easy to understand, some participants did perceive them as being repetitive or redundant.

Step 6: The To-Be-Validated Version of the ASPI 1.0

Based on the qualitative data of the pilot study, 32 items were deleted for the to-be-validated version of the ASPI 1.0 to avoid redundancy (e.g., “I like being sexually aroused. [deleted]” and “I love feeling sexual arousal. [retained]” for trait and “Sex strengthened the bond with my sexpartner [deleted]” and “Sex brought me closer to my sex partner. [retained]” for state). This resulted in a total of 44 state items (10 deleted) and 36 trait items (22 deleted). We intended to delete further items to make the final questionnaires even better tailored to survey research.

Based on the sexual pleasure framework and taxonomy, items combine into five scales representing the different facets for state and trait pleasure respectively (Werner et al. 2023a). *State Scales*: Sensual Pleasure (9 items), Bonding Pleasure (6 items), Interaction Pleasure (6 items), Pleasure-related Mastery (8 items), Pleasure-related Validation (7 items); *Trait Scales*: Arousal Enjoyment (5 items), Bonding Enjoyment (6 items), Interaction Enjoyment (6 items), Enjoyment-related Self-Efficacy (7 items), Enjoyment-related Self-Worth (6 items). In addition, there are two general scales that are not part of the sexual pleasure framework: General Sexual Pleasure (state; 8 items) and Sexual Experience Enjoyment (trait; 6 items). The general scales include items that ask about (usually experienced) pleasure associated with different types of sexual activities (flirting, erotica, fantasy, masturbation, partner sex, general sexual experiences/one's sex life) rather than pleasure associated with the experience of one specific rewarding aspect of sexual activity. Since these items refer to different, partly unrelated, activities we consider the overall pleasure associated with these activities as a composite (formative) rather than latent (reflective) variable (Fried, 2020) because the respective constructs are a function of the evaluation of each activity rather than common latent factors.

Participants

Sample 1

Between May 2021 and January 2022, $N = 2579$ people were interested in participating in a larger study concerning sexual experience. After excluding people under the age of 18 and

people who had not accepted the declaration of consent, $n = 2518$ German-speaking participants wanted to take part in the study (56.7% female assigned-at-birth; $M_{age} = 39.7$; $SD_{age} = 13.6$; age range: 18 to 86 years). We excluded those participants who failed attentive responding checks and/or time checks to ensure the quality of data ($n = 1147$; of which $n = 704$ only accepted the declaration of consent but did not start the main survey and therefore did not fulfill the attentive responding check, and $n = 443$ provided survey responses but did not fulfill attentive responding checks). The potentially usable sample consisted of $n = 1371$ participants.

Sample 2

Sample 2 was a subsample of sample 1 ($n = 1371$), with participants who were interested in taking part in a follow-up qualitative study which inquired further into item comprehension. The follow-up study was completed by 637 participants.

Procedure

This study followed a cross-sectional multi-method design in which we collected quantitative and qualitative data. We collected survey data using the online questionnaire program Qualtrics (Qualtrics, Provo, UT). Participants were first asked demographic background questions, followed by the ASPI 1.0 and other questionnaires. All questionnaires following the ASPI 1.0 were shown in random order to reduce order effects. In the ASPI, the trait and state parts as well as the items within the two parts were presented randomly. At the end of the survey, we asked participants to provide their e-mail address if they were interested in participating in the follow-up qualitative study, which took place two weeks later. The e-mail address was saved separately from the data to ensure anonymity of responses and was only used for inviting participants to the qualitative survey. The qualitative survey consisted of meta-questions about the items according to the response process evaluation method (Wolf et al., 2019). Participants were offered to enrol in a lottery (5 times 100 francs). The study was approved by the ethics committee of the University of Bern. The analysis of this study was preregistered on the OSF (<https://osf.io/wnrxa/>).

Measures

Demographics

We asked about age, sex assigned-at-birth, gender, sexual orientation, relationship status and duration, marital status, number of children, year of birth, educational attainment, as well as the frequency of masturbating and having partner sex.

The Amsterdam Sexual Pleasure Inventory 1.0

The Amsterdam Sexual Pleasure Inventory (ASPI 1.0) is a self-report questionnaire including a trait and state section each comprising 6 scales. In total, the to-be-validated questionnaire contained 80 original test items (36 trait and 44 state items) and the eventual version contains 57 items (27 trait and 30 state items). State items are rated on a 6-point Likert-scale from not

at all (1) to a great extent (6), while trait items are rated on a 6-point Likert-scale from strongly disagree (1) to strongly agree (6), allowing for the differentiation of intensity and general tendencies in sexual pleasure experiences. If participants indicate that they did not engage in partner sex or masturbation in the last two weeks, state items about partner sex and/or masturbation are not presented and coded as NA. In addition, for some state items, there is a NA response category available for respondents to select if an event or experience did not occur.

Trait and state scales are scored separately per scale (6 each) and should be used independently from each other, with higher values representing stronger tendencies for sexual pleasure (traits) and higher levels of recently experienced sexual pleasure (states), respectively. To calculate the scores for each scale, available item scores are averaged for each respondent (see, for a similar rationale, the discussion in McClelland & Holland, 2016). An overall ASPI score should not (yet) be calculated as its validity would be questionable. Scores between scales are not yet shown to be comparable in scale and can therefore not be summed or averaged yet to imply greater overall (tendencies for) sexual pleasure. For ease of use, we provide information on the use and scoring of the ASPI within R and SPSS on the OSF (<https://osf.io/9hkde/>).

Sexual Excitation and Inhibition

The Sexual Inhibition and Sexual Excitation Scales-Short Form (SIS/SES-SF) by Carpenter et al. (2010; for German version, see Rettenberger et al., 2019; Velten et al., 2018) distinguishes between three facets: (1) Sexual Excitation (SES), (2) Sexual Inhibition – threat due to failure in a sexual situation (SIS1), and (3) Sexual Inhibition – threat of the consequences of a sexual situation (SIS2) and consists of 14 items rated on 4-point Likert-scales, with higher scores indicating a higher propensity for sexual excitation or inhibition. Reliability of SES in the current study is high, with Cronbach's $\alpha = .79$, and rather poor for SIS with $\alpha = .59$ for SIS1, and $\alpha = .63$ for SIS2.

Sexual Assertiveness

Sexual assertiveness was assessed using the corresponding subscale of the *Multidimensional Sexuality Questionnaire* (MFS; Brenk-Franz & Strauß, 2011; Snell & Kilimnik, 2019); items are rated on a 5-point Likert-scale and higher scores indicate stronger sexual assertiveness. Reliability of this measure was acceptable in the current study, $\alpha = .78$.

Sexual Function

The German version of the *Female Sexual Function Index* (FSFI-d; Berner et al., 2004; Rosen et al., 2000) includes 19 items rated on a 5- or 6-point Likert-scale, with higher scores indicating better sexual function. The cutoff value of 26.55 defined by Wiegel et al. (2005) was used to distinguish between functional-scoring and dysfunctional-scoring individuals.

The *Male Sexual Function Index* (MSFI) by Kalmbach et al. (2015) consists of 16 items scored on 5- or 6-point Likert-scales, with higher scores indicating better sexual function. The cutoff value of 22.35 defined by Kalmbach et al. (2015) was

used to distinguish between functional-scoring and dysfunctional-scoring individuals. For the correlational analyses, we excluded the satisfaction subscales from the calculation of the overall score for sexual function to avoid inflating the relationship of sexual function with the satisfaction scales (FSFI: 16 items instead of 19; MSFI: 13 items instead of 16).

The *Premature Ejaculation Profile* (PEP; Patrick et al., 2009) consists of 4 items rated on a 6-point Likert-scale, with higher scores indicating more experienced control of ejaculation and a cutoff value of 10 or lower indicating sexual dysfunction (Jern et al., 2013). To cover and operationalize all aspects of sexual function in men, we combined the MSFI and PEP for our analysis.

The *Human Sexual Response Questionnaire* (HSRQ) assesses sexual function in participants who chose to be presented with a gender-neutral and sex-neutral version of a sexual function assessment. The HSRQ was developed for this study and includes 29 items rated on 5- or 6-point scales. For the correlational analyses, the PEP and HSRQ scales were weighted according to the rules of the MSFI/FSFI to make the scores more comparable between the different scales.

The reliability for all function scales was high with $\alpha = .94$ for FSFI, $\alpha = .93$ for MSFI, $\alpha = .90$ for PEP, and $\alpha = .98$ for HSRQ.

Sexual Distress

The Sexual Distress Scale Short Form (SDS-SF) by Santos-Iglesias et al. (2020) contains 5 items rated on a 5-point Likert-scale, with higher scores indicating more sexual distress (Derogatis et al., 2002; Santos-Iglesias et al., 2018). Reliability of this measure was also high in the current study, $\alpha = .88$.

Sexual Satisfaction

Three self-formulated items on a 6-point Likert-scale captured participants' sexual satisfaction, with a higher score indicating higher sexual satisfaction (e.g., "Overall, how satisfied are you with your sexuality in general at the moment?"). Reliability of this measure was acceptable in this study, $\alpha = .73$.

Unidimensional State Sexual Pleasure

The Sexual Pleasure Scale (SPS) by Pascoal et al. (2016) measures recently experienced levels of sexual pleasure in a unidimensional way and includes 3 items rated on a 7-point scale, with higher scores representing higher levels of recently experienced sexual pleasure and reaching a high reliability in the current study, $\alpha = .88$.

Self-Esteem

The Rosenberg Self Esteem Scale (Rosenberg, 1965; Von Collani & Herzberg, 2003) includes 10 items with a 4-point Likert-scale, with higher scores representing higher self-esteem and a high reliability in this study $\alpha = .90$.

Behavioral Inhibition and Behavioral Activation

The Behavioral Inhibition and Activation Scale (BIS/BAS; Carver & White, 1994; Strobel et al., 2001) assesses the

behavioral approach system (BAS) and the behavioral inhibition system (BIS) with three BAS scales (BAS Fun Seeking, $\alpha = .62$; BAS Drive, $\alpha = .74$, and BAS Reward, $\alpha = .58$ in current study) and one BIS scale ($\alpha = .84$ in current study). Items are rated on 4-point Likert scales and higher scores represent a stronger tendency toward behavioral activation or inhibition.

Attachment Style

The Experiences in Close Relationships – Revised (ECR-RD; Ehrental et al., 2009; Fairchild & Finney, 2006) comprises 12 items and includes an attachment anxiety scale ($\alpha = .68$ in current study) and an attachment avoidance scale ($\alpha = .73$ in current study) rated on a 7-point Likert-scale. Higher scores represent more attachment anxiety or attachment avoidance.

Positive and Negative Affect

The Positive and Negative Affect Schedule (PANAS; Breyer & Bluemke, 2016; Watson et al., 1988) measures positive (PA, $\alpha = .89$ in current study) and negative affect (NA, $\alpha = .86$ in current study) using 20 items on a 5-point Likert-scale, with higher scores indicating higher positive or negative affect in the last two weeks.

Social Desirability

The *SEA Short Form* (Satow, 2012) measures socially desirable response tendencies using two items having 4 response options, with higher scores representing a stronger tendency toward socially desirable responses. Reliability of this measure was acceptable in the current study, $\alpha = .64$.

