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SEXUAL HEALTH

The risks and benefits of technologised sexual practice scale: a quantitative measure of technology facilitated sex and intimacy

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ABSTRACT

Background. Technologies such as the Internet, smartphones, and sex toys have demonstrated the capacity to facilitate and enhance sexual and intimate practice by offering new ways to meet sexual partners, maintain and establish intimate connections, and providing access to sexual education and exposure to new ways of engaging in sex. They have also afforded novel risks to safety, privacy, and sexual autonomy. Understanding how people perceive and experience both the risks and benefits of using technology to facilitate sex and intimacy is important to understanding contemporary sexual practice, health, and pleasure. However, research in this space is currently hampered by a lack of quantitative measures to accurately and holistically assess both the risks and benefits in the context of technologised sexual practices. **Methods.** To facilitate a nuanced quantitative exploration of these concepts, we present the psychometric properties of the newly developed *Risks and Benefits of Technologised Sexual Practice Scale*. **Results.** Using an exploratory (Study 1, $n = 445$) and confirmatory factor analysis (Study 2, $n = 500$), this paper presents evidence for a 6-factor scale (Benefits (3): 'sexual gratification', 'connection', and 'access to information and culture'; Risks (3): 'concerns', 'worries', and 'knowledge of rights and ownership'). **Conclusion.** This scale may be used to contribute to research areas including sexual health, sexual behaviour, sexual education, online connection, online safety, and digital literacy with the aim to contribute to a sex- and technology-positive framework for understanding sexual health and pleasure.

Keywords: benefit, intimacy, online dating, risk, sexual practices, technology.

Introduction

As social and personal lives become increasingly mediated, moderated, and enabled by technological advancements, so too do sexual and intimate lives. Sex and intimate connection are no longer reliant on geographical proximity due to the rapid evolution and ubiquity of the Internet, smartphones, and personal computers. Advances in social media apps and live video chat enable sexual connection with people around the world, including between people who have never met offline, whilst digital connectivity affords fast, private access to pornography and the capacity to control sex toys from a distance.

The ever-evolving integration of technology and sex has seen a large body of research emerge exploring the social, health, legal, educational, and emotional consequences of technologised sexual practice, the majority of which focuses on the risks and harms of this practice).[1–4] However, there is a burgeoning body of research dedicated to understanding the capacity of various technologies to build intimacy and enhance sexual experiences.[5–9]

In this paper, we present a brief review of the existing literature exploring both the benefits and risks of technologised intimate practice and as well as a novel quantitative instrument for measuring adult's perceived benefits and risks of engaging with technology to facilitate sex and intimacy. We aim to contribute to the emerging body of research aiming to better understand the role of technology in contemporary sex lives, rather than reduce this to measuring negative outcomes, and present evidence for the utility of quantitatively studying the nuanced and complex outcomes of technologised sexual and intimate practice.

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Risks

Internet-enabled technologies such as mobile phones and personal computers have led to significant changes to modern practices of romantic, platonic, and familial intimacy, due to their capacity to facilitate remote communication and thus, connection.[10–12] However, these technologies have also provided novel avenues for risk and harm, a focus on which has dominated the research exploring the use of technology for sexual and intimate practice. The exchange of sexually explicit photos and videos ('sexting') is often framed as inherently dangerous[13] and increasing the risks of experiencing image-based sexual abuse (IBSA),[14] watching online pornography is frequently discussed in the context of poor mental health outcomes[15] and addiction,[16] and the use of dating apps is often presented in the context of rising rates of STIs[17] and physical violence towards women and gay and bisexual men.[18,19]

Sexting has arguably received the most attention. The majority of this research has utilised adolescent or young adult samples, citing the potential social and legal outcomes of creating or sharing images as spanning from being ostracised and 'slut-shamed'[20] to being charged with the production and dissemination of child pornography.[21] Another body of social and criminological research has dedicated focus to the legal complexities and psychosocial outcomes of IBSA.[14,22] IBSA refers to the non-consensual creation, sharing or distributing ('revenge porn'),[23,24] and threatening to share sexual or nude images of another person.[25,26] The consequences of IBSA include physical harm, mental and emotional distress, as well as a loss of privacy and sexual autonomy.[22,26]