Attentive Responding Checks

We included 6 different types of items assessing inattentive responding throughout the survey (inspired by Berinsky et al., 2014; Huang et al., 2015; Meade & Craig, 2012).

Power Analysis

To specify a minimum sample size which obtains sufficient power to estimate the factor models precisely, we followed the proposed test of not-close fit by MacCallum et al. (1996). The power analysis suggested a sample of $n = 353$ per measurement invariance group for the trait-scale and $n = 262$ per measurement invariance group for the state-scale, with an expected power of $> .99$. In order to perform the analyses for state and trait with the same sample, the higher n of the trait power calculation was used for the states as well, so that all main factor analyses were conducted with a minimum sample size of $n = 706$ ($n = 353$ per measurement invariance group). Measurement invariance groups were female/male and sexually functional/dysfunctional-scoring individuals.

Data Management

As specified in the preregistration, we excluded individuals based on the amount of missingness on the ASPI, starting

with those with the most missing values until we reached the minimum necessary n for power. Note that missing values on the ASPI can occur due to three reasons: (1) the item was presented but not completed (true missing), (2) the item was not presented because it related to masturbation or partner sex and participants indicated that they did not engage in one and/or the other in the last two weeks (not applicable missing), (3) the item was presented but participants did not have the experience the item asked about in the last two weeks and therefore selected the respective “not applicable” response option (not applicable missing).

Practically, this data exclusion procedure resulted in individuals being excluded from the analyses who did not engage in either partnered or solo sex in the last two weeks. However, individuals could still be included if they engaged in either solo or partnered sex, or in both, but did indicate on one or a few items to not have experienced a certain situation. This data management procedure was chosen to strike a balance between analyzing the psychometric properties of the ASPI in a dataset that was as complete and representative as possible, while not losing power by excluding everyone with a single missing value with listwise deletion.

Remaining missing values and “not applicable” responses were both treated as missing in the factor analysis through full information maximum likelihood estimation (FIML). Note that the remaining participants ($n = 706$) did not differ from the excluded participants ($n = 665$) in terms of age, educational background, and sexual orientation, but did differ in terms of sex and relationship status (more male and partnered participants in the final than the excluded sample) which resulted from stratifying on sex for the measurement invariance analysis and the fact that partnered individuals were less likely to choose “not applicable” responses due to being more likely to engage in both partnered and solo sex.

No additional participants were excluded from any analyses based on background characteristics, nor were outliers. Only for measurement invariance and known-group analysis regarding sexual dys/function, we additionally excluded those who indicated to have been sexually inactive on subscales of the sexual function questionnaires (FSFI, MSFI/PEP, $n = 9$) and those participants who opted for the gender-neutral sexual function questionnaire (HSRQ, $n = 4$) since no validated cutoff for sexual dysfunction exists for these participants yet.

Statistical Analysis

Analysis was performed using IBM SPSS Statistics (SPSS) 27.0. and R-Studio (Package ggthemes; Arnold et al., 2021; Package GPArotation; Bernaards & Jennrich, 2005; Package data.table; Dowle et al., 2021; Package qgraph und bootnet; Epskamp et al., 2018, 2012; Package semPlot; Epskamp et al., 2022; Package Hmisc; Harrell & Dupont, 2022; Package Amelia; Honaker et al., 2011; Package networktools; Jones, 2022; Package semTools; Jorgensen et al., 2021; Package MVN; Korkmaz et al., 2014; Package psych; Revelle, 2023; Package lavaan; Rosseel et al., 2017; Package corpor; Schafer et al., 2021; RStudio Team, 2020; R Core Team, 2021; Package corrplot; Wei et al., 2021; Package haven; Wickham, 2016; Package tidyverse; Wickham et al., 2019; Package ggplot2; Wickham

& Miller, 2021; Package dplyr; Wickham et al., 2021; Package knitr; Xie, 2021; Package EFAutilities; Zhang et al., 2020). To analyze the ASPI's psychometric properties, we performed the following six steps:

Factor Analysis

First, we ran factor analyses using exploratory structural equation modeling (ESEM) separately for the trait and state model. We used ESEM as it better accommodates complex measurement models by not imposing zero constraints on the relationship between items and factors (i.e., it allows for cross-loadings). Furthermore, ESEM offers better insight in discriminant validity as it delivers a more realistic representation of the data (Marsh et al., 2009, 2014). We specified oblique semi-specified target rotation for which we could specify which loadings we expected to be 0 while leaving the remaining elements unspecified. This specification followed the conceptual background of Werner et al. (2023a, see Table 1; Lavaan Package; Fischer & Karl, 2019; Rosseel et al., 2017). For the two general scales (Sexual Experience Enjoyment for trait and General Sexual Pleasure for state), we performed principal component analyses ([PCA]; psych package; Revelle, 2023) since these scales represent indices rather than factors (Fried, 2020). Since multivariate normality was not given, we used robust methods (robust maximum likelihood estimation and polychoric correlations) for both ESEM and PCA (Brown, 2015; Costello & Osborne, 2005).

We wanted to shorten the questionnaire to make it more usable for survey research. After having evaluated all ASPI items in terms of content (conceptual background and qualitative data) and statistics (distribution, Cronbach's alpha, factor loading higher than .3), we reduced the item number and ran ESEM and PCA again for the shortened final state and trait model (Brown, 2015; Costello & Osborne, 2005; Marsh et al., 2010; Rammstedt & Beierlein, 2014). We provide a detailed rationale for the criteria used to select each final ASPI item in the Online Supplementary S1. Importantly, we calculated the model fit indices for the models including all original items before item reduction and for the models with reduced number of items. We carried out all following steps using the reduced models.

Measurement Invariance

Second, we tested for measurement invariance across sex assigned-at-birth and sexual function groups to evaluate whether scale scores can be validly compared among these groups (Fischer & Karl, 2019; Luong & Flake, 2023).

Internal Consistency

Third, we checked the scales' reliability using omega coefficients and expected adequate internal consistency for each validated scale (Clark & Watson, 2019; Dunn et al., 2014; Hayes & Coutts, 2020).

Construct Validity

Fourth, we examined construct validity through convergent and discriminant relationships to other relevant constructs as well as

differences between known-groups (sexual functional vs. dysfunctional). We aimed to include construct validation measures for each of the 12 subscales of the ASPI (both trait and state parts) that could be expected to be associated with pleasure and enjoyment based on insights from psychology (e.g., Behavioral Activation and Attachment Avoidance and Anxiety; Carver & White, 1994; Davis et al., 2004; Impett et al., 2008; Nelson-Coffey et al., 2017; Picardi et al., 2005), as well as measures that could be expected to be associated based on insights from sexology (e.g., Sexual Excitation; Bancroft et al., 2005; Janssen & Bancroft, 2007; Werner et al., 2023b, January 25). This approach allowed us to examine the relationship of each ASPI subscale with a corresponding psychological construct (usually more weakly correlated; e.g., Positive Affect; Bancroft et al., 2003; Kalmbach & Pillai, 2014; Oliveira & Nobre, 2013; Peixoto & Nobre, 2012; Werner et al., 2023b, January 25) and sexological construct (usually more moderately or strongly correlated, but not so much as to be measuring the same construct; e.g., Sexual Satisfaction; Bois et al., 2013; McClelland, 2010, 2014; Stephenson & Meston, 2012). For convergent and discriminant construct validity, we used network analysis to model Spearman correlations between ASPI scales and the sexological and psychological constructs (Epskamp et al., 2012, 2018). We ran network analysis for trait and state separately. The postulated hypotheses are provided in the preregistration on the OSF (<https://osf.io/wnrxa/>; p. 2–4) and in Table 14 for trait constructs and Table 15 for state constructs.

Differences between known-groups were tested using t-tests for independent groups. We expected sexually dysfunctional-scoring participants to report less enjoyment (ASPI trait domains) and pleasure (ASPI state domains) than sexually functional-scoring participants. To account for multiple comparisons, we applied the Bonferroni correction with an initial α -level of .05, which resulted in a significance threshold of $p < .0042$ (.05/12), where 12 refers to the number of ASPI subscales (Abdi, 2007; Andrade, 2019).

Sensitivity Analysis

Fifth, to verify whether the NA values of the ASPI could be treated as missing, we performed two sensitivity analyses. (1) We reran the factor and network analyses on the same dataset in which NA was set to 0 instead of missing. (2) We reran the same factor and network analysis on the data of those participants who had no NA nor missing responses on any of the items.

Social Desirability

Sixth, we analyzed the association of the ASPI scales with the SEA-Short Form to see whether responses on the ASPI were systematically associated with socially desirable responses. In order to ascertain whether this is a problem for the ASPI specifically, we compared the strength of association of the largest Spearman correlation coefficient for the trait and state scales with that of the Spearman correlation coefficients of the SES and the Sexual Satisfaction scales and the SEA-Short Form, respectively, and considered correlation coefficients equal to or higher than .5 as problematic (Satow, 2012).

Sex Differences

As an explorative step, we examined sex differences on all scales of the ASPI using (Bonferroni corrected) t-tests for independent groups and Spearman correlations for associations between the ASPI scales and the Orgasm Function scale.

Divergence with Respect to the Preregistration

There are seven points of divergence with respect to the preregistration. (1) We estimated five-factor models for state and trait rather than six-factor models because we did not include the general scales for state and trait in the factor models as originally but erroneously specified. The general scales are exploratory and are not based on the conceptual framework of sexual pleasure (Werner et al., 2023a). Since the scales are not theory-based and represent components rather than factors, we adjusted the statistical procedure before analyzing the data. This correction was attached to the pre-registration and can be found as an erratum document on the OSF (<https://osf.io/qv2wd>). (2) Item generators decided to call the ASPI 1.0 an inventory rather than index, since the ASPI 1.0 is a battery rather than single questionnaire and the adapted name does not suggest that the scales assess components rather than factors. (3) Also note that we have adjusted the names of the two scales of one facet: Bonding Enjoyment and Bonding Pleasure were used to be called Attachment Enjoyment and Attachment Pleasure. (4) In order to combine all sexual function scales into one scale for the correlational construct validity analyses, we calculated weighted sum scores rather than average scores before combining the scales because this led to more comparable scores across the function scales. (5) We accepted a higher number of “not applicable” responses for three state scales as initially specified as we would not have reached sufficient power otherwise. This more representative rate of NA responses allowed us to formulate suggestions for future use of the ASPI state questionnaire. (6) We did not have to run the factor sensitivity analyses on subparts of the questionnaire items, since the previous models fit sufficiently well and gave sufficient insight into potential misspecifications. (7) We had planned to sub-select groups for measurement invariance based on gender rather than sex assigned-at-birth. However, we eventually did not want to exclude specific transgender individuals from our sample, but also did not have sufficient individuals in transgender subgroups to run factor and measurement invariance analyses separately for them. We therefore decided to select measurement invariance groups based on sex assigned-at-birth rather than gender. Future studies need to approach the sampling design and measurement invariance analyses differently.