Similarly, the accessibility of pornography via mobile phones and personal computers has sparked research interest in the potential risks of porn addiction, mental ill health, as well as harm to women based on the generalisation that it is misogynistic, representative of violent sex,[27] and lacks depictions of consent.[28] Beyond wellbeing, the accessibility of online pornography raises other ethical concerns relating to data privacy. The hacking and tracking of online pornography watch history presents threats to sensitive sexual data privacy and autonomy, the leaking of which can be tangibly harmful to the user.[29]

Benefits

Despite a focus on the risks and dangers of technologised sex, there is an expanding body of literature exploring the unique benefits technology may contribute to sexual intimacy, establishing and maintaining connection, and expressing sexuality and desire.[9] Various digital and biomechanical technologies, such as mobile phones and sex toys create unique opportunities for sexual expression, gratification, and autonomy, as well as intimate connection, and access to sexual education and exposure to diverse sexual cultures.

The Internet has afforded new and unique possibilities for sexual pleasure via instantaneous access to a wide range of sexually explicit material (SEM) and potential sexual and romantic opportunities via dating apps.[8,29] While, as described above, easy access to digital pornography has raised concerns about negative outcomes or addiction, viewing SEM has demonstrated the capacity to help people better understand their sexual identities and desires as well as provide access to new communities.[29,30] Despite the body of research suggesting that online pornography is misogynistic, degrades women, and is related to poor mental health, qualitative studies of women's experience with pornography suggest that is also related to feelings of validation for sexual preferences when exposed to depictions of these preferences, as well as for providing language for what is pleasurable and how to ask for it from a partner.[8] Exposure to different or previously unknown sexual cultures means that those who may feel alienated by their sexual preferences may feel validated by access to communities who share these interests.

Whilst ubiquitous technologies such as mobile phones and personal computers may be used to facilitate sexual gratification via access to SEM and intimate communication with a partner, there is an ever-expanding industry of biodigital technologies that have been specifically created for the purpose of sexual pleasure. The addition of WFi and Bluetooth technology to sex toys such as dildos, vibrators, and sleeves ('teledildonics') have increased the ways in which physical touch, sexual gratification, and intimacy may be enacted.[31]

Various technologies have also been shown to have facilitate feelings of sexual and intimate connectedness, in conjunction with or separate from physical pleasure. Connectedness is the drive to develop and continually participate in positive, lasting, and significant interpersonal relationships in order to cultivate a feeling of belonging.[32,33] The definition of connectedness is flexible in its capacity to fit cultural and temporal contexts, however, it is primarily used to describe face-to-face, physical interactions and leaves less space for those that are technologically mediated.[32] Research has focused primarily on the impact of biodigital technologies, particularly social media, instant messaging, and dating apps, on *social* connectedness, such as long distance friendships and transnational families.[11,33] Such tech is also able to facilitate communication between those in a pre-existing physical relationships and may also unite people who are unable to initiate or participate in physical intimate or sexual practices due to ability, discrimination or marginalisation (i.e. on the basis of gender, sexual orientation, race, socio-economic status, physical ability, kink/fetish) and may find online platforms more inclusive, accommodating, and safe.[11]

Beyond social connection, online communication methods such as text messaging have demonstrated the capacity to facilitate feelings of intimate connection. Text messaging between sexual or intimate partners is a private and autonomous method of communication and has been described as enriching relationships and facilitating feelings of closeness, honesty, and

emotional connection.[34,35] It can help people to have difficult or emotional conversations which some people may find hard to have face-to-face, including conversations about sexual health such as HIV status, birth control, and pregnancy.[36]