Results

Participants

After preprocessing the data, we obtained a sample of $n = 706$ participants (sample 1). The sample included an equal number of individuals who were assigned the sex female or male at

birth ($n = 353$, 50%). The average age was 40.3 years ($SD = 13.4$) with a range between 18 and 86 years. Out of the sample, $n = 16$ (2.3%) individuals reported that their sex assigned-at-birth did not match their gender. Instead, they identified as genderfluid, bi-gender, diverse or trans. Participants reported their average masturbation frequency ($M = 3.51$, $SD = .65$), with $n = 42$ (5.9%) masturbating less than once per month, $n = 278$ (39.4%) masturbating more than once per month to once per week, $n = 368$ (52.1%) masturbating more than once per week to once per day, and $n = 18$ (2.5%) masturbating more than once per day. No participants reported never having masturbated. The mean frequency of partner sex was $M = 3.38$ ($SD = .64$), with $n = 50$ (7.1%) having partner sex less than once per month, $n = 349$ (49.4%) having partner sex more than once per month to once per week, $n = 297$ (42.1%) having partner sex more than once per week to once per day, and $n = 10$ (1.4%) having partner sex more than once per day. No participants reported never having partner sex. Sample 2 is a subsample of sample 1, with participants who were interested in taking part in a follow-up qualitative study which inquired further into item comprehension ($M_{age} = 41.1$; $SD_{age} = 14.1$; age range: 19 to 86 years). Further sociodemographic characteristics are presented in Table 3 separately for sample 1 and 2.

Factor Structure

Trait Model

The original 30-items trait version showed a good model fit¹ for the five-factor structure (see Table 4). Except for seven items, the items had factor loadings higher than .3 on their expected factor. After item reduction, seven items were excluded, and 23 items were retained (see Table 5).

The final 23-items trait model also showed a very good model fit (see Table 4). All items, except for items 18 and 11, showed factor loadings higher than the cutoff .3. Nevertheless, the items were not excluded due to the other reduction criteria described in the rationale (see Online Supplementary S1). Items 4, 10, and 14–18 showed cross-loadings (i.e., >.3, see Brown, 2015, p. 115; Costello & Osborne, 2005) as can be seen in Table 5.

State Model

The original 36-items state version showed a good model fit¹ for the five-factor structure (see Table 6). Except for 11 items, the items had factor loadings higher than .3 on their expected factors. After item reduction, 12 items were excluded and 24 items were retained (see Table 7).

The final 24-items state model also showed a very good model fit (see Table 6). Most factor loadings were above the cutoff > .3, seven items were below (Brown, 2015; Costello &

¹We used the following criteria for model fit: root mean square error of approximation (RMSEA) with values less than .06 indicating excellent fit, values between .08 and .10 indicating mediocre fit and values above .10 indicating poor model fit (Hu & Bentler, 1998); the standardized root mean square residual (SRMR) with values smaller than .09 suggesting good fit (Hu & Bentler, 1998); the comparative fit index (CFI) and Tucker – Lewis Index (TLI) with values above .90 indicating acceptable fit and values above .95 indicating good model fit (Hu & Bentler, 1998; MacCallum et al., 1996).

Table 3. Sociodemographic characteristics of participants.

Demographic Characteristics	Sample 1		Sample 2	
	<i>n</i>	%	<i>n</i>	%
Sex				
Female at birth	353	50	379	59.5
Male at birth	353	50	258	40.5
Highest educational level				
Higher education or university degree	388	55.0		
Apprenticeship or gymnasium	288	40.8		
Secondary school	8	1.1		
Primary school	1	0.1		
Other	17	2.4		
Sexual orientation ^a				
Heterosexual	523	74.1	495	77.7
Bisexual	106	15.0	76	11.9
Homosexual	20	2.8	14	2.2
None of the above	57	8.0	52	8.1
Relationship				
Yes ^b	556	78.8	454	71.3
No	150	21.2	183	28.7

Sample 1: *n* = 706; Sample 2: *n* = 637. Four participants did not report their education level.

^aParticipants were allowed to provide their own labels when none of the response options suited them, resulting in heteroflexible, bi-interested, polysexual, polymorph, open, human sexual and pan curious.

^b*M* = 11.7 years of relationship, *SD* = 10.9 years of relationship, range = 1–56.

Osborne, 2005). Nevertheless, these items were retained due to the other reduction criteria described in the rationale (see Online Supplementary S1). Items 5–7, 9, 11, 15–17, and 19

showed cross-loadings >.3 (see Table 7). For a detailed summary of all ASPI items, the EFA factor-loadings, and the final decisions regarding item selection, see the Excel[®] file on the OSF (<https://osf.io/fq29c/>).

Principal Component Analysis (PCA) for General Scales (Sexual Experience Enjoyment and General Sexual Pleasure)

Examination of Kaiser's criterion and the scree-plot yielded empirical justification for retaining one component with eigenvalue >1 for the trait-scale. Due to the component loadings, we decided to exclude the trait I and trait II item. For the trait-scale, 45% of the total variance was captured by one component (see Table 8).

Examination of Kaiser's criterion and the scree-plot yielded empirical justification for retaining one component with eigenvalue exceeding 1 for the state-scale. Due to the component loadings, we decided to exclude the state I and state II item. For the state-scale, 49% of the total variance was captured by one component (see Table 9).

Measurements Invariance for Sex and Sexual Function

Measurement invariance for trait and state model was given between females and males assigned-at-birth (see Table 10).

Table 4. Trait fit indices ESEM.

	CFI	TLI	RMSEA.robust	SRMR	BIC	AIC
5-Factor original trait model	.956	.930	.044	.029	45022.095	44155.768
5-Factor final trait model	.981	.962	.036	.021	32988.611	32313.788

ESEM = Exploratory structural equation modeling; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; BIC = Bayesian-Information-Criterion; AIC = Akaike-Information-Criterion. See Footnote 1 for applied cutoff values.

Table 5. Trait factor loadings.

Domain	Item No	Item	M1	M2	M3	M4	M5
Hedonic	Arousal Enjoyment						
	trait1	I enjoy it when my body reacts to sexual stimuli.	.62				
	trait2	I love feeling sexual arousal.	.65				
	trait3	I love the sensations of my aroused genitals.	.70				
	trait4	I love it when my erogenous zones are being touched.	.41				.35
Intrapersonal	trait5	I enjoy feeling sexual sensations in my body.	.58				
	Enjoyment-Related Self-Efficacy						
	trait6	I know how to shape my sex life in a way that I really enjoy.		-.81			
	trait7	I understand what I need in order to enjoy myself sexually.		-.63			
	trait8	I know how to pleasure my sex partner.		-.52			
	trait9	I can engage in partner sex in a way that I really enjoy.		-.73			
	trait10	I can masturbate in a way that I really enjoy.	.30	-.35			
	Enjoyment-Related Self-Worth						
	trait11	I feel I am worthy of receiving pleasure from my sex partner.			.29		
	trait12	During partner sex, I neglect my own pleasure. (R)			.72		
Interpersonal	trait13	My sexual pleasure is irrelevant. (R)			.50		
	Interaction Enjoyment						
	trait14	I find it arousing to entice my sex partner into having sex.				.32	.61
	trait15	I feel fulfilled when my sex partner enjoys themselves during sex.				.72	.92
	trait16	I find it arousing to pleasure my sex partner during sex.				.74	.88
	trait17	I enjoy stimulating my sex partner during sex.				.7	.85
	trait18	I enjoy it when my sex partner stimulates me during sex.	.30			.20	.30
	Bonding Enjoyment						
	trait19	During sex, I enjoy being close to my sex partner.					.77
	trait20	During sex, I feel connected to my sex partner.					.67
	trait21	During sex, I enjoy the affection between me and my sex partner.					.81
	trait22	During partner sex, I enjoy the feeling of security.					.56
	trait23	Sex brings me closer to my sex partner.					.57

M1-M5 = Factors; bold = factor loadings; italics = cross loadings. Negative loadings stem from rotation and do not affect item interpretation or scoring, provided all items within a scale are directionally consistent.

Table 6. State fit indices ESEM.

	CFI	TLI	RMSEA.robust	SRMR	BIC	AIC
5-Factor original state model	.944	.920	.051	.030	46402.370	45429.565
5-Factor final state model	.968	.939	.054	.023	34377.314	32699.930

ESEM = Exploratory structural equation modeling; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; BIC = Bayesian-Information-Criterion; AIC = Akaike-Information-Criterion. See Footnote 1.

Table 7. State factor loadings.

Domain	Item No	Item	M1	M2	M3	M4	M5
Hedonic	Sensual Pleasure						
	state1	Feeling sexually aroused was amazing.	.72				
	state2	Touching my erogenous zones was pleasurable.	.49				
	state3	Feeling sexual sensations in my body was pleasurable.	.75				
	state4	During partner sex, my genitals glowed with excitement.	.52				
Intrapersonal	state5	During masturbation, my genitals glowed with excitement.	.29	.55			
	Pleasure-Related Mastery						
	state6	I could shape my sex life in a way that I really enjoyed.		.23	.32	-.43	
	state7	During partner sex, I was able to get what I needed to enjoy myself.		.14	.42		
	state8	During masturbation, I was able to give myself what I needed to enjoy myself.		.88			
	state9	During partner sex, I felt "good at sex."	.30	.14		-.37	
	state10	During masturbation, I was good at pleasuring myself.		.69			
	state11	During sex, I had the feeling that I was able to pleasure my sex partner.		.12		-.41	
	Pleasure-Related Validation						
	state12	I thought it was important to live out my sexual needs.			.23		
	state13	During partner sex, I neglected my own pleasure. (R)			.63		
	state14	During partner sex, my sexual pleasure was irrelevant. (R)			.49		
Interpersonal	Interaction Pleasure						
	state15	Seducing my sex partner was pleasurable.	.46			-.32	
	state16	Stimulating my sex partner was pleasurable.	.41			-.38	
	state17	Being stimulated by my sex partner was pleasurable.	.41			-.23	
	state18	During partner sex, we were both completely absorbed in pleasure.				-.45	
	state19	During partner sex, we whipped each other into ecstasy.	.32			-.47	
	Bonding Pleasure						
	state20	Feeling the closeness of my sex partner during sex was pleasurable.					-.68
	state21	During sex, I felt connected to my sex partner.					-.79
	state22	Feeling affection between me and my sex partner during sex was pleasurable.					-.75
	state23	The feeling of security during partner sex was pleasurable.					-.71
	state24	Sex brought me closer to my sex partner.					-.68

M1-M5 = Factors; bold = final factor loadings; italics = cross loadings. Negative loadings stem from rotation and do not affect item interpretation or scoring, provided all items within a scale are directionally consistent.

Table 8. PCA for sexual experience enjoyment.

Item No	Item	Original model		Final model	
		Component loadings	h ²	Component loadings	h ²
trait24	I experience sexual pleasure in my life.	.63	.40	.76	.57
<i>trait I</i>	I enjoy using sexually stimulating media (stories, audio books, magazines, porn, etc.).	.52	.27		
trait25	I enjoy partner sex.	.57	.33	.70	.49
trait26	I enjoy fantasizing about sex.	.70	.48	.62	.38
trait27	I enjoy masturbating.	.60	.36	.59	.35
<i>trait II</i>	I enjoy flirting.	.51	.26		

Items in italics are those that were excluded after item reduction. Proportion of variance of the original model = .35; Proportion of variance of the final model = .45.