Beyond physical intimacy and sex, technology also provides access to sexual health and education information on social media platforms such as Instagram[37] and YouTube,[38] whilst message-board sites like Reddit[39,40] allow for people to explore and discuss sexual cultures and experiences that they may not have previously had access.[41,42] The accessibility of online sex and sexuality education is significant, particularly in circumstances in which a person may feel uncomfortable or unable to talk to potential educators such as parents, teachers, friends, or practitioners for fear of embarrassment, discrimination, or rejection. This is particularly important as previous research has indicated that young adults report school-based sex education to be inadequate and unaligned with their concerns and interests.[43]

Online platforms may also provide new possibilities for sexual experimentation as well as accessible options for those who may struggle or be unable to engage in physical sexual behaviour. Opportunities for experimentation can be crucial for those for whom engage in face-to-face sexual interests with others may be risky as well as providing opportunities for learning about pleasure and forming sexual identities. For lesbian, gay, bisexual, transgender, and queer communities, access to safe and inclusive online spaces can reduce feelings of loneliness and isolation and increase self-acceptance by providing supportive environments.[42]

Despite this body of research exploring the benefits of technologised sexual practice, there are few quantitative studies which have aimed to improve the understanding of the ways technology may contribute to building intimacy or enhancing sexual experiences. Most studies that have explored these concepts are qualitative in design.[8,44–48] This research contributes significantly to the development of a sex-positive framework for research about sexualised use of technology; however, there is a lack of research using both hypothesis driven and exploratory quantitative analysis to understand the nuanced ways in which people engage with technology to facilitate sex and intimacy as well as their positive and negative outcomes. Quantitative analysis of this phenomenon thus far has been a significant contributor to the risk-focused discourse with hypotheses commonly focused on addiction and negative mental health outcomes. As a result, there have been calls from researchers of quantitative social science to challenge this discourse, arguing the merit of operationalising constructs related to sexual and intimate practice.[44,49,50]

Introducing the Risks and Benefits of Technologised Sexual Practice Scale

As the market of technologies with the capacity to facilitate sex and intimacy continues to expand, so too do the opportunities to understand experiences inclusive of and beyond just a description of what these technologies may be, how often they are used, by whom, and for what kind of pleasure. It is also an opportunity to conceptualise the consequences of this mediated sexual practice, in terms of pleasure and risk. It is important to position technology users as active, autonomous actors in their mediated sexual behaviour, rather than as 'victims of deterministic media effects',[42] emphasising that individuals have the capacity to consciously and discerningly engage with, interpret, create, and reject technology according to their needs.

When considering the social, cultural, legal, and policy implications of the rapid advancements in and adoption of technologies for the facilitation of sexual and intimate practice(s), it is important to understand the ways in which people use these technologies, as well as their perceptions and experiences of this use to develop a holistic understanding of the role of technology in peoples' sexual lives and contemporary sexual cultures. This demands an exploration of both the perceived benefits and risks of integrating technology into sexual and intimate practice.

There is no existing quantitative measure to date that aims to capture perceptions of the benefits and risks of technologised sexual and intimate behaviour. Using a quantitative measure means that the frequencies of experienced or perceived risks and benefits of technologised sex as well as their covariates can be understood in a way that is accessible and time efficient. Developing such a scale using a data-driven approach and based in classic testing theory is the major aim of this paper. We acknowledge that no single scale could measure all possible outcomes of technologised sexual and intimate practice. However, the literature review presented above inspired the development of the items in the current scale, reflecting of some of the affordances and harms commonly explored in research. The scale presented in this paper is a measure of the consequences related to the opportunities afforded by technology to facilitate access to sexual education and culture (i.e. through exposure to different experiences of sexual health and practice on online platforms), connection (i.e. via online communication platforms), and sexual gratification (i.e. through the exchange of sexually explicit content with others). For potential harms, we focused on concerns about social and legal harm (i.e. as a consequence of exchanging sexually explicit content), worries about data privacy, and personal understandings of the potential legal ramifications of exchanging sexually explicit content.