Table 9. PCA for general sexual pleasure.

Item No	Item	Original model		Final model	
		Component loadings	h ²	Component loadings	h ²
state25	My sexual experiences were pleasurable.	.78	.51	.82	.68
<i>state I</i>	Using sexually stimulating media was pleasurable (stories, audio books, magazines, porn, etc.).	.39	.15		
state26	Partner sex was pleasurable.	.73	.53	.79	.63
state27	Fantasizing about sex was pleasurable.	.60	.36	.54	.29
state28	Masturbation was pleasurable.	.63	.40	.59	.35
state29	After partner sex I felt amazing.	.76	.57	.81	.65
state30	After masturbation, I felt amazing.	.60	.36	.58	.34
<i>state II</i>	Flirting was pleasurable.	.53	.28		

Items in italics are those that were excluded after item reduction. Proportion of variance of the original model = .41; proportion of variance of the final model = .49.

Table 10. Measurement invariance between sexes.

	χ^2	df	p	RMSEA robust	CFI robust	TLI robust	Model Comparison	Δdf	$\Delta RMSEA$ robust	ΔCFI robust	ΔTLI robust
Configural (trait)	401.7	256	<.001	.045	.972	.944		—	—	—	—
Metric (trait)	516.3	366	<.001	.038	.971	.959	2 vs. 1	110	-.006	-.001	.015
Scalar (trait)	577.6	384	<.001	.042	.963	.951	3 vs. 2	18	.004	-.008	-.009
Configural (state)	564.9	292	<.001	.058	.962	.929		—	—	—	—
Metric (state)	703.5	407	<.001	.053	.956	.941	2 vs. 1	115	-.005	-.006	.012
Scalar (state)	765.7	426	<.001	.056	.949	.934	3 vs. 2	19	.003	-.007	-.006

n = 353 per group. See Footnote 2.

Table 11. Measurement invariance between sexually functional and dysfunctional scoring groups.

	χ^2	df	p	RMSEA robust	CFI robust	TLI robust	Model Comparison	Δdf	$\Delta RMSEA$ robust	ΔCFI robust	ΔTLI robust
Configural (trait)	371.8	256	<.001	.040	.975	.951		—	—	—	—
Metric (trait)	499.6	366	<.001	.035	.972	.962	2 vs. 1	110	-.005	-.003	.011
Scalar (trait)	524.8	384	<.001	.035	.971	.962	3 vs. 2	18	.000	-.001	.000
Configural (state)	659.7	292	<.001	.061	.955	.916		—	—	—	—
Metric (state)	792.7	407	<.001	.054	.951	.934	2 vs. 1	115	-.007	-.004	.018
Scalar (state)	821.7	426	<.001	.054	.950	.936	3 vs. 2	19	.001	-.001	.002

n = 583 in the sexually functional scoring group; *n* = 110 in the sexually dysfunctional scoring group. See Footnote 2.

According to the large majority of our model fit criteria,² measurement invariance held at all levels between sexes. In fact, the fit for the ASPI (trait and state) scales was good at the configural level indicating that the same factor structure (which factor is measured by what item) held across groups (Hu & Bentler, 1998; MacCallum et al., 1996). Furthermore, metric and scalar invariance held, as the difference in goodness-of-fit when constraining loadings (metric model) and intercepts (scalar model) was not above commonly used cutoff values for the differences in CFI, RMSEA, and TLI (Chen, 2007; Cheung & Rensvold, 2002). In other words, loadings and intercepts were equivalent across groups, and the latter was actually against our expectations.

Measurement invariance held at all levels for sexually functional-scoring and dysfunctional-scoring groups according to the large majority of fit criteria² (see Table 11). The fit for the ASPI trait and state scales was good at the configural level indicating that the same factor structure held across groups (Hu & Bentler, 1998; MacCallum et al., 1996). Furthermore, metric and scalar invariance held, as the difference in goodness-of-fit when constraining loadings (metric model) and intercepts (scalar model) was not above commonly used cutoff values for the CFI, RMSEA and TLI (Chen, 2007; Cheung & Rensvold, 2002). In other words, loadings and intercepts were equivalent across sexual function groups.

²For configural we used the following criteria for model fit: root mean square error of approximation (RMSEA) with values less than .06 indicating excellent fit, values between .08 and .10 indicating mediocre fit and values above .10 indicating poor model fit (Hu & Bentler, 1998); the comparative fit index (CFI) and Tucker – Lewis Index (TLI) with values above .90 indicating acceptable fit and values above .95 indicating good model fit (Hu & Bentler, 1998; MacCallum et al., 1996). For metric and scalar: differences in fit larger than .01 (for RMSEA) and smaller than -.01 (for CFI and TLI) suggest non-invariance across groups (Chen, 2007; Cheung & Rensvold, 2002).

Reliability: Internal Consistency

Most scales showed acceptable to excellent values in Standardized Cronbach's Alpha and McDonald's Omega, except Enjoyment-Related Self-Worth of the trait scales and Pleasure-Related Validation of the state scales which showed questionable values (Table 12).

Construct Validity I: Convergent and Discriminant Associations

In Figures 2 and 3, Panels A and B, we present the zero-order and model-selected associations between all ASPI trait and state scales respectively and the respective convergent and discriminant construct scales. We ran the recommended stability analyses for the network estimation which showed that the overall correlation structure and individual edge estimation was sufficiently stable to allow

Table 12. Standardized Cronbach's alpha and McDonald's omega.

	Standardized Cronbach's α	McDonald's Omega
TRAIT		
Arousal Enjoyment	.825	.825
Enjoyment-Related Self-Efficacy	.785	.801
Enjoyment-Related Self-Worth	.640	.637
Interaction Enjoyment	.777	.763
Bonding Enjoyment	.855	.85
STATE		
Sensual Pleasure	.789	.76
Pleasure-Related Mastery	.769	.768
Pleasure-Related Validation	.611	.652
Interaction Pleasure	.869	.873
Bonding Pleasure	.906	.906

Values around .9 indicate excellent, around .8 indicate good, around .7 indicate acceptable, around .6 indicate questionable, and values of .5 or less indicate poor (Crutzen & Peters, 2017).

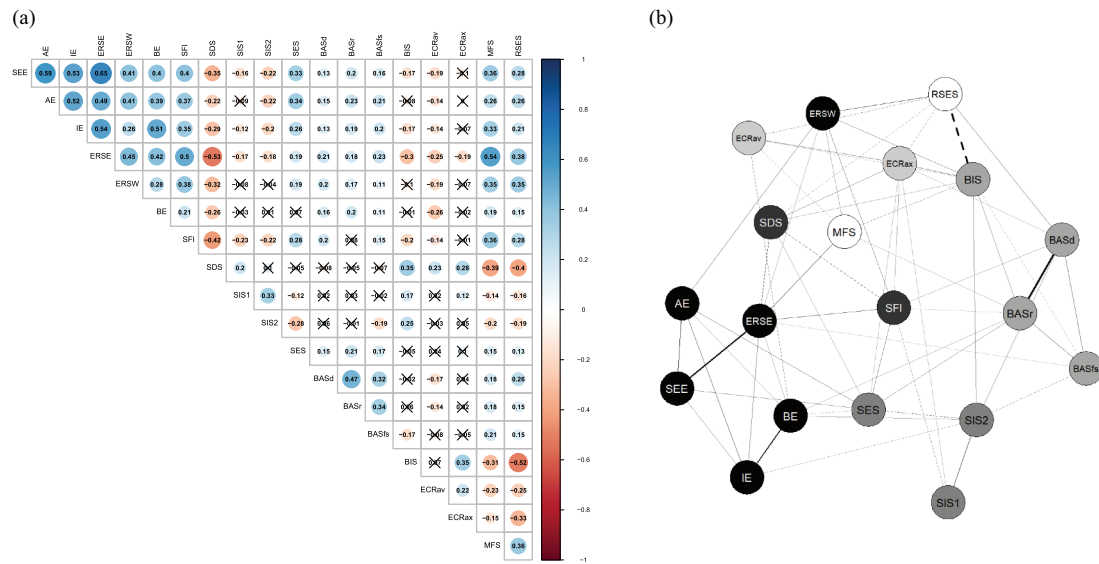


Figure 2. (Panel A and B). Relationships with other constructs of the ASPI trait scales. Zero-order Spearman correlations on the left and model-selected Spearman correlations on the right. Zero-order correlations which did not reach statistical significance are crossed out ($\alpha = .001$). Note. SEE = Sexual Experience Enjoyment; AE = Arousal Enjoyment; IE = Interaction Enjoyment; ERSE = Enjoyment-Related Self-Efficacy; ERSW = Enjoyment-Related Self-Worth; BE = Bonding Enjoyment; SFI = Sexual Function Index; SDS = Sexual Distress; SIS1 = Sexual Inhibition (Performance Failure); SIS2 = Sexual Inhibition (Performance Consequences); SES = Sexual Excitation; BASd = Behavioral Activation (Drive); BASr = Behavioral Activation (Reward Responsiveness); BASfs = Behavioral Activation (Fun Seeking); BIS = Behavioral Inhibition; ECRav = Attachment Avoidance; ECRax = Attachment Anxiety; MFS = Sexual Assertiveness; RSES = Self-Esteem. Legend for panel B) Different questionnaires have different node colors (black = ASPI; dark gray = Sexual Function and Distress, gray = SIS/SES, middle gray = BIS/BAS, light gray = Attachment, white = Self-Esteem and Sexual Assertiveness). Solid lines indicate positive, dashed lines indicate negative relationships. The thicker the line, the stronger the relationship.

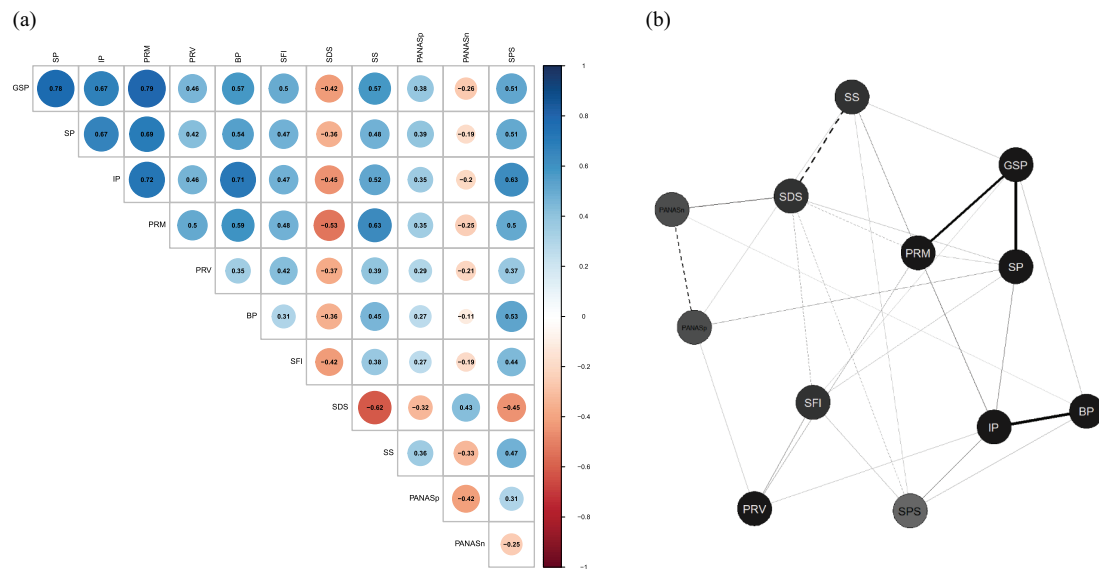


Figure 3. (Panel A and B). Relationships with other constructs of the ASPI state scales. Zero-order Spearman correlations on the left and model-selected Spearman correlations on the right. Zero-order correlations which did not reach statistical significance are crossed out ($\alpha = .001$). Note. GSP = General Sexual Pleasure; SP = Sensual Pleasure; IP = Interaction Pleasure; PRM = Pleasure-Related Mastery; PRV = Pleasure-Related Validation; BP = Bonding Pleasure; SFI = Sexual Function Index; SDS = Sexual Distress; SS = Sexual Satisfaction; PANASp = Positive Affect; PANASn = Negative Affect; SPS = Sexual Pleasure Scale. Legend for panel B) Different questionnaires have different node colors (black = ASPI; dark gray = Sexual Function, Distress and Satisfaction, gray = Sexual Pleasure and Positive and Negative Affect). Solid lines indicate positive, dashed lines indicate negative relationships. The thicker the line, the stronger the relationship.

Table 13. Descriptive statistics of sexological and psychological scales ($N = 706$).

Scale	<i>M</i>	<i>SD</i>	Possible Range
Sexual Excitation (SES)	16.87	2.78	6–24
Sexual Inhibition (SISs)			
Performance Failure (SIS1)	8.96	2.00	4–16
Performance Consequences (SIS2)	9.73	2.33	4–16
Sexual Assertiveness (MFS)	14.93	3.76	0–20
Sexual Distress (SDS)	9.11	3.84	5–25
Female Sexual Function Index ^a	30.41	3.67	2–36
Male Sexual Function Index ^b	26.53	2.36	2–30
Premature Ejaculation ^c	14.95	3.70	0–20
Human Sexual Response Questionnaire ^d	4.32	0.35	1–5
Sexual Function Index ^e (SFI)	25.55	2.79	1.2–30
Sexual Satisfaction (SS)	4.81	.92	1–6
Sexual Pleasure Scale (SPS)	18.76	3.04	0–21
Behavioral Activation (BAS)			
BA Reward Responsiveness (BASr)	16.21	2.05	5–20
BA Drive (BASd)	11.92	2.02	4–16
BA Fun Seeking (BASs)	11.98	1.95	4–16
Behavioral Inhibition (BIS)	20.00	4.00	7–28
Attachment Anxiety (ECRax)	3.40	1.09	1–7
Attachment Avoidance (ECRav)	2.33	.93	1–7
Self-Esteem (RSES)	32.91	5.20	10–40
Positive Affect (PANASp)	3.48	.66	1–5
Negative Affect (PANASn)	1.89	.61	1–5

^a $n = 345$, ^b $n = 349$, ^c $n = 347$, ^d $n = 4$, ^eexcluding satisfaction subscales and the PEP and MSFI were combined.

substantive interpretation.³ Table 13 reports all descriptive statistics of convergent and discriminant construct scales. The ASPI's descriptive statistics can be found in Table 16. Additionally, a table outlining the correlations between the state and trait scales, available in the Online Supplementary S2, demonstrates that although these scales are related, they may capture distinct domains and facets of the construct of sexual pleasure.

Trait Scales

The construct validity (convergent and discriminant validity) of the ASPI trait subscales was supported by most of the observed associations with sexological and psychological constructs, as shown in Table 14 and Figure 2. Most hypotheses were confirmed, with some deviations from expectations. The observed moderate to strong associations between the ASPI trait subscales and Sexual Function, Sexual Distress, Sexual Assertiveness, Sexual Excitation, Sexual Inhibition (specifically SIS2), and Attachment Avoidance highlight the convergent validity of the ASPI trait subscales. The ASPI trait scales were associated less strongly with psychological compared to sexological trait scales (e.g., BAS versus SES) and showed differential relationships with Self-Esteem and Sexual Assertiveness, providing evidence for discriminant validity. The discrepancies between expected and observed results (specifically, regarding Attachment Anxiety and SIS1) warrant further investigation, but overall, the construct validity of the ASPI trait subscales appeared to be supported.

State Scales

The construct validity (convergent and discriminant validity) of the ASPI state subscales was largely supported by the observed

associations with relevant sexological and psychological constructs, as shown in Table 15 and Figure 3. For example, the positive associations between ASPI state subscales and Sexual Function, Sexual Satisfaction, and Positive Affect, as well as the negative associations with Sexual Distress and Negative Affect, were largely in line with the hypotheses. Discriminant validity of the ASPI state scales was shown by the fact that the ASPI state scales generally associated less strongly with psychological states (PA and NA) compared to sexological state scales (SF, SS, and SD). Furthermore, the associations between Sexual Satisfaction and the ASPI state scales were smaller than the association of Sexual Satisfaction with Sexual Distress. A few discrepancies between expected and observed results might suggest areas for future research (i.e., the alternative Sexual Pleasure Scale (SPS) showed a different pattern of correlations than anticipated, correlating most strongly with Bonding and Interaction Pleasure only), but overall, the construct validity of the ASPI state subscales appeared to be supported, as demonstrated in Table 15.

Contrary to our expectations, the two general ASPI scales did not correlate equally with all other ASPI scales. Sexual Experience Enjoyment correlated most strongly with Enjoyment-Related Self-Efficacy, followed by Arousal and Interaction Enjoyment (see Figure 2). General Sexual Pleasure correlated most strongly with Sensual Pleasure and Mastery, followed by Interaction Pleasure (see Figure 3 Panel A) and Bonding Pleasure (see Figure 3 Panel B) for the zero-order and model-selected correlations, respectively.

Construct Validity II: Differences Between Known-Groups

T-tests for independent groups per scale confirmed the expected differences between the sexually functional-scoring and the sexually dysfunctional-scoring group. The sexually dysfunctional-scoring group had significantly lower mean ASPI scores than the sexually functional-scoring group on all scales ($p < .0042$; corrected for multiple comparisons using the Bonferroni method; see Table 16), with Enjoyment-Related

³Edge stability (retaining a correlation of .7 in at least 95% of the samples) for the trait and the state network was 0.751 (0.673–1) and the bootstrap-based variance around the edge estimates seemed acceptable. Stability plots can be found in the Online Supplementary S5.

Table 14. Associations between relevant sexological and psychological constructs with ASPI trait subscales: comparing expected and observed outcomes for construct validity (convergent and discriminant validity).

	A priori Hypothesis	Observed Results
Sexual Function	We expect a low to moderate positive association between all ASPI trait-domains and Sexual Function (Pascoal et al., 2016; Stephenson & Meston, 2012; Werner et al., 2023b, January 25).	Observed stronger than expected positive zero-order correlations with ASPI trait scales (moderate-strong rather than moderate). Correlated most strongly with Enjoyment-related Self-Efficacy in the zero-order correlations, and only showed direct relationships with Enjoyment-related Self-Efficacy and Enjoyment-related Self-Worth in the model-selected networks.
Sexual Distress	We expect a moderate negative association between the ASPI trait-domains and Sexual Distress (Pascoal et al., 2016; Stephenson & Meston, 2012; Werner et al., 2023b, January 25).	Observed stronger than expected negative zero-order correlations with ASPI trait scales (moderate-strong rather than moderate). Only Enjoyment-related Self-Efficacy correlated with Sexual Distress in the model-selected network.
Sexual Assertiveness	Among all ASPI trait-domains, we expect Sexual Assertiveness to associate most positively (moderate to high strength) with Enjoyment-related Self-Efficacy and Enjoyment-related Self-Worth, with the association between Sexual Assertiveness and Enjoyment-related Self-Efficacy being stronger than the association between Sexual Assertiveness and Enjoyment-related Self-Worth (Mastro & Zimmer-Gembeck, 2015).	Confirmed. Moderate to high positive correlations with Enjoyment-related Self-Efficacy and Enjoyment-related Self-Worth. Association between Sexual Assertiveness and Enjoyment-related Self-Efficacy stronger than the association between Sexual Assertiveness and Enjoyment-related Self-Worth, even in the model-selected network.
Sexual Excitation	Among all ASPI trait-domains, we expect Sexual Excitation to associate most positively (moderate to high strength) with the ASPI-domains Arousal Enjoyment and Sexual Experience Enjoyment (Bancroft et al., 2005; Janssen & Bancroft, 2007; Werner et al., 2023b, January 25). Comparatively, we expect Behavioral Activation to show relatively lower positive associations (low to moderate strength) with the ASPI-domains Arousal Enjoyment and Sexual Experience Enjoyment. Similarly, we expect Sexual Inhibition to show relatively higher negative associations with the ASPI-domains compared to Behavioral Inhibition with the ASPI-domains.	As expected, moderately positive correlations with Arousal Enjoyment and Sexual Experience Enjoyment. Less strong or no correlations with Behavioral Activation.
Sexual Inhibition		Expectations partially dis/confirmed. Negative zero-order correlations with ASPI scales, but similar in strength to Behavioral Inhibition. Not all ASPI scales correlated with Sexual Inhibition in the model-selected network.
Behavioral Activation		As expected, lower positive associations with Arousal Enjoyment and Sexual Experience Enjoyment compared to Sexual Excitation.
Behavioral Inhibition		As expected, negative zero-order correlations with ASPI scales, but similar in strength to Sexual Inhibition.
Attachment Anxiety	We expect Attachment Anxiety to associate positively (moderate to high strength) with the ASPI-domain Attachment Enjoyment (with Interaction Enjoyment following in strength) but negatively (moderate to high strength) with the ASPI-domain Enjoyment-related Self-Worth. We expect these three associations to be the strongest associations among all ASPI trait-domains with Attachment Anxiety (Davis et al., 2004; Impett et al., 2008; Nelson-Coffey et al., 2017; Picardi et al., 2005). We expect Attachment Avoidance to associate negatively (moderate to high strength) with the ASPI-domain Attachment Enjoyment (with Interaction Enjoyment following in strength); however, in contrast to Attachment Anxiety, Attachment Avoidance does not, or only weakly, associate with Enjoyment-related Self-Worth. We hypothesize these two expected associations to be the strongest associations among all ASPI trait-domains with Attachment Avoidance (Davis et al., 2004; Impett et al., 2008; Nelson-Coffey et al., 2017; Picardi et al., 2005).	Expectations not met. No strong or moderate positive correlations with Bonding Enjoyment, Interaction Enjoyment, or Enjoyment-related Self-Worth. Small negative zero-order correlation with Enjoyment-related Self-Efficacy. Unexpected positive correlations with Sexual Function and Sexual Excitation in the model-selected network.
Attachment Avoidance		Partially followed expectations. Small to moderate negative zero-order correlations with all ASPI facets. Negative correlation with Bonding Enjoyment but not Interaction Enjoyment in the model-selected network.
Self-Esteem	Among all ASPI trait-domains, we expect Self-Esteem to associate most positively (moderate to high strength) with Enjoyment-related Self-Worth and Enjoyment-related Self-Efficacy, with the association between Self-Esteem and Enjoyment-related Self-Worth being stronger than the association between Self-Esteem and Enjoyment-related Self-Efficacy (Mastro & Zimmer-Gembeck, 2015; Rowland et al., 2015; Steinke et al., 2008).	Expectations partially dis/confirmed. Moderate positive correlations with Enjoyment-related Self-Worth and Enjoyment-related Self-Efficacy, but no stronger relationship for Enjoyment-related Self-Worth than Enjoyment-related Self-Efficacy in the zero-order correlations. In the model-selected network, only related to Enjoyment-related Self-Worth, not Enjoyment-related Self-Efficacy.