Overview of studies and predictions

The current study aims to contribute to the research exploring how technology has been incorporated into people's contemporary sex lives, including understanding what people perceive to be the risks and benefits. This paper presents the newly developed *Risks and Benefits of Technologised Sexual Practice Scale* (RBTSPS), including findings from an

Australian study exploring the factor structure and reliability of this new measure. The RBTSPS was created in response to the lack of quantitative research that holistically explores the perceived and experienced consequences of using various online technologies to facilitate sexual and intimate practice.

To develop this scale, we considered two broad conceptual components (i.e. benefits and risks) that are often described in the existing research exploring the use of technology for sexual and intimate practices such as sexting, accessing online pornography, and purchasing sex toys online. Each component was defined and broken down into three further sub-components, and based on a review of the literature and the shared expertise of the authors, we generated a pool of items that might capture these six areas of interest (these items were generated from concepts commonly found in the literature review, from speaking with our industry-based partners, and from the guild knowledge of the research team). The items were originally included in a broad survey (utilised in Study 1) exploring engagement with and attitudes towards the use of technology for sexual and intimate practice amongst Australian adults. These items were targeting the benefits and risks that were of interest to the research team, as well as reflecting those often presented in academic and media discourse. As no existing quantitative measure of these outcomes was available, they were constructed based on the research team's shared knowledge of item development and understanding of the outcomes that we aimed to explore in this research. Whilst it certainly does not cover all potential consequences, they constituted a measure of six key outcomes of interest.

More specifically, the benefits of technologised sexual practice comprise 'sexual gratification, connection', and 'access to sexual information and culture'. These constructs encapsulate the beneficial experiences sexualised technology use has been reported to contribute to in the existing literature, as described above. Then, the risks of technologised sexual practice comprise 'concerns (about sharing explicit content)', 'worries (about privacy)', and 'knowledge of rights and ownership'. These components are reflective of the risks related to the use of technology for sex and intimacy, which are frequently presented in this space.

In summary, the newly developed RBTSPS comprises six subscales (three focusing on risk and three focusing on benefit). Following the scale development process, the final measure contains 26 items that measure perceptions and experiences of the risks and benefits of technologised sexual and intimate practice. The psychometric properties of the RBTSPS were tested over two studies with two unique data sets using the following hypotheses:

H1: Factor structure hypotheses (Studies 1 and 2): it is predicted that in the exploratory factor analysis (EFA, Study 1), six interrelated yet distinct factors are predicted to emerge from the analysis of 26 items of the RBTSPS, which will be confirmed using confirmatory factor analysis (CFA, Study 2) – values of comparative fix index (CFI) >0.90 and root mean square error of approximation <0.80 (RMSEA[51]), and a standardised root mean residual <0.06 (SRMR).[52]

H2: Reliability hypotheses (Studies 1 and 2): it is predicted that internal consistency estimates for all subscales of the RBTSPS (and across both studies) from both studies will be above 0.70.[53]

Study 1

Materials and method

Ethics approval for this study was granted by the Human Research Ethics Committee of La Trobe University. A cross-sectional survey of adults (18 years and over) currently living in Australia was used to collect data via an online survey. The RBTSPS was developed for a larger study exploring Australian adults use, perceptions, and experiences of technology to facilitate sex and intimacy both prior to and after the lockdowns and travel restrictions implemented in Australia in March 2020 in response to the coronavirus disease 2019 (COVID-19) pandemic.