Self-Efficacy differentiating most among the trait facets, and differences appearing more pronounced on the state compared to the trait scales. In other words, the ASPI scales discriminated between sexual function groups and the state and trait scales showed differential utility in discriminating between sexual function groups since the state scales appeared to show larger differences than the trait scales.

Sensitivity Analysis Regarding Handling of “Not Applicable” Responses

Factor analysis for the state model still resulted in similar, i.e., good model fit compared to the original models (in which “not applicable” was handled as missing) when participants with

“not applicable” responses were included but “not applicable” was set to 0, and when participants with “not applicable” responses were excluded (see Table 17).

We also ran sensitivity analyses with the two additional samples for the network analysis. For both cases (“not applicable” set to 0 and NA excluded), all networks were highly similar to the original networks with all newly estimated correlation matrices correlating above .9 with the original correlation matrices.

Response Bias for ASPI Scales

ASPI scales were not systematically associated with socially desirable responses since correlation coefficients were not equal or higher than the cutoff of $r_s > .5$ (the highest zero-

Table 15. Associations between relevant sexological and psychological constructs with ASPI state subscales: comparing expected and observed outcomes for construct validity (convergent and discriminant validity).

	A priori Hypothesis	Observed Results
Sexual Pleasure	We expect Sexual Pleasure to associate strongly positively with General Pleasure, Sensual Pleasure, Attachment Pleasure and Interaction Pleasure, but less strongly positively with the ASPI state domains Mastery and Validation (Werner et al., 2023a, 2023b, January 25).	Contrary to expectations, SPS correlated most strongly and robustly with Bonding and Interaction Pleasure only.
Sexual Function	We expect a moderate positive association between all ASPI state-domains and Sexual Function (Pascoal et al., 2016; Stephenson & Meston, 2012; Werner et al., 2023b, January 25).	Observed stronger than expected positive zero-order correlations with ASPI state scales. In the model-selected network, correlated positively with Validation, Sensual Pleasure, and General Sexual Pleasure, but not with Mastery, Bonding Pleasure, nor Interaction Pleasure.
Sexual Distress	We expect a moderate to high negative association between all ASPI state-domains and Sexual Distress (Pascoal et al., 2016; Stephenson & Meston, 2012; Werner et al., 2023b, January 25).	Observed stronger than expected negative zero-order correlations with ASPI state scales. In the model-selected network, correlated negatively only with Mastery and positively with Sensual Pleasure (possibly due to suppression effect).
Sexual Satisfaction	We expect Sexual Satisfaction to associate moderately positively with the ASPI-state-domains (Bois et al., 2013; McClelland, 2010, 2014; Stephenson & Meston, 2012).	Observed stronger than expected positive correlations with ASPI state scales (strong rather than moderate). Correlations with ASPI state scales were generally stronger than those with Positive Affect and Negative Affect.
Positive Affect	We expect a relatively lower positive association between the ASPI-state-domains and Positive Affect and a relatively lower negative association between the ASPI-state-domains and Negative Affect compared to the sexual state constructs (Sexual Satisfaction, Sexual Function, Sexual Pleasure) (Bancroft et al., 2003; Kalmbach & Pillai, 2014; Oliveira & Nobre, 2013; Peixoto & Nobre, 2012; Werner et al., 2023b, January 25).	As expected, the correlations between the ASPI state scales and Sexual Function, Sexual Distress, and Sexual Satisfaction were generally stronger than the zero-order and model-selected correlations between the ASPI state scales and Positive Affect.
Negative Affect		As expected, the correlations between the ASPI state scales and Sexual Function, Sexual Distress, and Sexual Satisfaction were generally stronger than the zero-order and model-selected correlations between the ASPI state scales and Negative Affect.

Table 16. Descriptive statistics of ASPI-scales overall, and for known-groups and explorative analyses.

Scale	Overall		female		male						functional		dysfunctional					
	N = 706		n = 353		n = 353						n = 583		n = 110					
TRAIT	M	SD	M	SD	M	SD	t	df	p	d	M	SD	M	SD	t	df	p	d
Arousal Enjoyment	5.57	.5	5.55	.54	5.59	.46	-1.073	704	.284		5.61	.45	5.36	.65	-4.002	129.838	<.001	-0.53
Enjoyment-Related Self-Efficacy	5.04	.67	4.99	.74	5.08	.6	-1.654	674.608	.099		5.13	.59	4.49	.79	-8.143	132.921	<.001	-1.03
Enjoyment-Related Self-Worth	5.03	.72	5.14	.73	4.91	.68	4.133	704	<.001	0.31	5.12	.66	4.54	.82	-6.954	137.455	<.001	-0.83
Interaction Enjoyment	5.48	.54	5.37	.6	5.59	.45	-5.451	655.544	<.001	-0.41	5.54	.48	5.17	.71	-5.139	128.928	<.001	-0.69
Bonding Enjoyment	5.26	.66	5.25	.65	5.27	.67	-.526	704	.599		5.31	.62	5.03	.77	-3.590	137.100	<.001	-0.43
Sexual Experience Enjoyment	5.29	.56	5.25	.58	5.33	.53	-1.798	704	.073		5.36	.5	4.94	.70	-6.004	130.578	<.001	-0.78
STATE																		
Sensual Pleasure	4.94	.77	4.94	.82	4.95	.72	-.235	704	.814		5.05	.69	4.39	.89	-7.431	134.817	<.001	-0.92
Pleasure-Related Mastery	4.81	.77	4.82	.81	4.80	.73	.325	704	.746		4.94	.67	4.10	.87	-9.537	134.288	<.001	-1.18
Pleasure-Related Validation	4.85	.93	4.95	.99	4.74	.86	3.084	691.871	.002	0.23	4.98	.83	4.14	1.06	-7.886	135.404	<.001	-0.97
Interaction Pleasure	4.95	.94	4.87	1.0	5.02	.87	-2.053	690.871	.041		5.1	.83	4.17	1.09	-8.442	133.547	<.001	-1.06
Bonding Pleasure	5.04	.94	5.0	.96	5.08	.93	-1.202	704	.230		5.15	.84	4.48	1.20	-5.537	129.993	<.001	-0.73
General Sexual Pleasure	4.90	.74	4.9	.79	4.89	.69	.090	690.678	.928		5.01	.65	4.29	.85	-8.465	134.363	<.001	-1.05

Due to unequal variances between the groups (significant Levene test), different df may occur due to the robust test applied.

Table 17. Model fit indices (ESEM) for the sensitivity analysis for the state model.

	CFI	TLI	RMSEA.robust	SRMR	BIC	AIC
NA set to 0	.960	.957	.046	.076	44382.214	44204.445
NA excluded	.992	.992	.020	.050	19089.846	18938.833
5-Factor final state model	.968	.939	.054	.023	34377.314	32699.930

ESEM = Exploratory structural equation modeling; CFI = Comparative Fit Index; TFI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; BIC = Bayesian-Information-Criterion; AIC = Akaike-Information-Criterion.

order correlation was $r_s = .18$ between SEA and Interaction Pleasure). In addition, the correlations between the ASPI scales and the SEA-Short Form were comparable to the correlation of the Sexual Satisfaction scales with the SEA-Short Form. The fact that both the ASPI and Sexual Satisfaction correlated more

strongly with the SEA than the SES correlated with the SEA warrants further investigation in the future. Detailed correlation tables (one for state and one for trait) can be found in the Online Supplementary S3 and S4, providing further information on the relationships between these variables.

Explorative Analysis: Sex Differences on ASPI Scales

Most scales showed no significant sex difference using t-tests for independent groups (see Table 16). Only the trait scales Interaction Enjoyment and Enjoyment-Related Self-Worth and the state counterpart scale Pleasure-Related Validation showed a significant sex difference, with males showing higher mean scores for the Interaction scale and females showing higher mean scores for the Self-Worth and Validation scales ($p < .0042$; corrected for multiple comparisons using the Bonferroni method; see Table 16). The effect sizes according to Cohen (1988) were small (Cohen's d for Interaction Enjoyment = -0.41, Cohen's d for Enjoyment-Related Self-Worth = 0.31, Cohen's d for Pleasure-Related Validation = 0.23).

We additionally explored sex differences in the associations between the Orgasm Function scale and the ASPI scales, considering differences in orgasm consistency across sex and gender (Frederick et al., 2018). Table 18 shows that across all participants all ASPI scales correlated moderately positively with the Orgasm Function scale, indicating that the experience of pleasurable sex was associated with orgasm function. Sex differences in associations emerged, with stronger correlations emerging among the female subsample compared to the male subsample, especially for the intrapersonal reward domain (Enjoyment-related Self-Efficacy and Self-Worth and Pleasure-related Mastery and Validation).

Response Process Evaluation: Item Comprehension and Content Validity

We asked participants of sample 1 whether they thought the ASPI covered (trait) enjoyment and (state) pleasure sufficiently or whether they felt that any pleasurable aspects of sexual experiences were missing. Respondents noted that playing with, exploring, and learning about personal and interpersonal boundaries and the resulting novelty, psychological “mindfuck” and spiritual and transcendent experiences were not yet sufficiently included. We also specifically targeted those people who indicated that they had not experienced any of the sexual experiences covered in the ASPI to ask them whether they had experienced anything as sexually pleasurable which was not

covered in the ASPI ($n = 10$ of 1371). None of these participants suggested any additional activity or experience; all indicated that no potential experience was missing.

In the qualitative survey (sample 2), we focused on whether participants understood the content of the items. For the most part, the items were understandable. Only for nine items more than three participants indicated that they did not fully understand them. Seven of these items were excluded based on the quantitative analysis. For the two retained items (state4: “During partner sex, my genitals glowed with excitement.” and state5: “During masturbation, my genitals glowed with excitement.”) we examined the qualitative responses in more detail and saw that people had difficulty understanding the word “glowed.” We checked what the two statements meant to respondents in their own words and noted that they described the statement as intended (e.g., hot, wet, blood flowing, swelling, maximum arousal). We therefore retained these two items.

Participants were also asked whether the items adequately covered the scales. Those participants who indicated issues, mainly had difficulties with the names of the scales. This difficulty could be due to failed scale-label translation into German or the fact that the scale labels are technical and potentially not intuitively familiar. The German labeling and definition of the scales could be reworded in future ASPI versions, which would allow for better insight in item-scale coverage in future response process evaluations.

Discussion

In this study, we presented the Amsterdam Sexual Pleasure Inventory (ASPI 1.0), a revised version of the original ASPI (0.1), and analyzed its psychometric properties to gather validity evidence regarding the intended interpretation and uses of the ASPI. The ASPI is a multidimensional instrument which aims to assess the different facets of sexual pleasure from a trait and state perspective and can be used in diverse groups of people to compare respective scores between male and female respondents with and without sexual dysfunction.

Our analyses suggested that the 5-facet structure for trait and state pleasure proposed by Werner et al. (2023a) showed good

Table 18. Spearman correlations between the ASPI and orgasm function for all participants ($n = 698$) and female ($n = 346$) and male ($n = 352$) participants separately.

Group	Orgasm Function All <i>M(SD)</i>	Orgasm Function Female <i>M(SD)</i>	Orgasm Function Male <i>M(SD)</i>
ASPI Facet	5.16 (1.07)	4.80 (1.20)	5.53 (0.77)
Sexual Experience Enjoyment	.23***	.29***	.16***
Arousal Enjoyment	.21***	.32***	.11*
Enjoyment-related Self-Efficacy	.32***	.47***	.21***
Enjoyment-related Self-Worth	.22***	.45***	.18***
Interaction Enjoyment	.24***	.27***	.11*
Bonding Enjoyment	.12***	.15***	.09
General Sexual Pleasure	.30***	.39***	.30***
Sensual Pleasure	.29***	.37***	.27***
Pleasure-related Mastery	.31***	.47***	.20***
Pleasure-related Validation	.27***	.50***	.18***
Interaction Pleasure	.30***	.41***	.19***
Bonding Pleasure	.17***	.20***	.13*

* .05 ** .01 *** .001. Correlations in bold are significantly different in strength between female and male participants at $\alpha = .0042$.

structural validity evidence and that the explorative general ASPI scales showed acceptable evidence of structural validity as indices. The majority of the scales showed acceptable internal consistency and the factor structure was invariant among intended comparison groups. Sexual pleasure as assessed by the ASPI differed sufficiently from similar and related constructs such as sexual satisfaction and associated theoretically sensibly with other sexological and psychological constructs, suggesting that the ASPI scales showed overall good validity evidence regarding relations with other constructs.

Differences between known-groups suggested that the state scales have differential utility compared to the trait scales in differentiating sexual dys/function and that the different facets have utility in researching differences between males and females (assigned-at-birth). Furthermore, we showed that the ASPI did not appear to be particularly sensitive to socially desirable responding. Based on the qualitative data, participants understood the items as intended and thought that the ASPI covered relevant facets of sexual pleasure. Therefore, we argue that the ASPI can be used in survey research among respondents with different sex, gender, and relationship types to assess the tendency to experience sexual pleasure and the levels of experienced sexual pleasure and can be used to compare scores on the respective scales between males and females, and potentially between groups with and without sexual dysfunction.

Factor Structure and Internal Consistency

Trait Scales

The model fit for the trait model was very good. Except for Interaction Enjoyment, all facets showed clearly demarcated factor loading patterns. For Interaction Enjoyment, we decided to retain the lowest loading item, as without it, the scale would primarily emphasize the giving of pleasure rather than the exchange of pleasure which we considered crucial to capture sexual *interaction*. However, future research needs to ascertain whether the tendency to enjoy sexual *interaction* reflects the tendency to enjoy the reciprocal sharing of pleasure or rather the giving of pleasure only (Lawrance & Byers, 1995; Muise & Impett, 2015; Muise et al., 2013).

For Interaction Enjoyment, we also accepted the strongly cross-loading items since they cross-loaded on Bonding Enjoyment only, which also belongs to the interpersonal enjoyment domain, and should therefore not be theoretically problematic (Werner et al., 2023a). We also did not collapse the items into one scale as the items from Bonding Enjoyment did not exhibit cross-loadings on Interaction Enjoyment and since the two scales showed differential patterns of convergent and discriminant relationships with other constructs. For instance, Bonding Enjoyment showed a controlled negative association with Attachment Avoidance (cf. Davis et al., 2004; Impett et al., 2008), whereas Interaction Enjoyment did not. This indicates that the two subscales represent different facets despite both belonging to the interpersonal enjoyment domain.

All scales, with the exception of the Enjoyment-Related Self-Worth scale, showed at least acceptable internal consistency, probably due to the fact that it is shorter with only three items,

two of which are reverse scored (Giles et al., 2020; Greenberger et al., 2003; Rodebaugh et al., 2007; Smith et al., 2000).

State Scales

The state structure showed good model fit. However, the factor loading patterns were not as consistent as for the trait model, and only Sensual Pleasure, Pleasure-Related Validation, and Bonding Pleasure showed clear demarcation in terms of their factor loadings. Interaction Pleasure showed four cross-loadings on Sensual Pleasure, probably because Interaction items also ask about pleasure received from *stimulation* (Item 15, 16, 17, 19), but with a focus on stimulation in a *partnered* rather than *general* context (Werner et al., 2023a). We decided to keep the scales separate in order to be able to still assess a more general, rather than only partnered, context with a Sensual Pleasure scale especially for those who did not engage in partnered sex. This decision was further supported by the Sensual Pleasure scale not exhibiting cross-loadings on Interaction Pleasure and both scales showing differential patterns of convergent and discriminant relationships with other constructs (e.g., Sensual Pleasure associated with Sexual Function, which Interaction Pleasure did not; Stephenson & Meston, 2012).

Pleasure-Related Mastery included four items which loaded weakly on Pleasure-Related Mastery while cross-loading strongly on other factors (Item 6, 7, 9, 11). Three of these cross-loading items refer to partner sex and loaded strongly on Interaction Pleasure and Bonding Pleasure, probably because these factors share the context of partnered sex. Since the Pleasure-Related Mastery scale is not about the activity and its context but about the mastery experienced during the activity and context, we decided to keep the scale separate to be able to measure this pleasurable facet of partnered sex separately (for a similar rationale, see the method in Murphy et al., 2001).

All scales except Pleasure-Related Validation showed at least acceptable internal consistency. Pleasure-Related Validation probably showed questionable consistency since it is shorter with only three items, two of which are reverse scored (Giles et al., 2020; Greenberger et al., 2003; Rodebaugh et al., 2007; Smith et al., 2000).

Trait vs. State Scales

Overall, the structure of the trait model was more robust than that of the state model with the state scales showing lower loadings overall and more cross loadings than the trait scales. We can speculate about three potential reasons. First, state scales might be affected more by measurement error than trait scales since experiences reflected in state items might be affected more by unsystematic extraneous time-varying aspects (Hamaker et al., 2007) than those of trait items, resulting in lower factor-loadings due to more residual variation. Second, in the state model more than in the trait model, items clustered alongside the activity and/or context, suggesting that state-evaluations are more sensitive to situational aspects which might lead respondents to answer items relating to the same situations more similarly even though the items refer to different aspects of those situations (Fleeson, 2001; Mischel & Shoda, 1995; Murphy et al., 2001). Future work could address this by modeling factor models including three method

factors (Morin et al., 2020) for general sexual experiences, partner sex, and solo sex. Third, the ASPI state scales are newer in development than the trait scales, since the trait scales were partially based on and therefore able to learn from the original version of the ASPI 0.1 (Gieles et al., 2022; Klein et al., 2022; Werner et al., 2023b, January 25).

Factors vs. Components – Latent Variables vs. Indices

We also demonstrated acceptable model fit for the component models for the general scales (Sexual Experience Enjoyment and General Sexual Pleasure), with component loadings generally surpassing acceptable strength (Brown, 2015; Costello & Osborne, 2005). However, the fact that the components only captured about 50% of the variance suggests that one should look critically at an average score of this scale (Abdi & Williams, 2010). Experience across the different activities seem to vary unsystematically across individuals – i.e., not everyone who experiences masturbation as pleasurable also experiences partner sex as pleasurable – which implies that overall pleasure and enjoyment across different activities cannot be easily reduced unidimensionally.

Measurement Invariance and Known-Group Differences

We showed that the ASPI can be used to compare scores across sex and probably sexual function groups since measurement invariance was given for both male and female participants and for sexually functional-scoring and dysfunctional-scoring people. Thereby, the ASPI is the first sexual pleasure scale with validity evidence regarding uses and comparability in such different groups of people.

Furthermore, we showed that all ASPI scale scores significantly differentiated between dysfunctional-scoring and functional-scoring participants, with Enjoyment-Related Self-Efficacy showing the biggest difference among the trait scales and the state scales showing bigger differences than the trait scales. These results confirm that the ASPI is able to discriminate sexual function groups and that sexually dysfunctional-scoring individuals report less pleasure and a lower tendency to experience pleasure than functional-scoring individuals, which is in line with previous research (Pascoal et al., 2016; Stephenson & Meston, 2012). Furthermore, these results suggest that it is useful to differentiate between state and trait sexual pleasure.

Somewhat contrary to the previous literature (Klein et al., 2022; Laan et al., 2021), sex differences occurred only on Enjoyment-Related Self-Worth and Interaction Enjoyment and the state counterpart Pleasure-Related Validation, with females scoring higher on Enjoyment-Related Self-Worth and Pleasure-Related Validation and lower on Interaction Enjoyment than males. Our finding highlights the utility of the ASPI in that it is possible to study specifically how groups differ in various aspects of pleasure and enjoyment. Earlier findings of gender differences in pleasure, with women reporting less pleasure than men, potentially resulted from the fact that those instruments assessed pleasure and enjoyment associated with the sexual interaction rather than other (aspects of) sexual activities.

Despite few sex differences in average reported levels of pleasure and enjoyment as assessed by the ASPI, female participants did report lower Orgasm Function and larger inter-individual differences in Orgasm Function than male participants, which is in line with the literature (Klein et al., 2022; Laan et al., 2021). Overall, pleasurable sex associated moderately positively with Orgasm Function, confirming that pleasurable sex encompasses, but is not equivalent to, orgasm during sex (Fahs & Plante, 2017; Tiefer, 2004). Importantly, Orgasm Function associated more strongly with pleasurable sexual experiences among female than male participants, presumably because of the more restricted variance in Orgasm Function in males than females (Laan et al., 2021, p. 518). The intrapersonal reward domain associated with Orgasm Function most strongly and consistently, suggesting that (the tendency) to feel worthy of and capable to create positive and validating sexual experiences might be particularly worthwhile points of intervention to not only make sex more pleasurable for both sexes but also orgasmic, especially for females. These observed sex differences should be replicated for further confirmation as they were exploratory in nature and included the ASPI scale with the lowest internal consistency.

Construct and Content Validity: Convergent and Discriminant Associations and Response Process Evaluation

Overall, each ASPI scale showed sufficiently differential inter-relationships with other constructs compared to the other ASPI scales which suggests that each ASPI scale represents a unique construct worthwhile to interpret and use separately. This further supports our decision to not collapse any of the factors into the same scale (e.g., Interaction Enjoyment and Bonding Enjoyment, or Interaction Pleasure and Sensual Pleasure). Furthermore, participants provided qualitative responses which showed good evidence of validity regarding the content of the ASPI scales. Items were considered comprehensive, understandable, and relevant.

Our construct validity analyses offered evidence of good validity of the ASPI scales in terms of relations with other variables, apart from some important exceptions regarding relationships with Sexual Inhibition and Attachment Anxiety. In line with our predictions, the ASPI scales correlated more strongly with sexological compared to psychological scales, with the trait scales correlating more strongly with Sexual Excitation compared to Behavioral Activation, and the state scales correlating more strongly with Sexual Function, Distress and Satisfaction compared to General Positive and Negative Affect. Furthermore, the Enjoyment-Related Self-Efficacy & Pleasure-Related Mastery and Enjoyment-Related Self-Worth & Pleasure-Related Validation scales showed differential patterns of relationships with Sexual Assertiveness and Self-Esteem, supporting their intended interpretation (Mastro & Zimmer-Gembeck, 2015; Rowland et al., 2015).

As expected, the ASPI scales correlated with Sexual Satisfaction, but generally less strongly and consistently so than Sexual Satisfaction and Sexual Distress correlated with each other, offering further evidence to interpreting the ASPI to measure a different construct than Satisfaction, which is consistent with the

literature (Bois et al., 2013; McClelland, 2010, 2014; Pascoal et al., 2014; Stephenson & Meston, 2012)

Contrary to our expectations, the ASPI trait scales did not correlate as expected with Attachment Anxiety and Sexual Inhibition, whereas the relationships between the ASPI trait scales and Attachment Avoidance and Sexual Excitation did follow our expectations overall (Davis et al., 2004; Impett et al., 2008; Nelson-Coffey et al., 2017). We speculate that these deviations could be due to two reasons. First, the Sexual Inhibition scales showed low internal consistency in our sample, which might explain why these scales did not systematically covary with any of the other scales (DeVellis & Thorpe, 2021; Nunnally & Bernstein, 1994). Second, we assume that, at the time we formulated our hypotheses, we had limited understanding of the differential roles Attachment Anxiety and Sexual Inhibition play in pleasure and enjoyment and might have underestimated potential sex differences which could moderate these associations (e.g., Sexual Inhibition due to performance threat, SIS1, might only associate negatively with pleasure and enjoyment among men for which those scales were originally created; Janssen & Bancroft, 2007). That is, we think that we specified faulty conceptual hypotheses rather than that we report on problems of the ASPI. Future research needs to replicate our findings, disentangle the differential role Attachment Avoidance and Attachment Anxiety appear to be playing in sexual pleasure and function (Barnett et al., 2018; Cohen & Belsky, 2008; Davis et al., 2004; Impett et al., 2008), and focus on the differential role Sexual Inhibition and Sexual Excitation seem to be playing in different domains of sexual pleasure and enjoyment (Janssen & Bancroft, 2007).

The general scales (Sexual Experience Enjoyment and General Sexual Pleasure) correlated most strongly and robustly with Arousal Enjoyment and Sensual Pleasure and Enjoyment-Related Self-Efficacy and Pleasure-Related Mastery, and somewhat less strongly and consistently with the Bonding and Interaction facets, and very weakly to not at all with Pleasure-Related Validation and Enjoyment-Related Self-Worth. This might imply that general sexual pleasure and enjoyment do not encompass the Enjoyment-Related Self-Worth and Pleasure-Related Validation facets, or that such an association is group-dependent and moderated by, for instance, gender (Klein et al., 2022; Meana, 2010). Also, the alternative general Sexual Pleasure Scale (SPS; Pascoal et al., 2016) did correlate consistently with the Bonding and Interaction scales, suggesting that this alternative general scale assesses the interpersonal domain of sexual pleasure. However, since the general scales correlated with at least one of the scales of each domain, these results suggest that the general ASPI scales can be interpreted and used to assess the general tendency to and experience of sexual pleasure.

Limitations and Future Improvements

There are several limitations and potential future improvements regarding the study and questionnaire.

Study

First, the study did not include repeated measurements which are needed to investigate differentiation into state and trait

variability on the scales over time (Hamaker et al., 2007), as well as reliability in terms of temporal stability. Second, in this study we did not further discuss and differentiate between traits as tendencies and traits as capacities which we briefly referred to in the introduction. We expect that a self-report assessment that is structured like the ASPI mostly assesses the tendency but not capacity to experience pleasure, an assumption which should be further researched in the future (see for a discussion Werner et al. 2023a, and Figure 1 in the introduction). Third, we studied the ASPI in a sample of German-speaking individuals. Investigations of cross-cultural measurement invariance are necessary in order to use the ASPI in other languages and cultural contexts. Fourth, examining the factor structure of the ASPI for sexually inactive people separately was beyond the scope of the study. We did assess different procedures for scoring the “not applicable” responses, indicating that in our sample the scoring of “not applicable” responses did not have a strong influence on the conclusions drawn regarding validity evidence. Future studies should assure the valid use and interpretation of the scores in samples with more “not applicable” and missing responses and explore the scaling and scoring in different groups in more detail using Item Response Theory. Fifth, measurement invariance in people with sexual dysfunction, people whose assigned sex does not correspond to their gender, and partnered versus non-partnered respondents needs to be assessed in a larger sample to pursue the goal of using the ASPI scores to compare these groups of individuals validly. Sixth, some of the scales used for construct validation showed less than acceptable internal consistency in our sample. Future studies need to ascertain whether our findings, specifically regarding Attachment Anxiety and Sexual Inhibition, were a result of lacking reliability of these measures in our sample. Finally, we focused on reporting validity evidence for the state and trait scales separately to establish their validity and performance independently, as outlined in our preregistration. We thereby aimed to lay the groundwork for future research which can investigate the interplay between the validated state and trait facets and delve deeper into their relationships.

Questionnaire

First, the ASPI is a self-report questionnaire, leaving the results subject to measurement limitations specific to self-report assessments (Giles et al., 2020). Future work using different instruments such as physiological measures of pleasure, instruments assessing standardized situations (Janssen et al., 2002a), and studies into response-scale interpretation (McClelland, 2017) can gather additional evidence regarding the interpretation of the ASPI state scales as a state measure and the interpretation of the ASPI trait scales as a trait measure. The integration of psychophysiological measures in future studies will not only contribute to the validation of the ASPI but also enhance our understanding of the complex interplay between self-reported sexual pleasure and its physiological underpinnings, paving the way for a more comprehensive approach to the study of sexual pleasure (e.g., Janssen et al., 2002b).

Second, the validity evidence suggested that the Interaction scales and the Enjoyment-Related Self-Worth and Pleasure-Related Validation scales require another round of

improvements. Future ASPI versions need to disentangle whether the Interaction scales need to capture reciprocity in exchanging pleasure or whether the pleasure involved in sharing pleasure lies mainly in giving rather than reciprocally receiving pleasure, the latter which might already be sufficiently captured by the Sensual Pleasure scale, explaining the cross-loadings of the Interaction scales (cf. Lawrance & Byers, 1995; Muise & Impett, 2015; Muise et al., 2013). Regarding the Self-Worth and Validation scales, their internal consistency could be improved by rephrasing included items from negative to positive valence and potentially adding new items (Giles et al., 2020; Greenberger et al., 2003; Rodebaugh et al., 2007; Smith et al., 2000).

Third, the current version does not yet cover all rewarding aspects of sexual experiences and participants suggested adding facets that dovetail with additional facets suggested in previous research (playing with, learning about, and expanding boundaries as well as novelty and the transcendence or spirituality of sex; see also Goldey et al., 2016; Kleinplatz et al., 2009; Werner et al. 2023a).

Fourth, as for previous versions of the ASPI (i.e. 0.1) and other sexual pleasure scales, the items and scores of the ASPI 1.0 were left skewed and non-normally distributed; however, rather than seeing this as a limitation of the instrument, it appears to be how pleasure is distributed in samples from the general population (Beckmeyer et al., 2021).

Strengths and Conceptual Implications

The ASPI is the first questionnaire to assess sexual pleasure from a conceptual and holistic perspective, capturing trait and state aspects of multiple facets of sexual pleasure, considering aspects of partner and solo sexuality, while being inclusive as it does not assume gender, sex, or relationship types. Overall, Werner et al.'s (2023a) suggestion that sexual pleasure encompasses the (tendency for the) experience of *different* rewards was supported in that the general scales did correlate consistently with at least one scale of each of the three reward domains (hedonic, interpersonal and intrapersonal). The latter suggestion is in line with views that suggest that sexual pleasure encompasses more than the experience of sensual pleasure and orgasm and that it is crucial to incorporate other rewarding aspects of sexuality in order to study sexually pleasurable experiences (Fileborn et al., 2017; Goldey et al., 2016; Kleinplatz et al., 2009; Opperman et al., 2014).

We investigated the questionnaire using a sufficiently large sample representing the general (German speaking) population. By adhering to the a priori power analysis specified in our preregistration, we ensured sufficient power and methodological rigor (Simmons et al., 2016).

Even though we did not study the ASPI in a clinical sample, comparing the scales between sexually functional-scoring and dysfunctional-scoring groups suggests the utility of the ASPI in differentiating these groups. The construct validity results suggest that the ASPI includes constructs which have not been covered sufficiently yet in other conceptual frameworks and questionnaires and which could be useful for future research on sexual dys/function and differences between groups. Specifically, among the trait scales, the two sexual function groups differed most regarding Enjoyment-related Self-Efficacy, suggesting that

individuals reporting sexual dysfunction tend to feel incapable of creating sexually pleasurable experiences. Also, the differences on the state scales between sexual function groups tended to be more pronounced than those on the trait scales, suggesting that, overall, individuals reporting sexual dysfunction currently might tend to experience sex as pleasurable but experience decreased levels of sexual pleasure due to contextual reasons. Future research could uncover how to best foster Enjoyment-related Self-Efficacy and determine which capacities and contextual factors predict state sexual pleasure in order to inform tailored sexual pleasure interventions.

Conclusion

In this study, we presented the psychometric properties of the ASPI 1.0, an inclusive instrument that comprehensively assesses both trait and state aspects of sexual pleasure, and reported on evidence regarding its intended interpretation and use. By revising the original ASPI 0.1 and adhering to the conceptual framework proposed by Werner et al. (2023a), the ASPI considers sexual pleasure as a multifaceted concept from a state and trait conceptualization of pleasure. Sexually pleasurable experiences can be more than “merely” sensually pleasurable experiences, they can also encompass the experience of feeling validated, feeling confident and competent, feeling intimate and connected, and sharing pleasure joyfully. Furthermore, people differ not only in the level of sexual pleasure experienced recently but also their tendency to experience sexual pleasure. By offering insights into the diverse aspects of pleasurable sexual experiences, the ASPI might contribute to a more nuanced understanding of sexual function, health, and wellbeing, and guide future research in uncovering the individual and contextual factors that determine sexual pleasure. We hope the ASPI helps us to find out why some people find it easier than others to create pleasurable sexual experiences, and how different contextual factors enable some people to experience sexual pleasure while disadvantaging others.

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Contribution

Contributions to conception and design of the questionnaire: EL, MB, MW
Contributions to conception and design of the study: DD, FA, LB, MB, MW

Acquisition of data: LB, MB

Analysis and interpretation of data: DD, LB, MB, MW

Drafting the article or revising it critically for important intellectual content: DD, HJZ, LB, MB, MW, SGS

Final approval of the version to be published: DD, HJZ, LB, MB, MW, SGS

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