Measures

The RBTSPS comprises three subscales measuring benefits of technologised sexual practice and three subscales measuring risk. All responses to the benefits subscales were measured on Likert-type scales. Responses to the concerns risk subscale were measured on a 4-point scale, ranging from 1 (*not at all concerned*) to 4 (*very concerned*), the worries subscale was measured using a 4-point scale from 0 to 3 (*not applicable, agree, disagree, don't know,* respectively), and the knowledge of rights and ownership scale was measured on a 6-point scale from 0 to 5 (*not applicable, strongly agree, agree, disagree, strongly disagree, don't know*, respectively). A full list of the items for each subscale is in Table 1. It is worth noting that the subscales use a range of different response methods. For instance, some of the risk-based subscales necessitated the use of a 'not applicable' option, which was not relevant for the other subscales. In addition, there is a different amount of response options for different subscales (so that the available response options best matched the question being asked). This decision means that the factor scores of the subscales cannot be compared without standardisation (although, we note that between-subscale comparisons at the descriptive level was never an intended use of the measure).

Factor scores for each subscale were established by averaging the item responses for each participant. 'Not applicable' responses were coded as missing data. All subscales had acceptable estimates of internal reliability ($\alpha_s > 0.711$).

Participants and procedure

Participants were recruited via Facebook advertising between May and July 2020. Participants were directed from the

Table 1. Items contained within each of the subscales of the RBTSPS.

Subscale	Item #	Items
Benefits		
Sexual gratification	SG1	I find it sexually gratifying or exciting to share explicit text messages with someone I have met online
	SG3	I find it sexually gratifying or exciting to receive erotic or sexual images from someone I have met online
	SG2	I find it sexually gratifying or exciting to share erotic or sexual images of myself with someone I have met online
	SG4	I find it sexually gratifying or exciting to have sex online via a webcam with another person(s)
Connection	Co4	I feel emotionally connected to my partner(s) because of our online communication
	Co2	Connecting with someone online helps me to develop a closer connection with them
	Co1	I feel as emotionally connected with someone when communicating online as I do in 'real life'
	Co5	I feel more sexually connected to my partner(s) because of our online communication
	Co3	I feel that I can be more honest with someone online than in person
Access to information and culture	A2	Information I have found online has helped me feel more comfortable about sex
	A5	The Internet has enabled me to explore sexual cultures I did not have access to previously
	A6	Thanks to the Internet, I have tried new things in my sex life
	A1	I have used the Internet to find information about sex that has improved my sexual experiences
Risks		
Concerns (about sharing explicit content)	C2	Sharing sexually explicit or naked images or videos with someone could cause me embarrassment
	C4	Sharing sexually explicit or naked images or videos with someone could cause me problems in the workplace
	C1	Sharing sexually explicit or naked images or videos with someone could cause me problems with friends or family
	C3	Sharing sexually explicit or naked images or videos with someone could cause me legal problems
Worries (about privacy)	W1	I worry that if I search for pornography online my search history will be seen by others
	W4	I worry that my friends or family will find out if I purchase sex toys online
	W3	I worry about giving my personal contact details to companies if I purchase sex toys online
	W2	I worry that my data will be hacked if I purchase sex products online
Knowledge of rights and ownership	K1	Sharing explicit or naked images or videos of myself online or via text means I no longer have control over where that images or video appears
	K2	Sharing explicit or naked images or videos of other people risks criminal prosecution
	K3	Sharing explicit or naked images or videos could potentially lead me to lose my job
	K4	Uploading sexually explicit or naked images or videos to a website means that website owns that image/video
	K5	Sharing explicit or naked images or videos of myself to a website means I have no right to ask for that image/video to be removed

SG, sexual gratification; A, access to sexual information and culture; C, concerns; Co, connection; K, knowledge of rights and ownership; W, worries.

advertisement to a survey hosted by Qualtrics. They first read an explanatory statement outlining the survey and indicated whether or not they consented to participate in the study. Those who consented were redirected to the survey in which they completed a set of questions relating to demographics, followed by a randomised presentation of items assessing sexualised technology use, and the benefits and risks of these practices. The sample consisted of 445 Australians (M_{age} = 41.71, s.d.. = 16.24; gender: men = 146, women = 252, non-binary/gender-fluid = 28, prefer not to specify = 5, other = 14; Sexuality: heterosexual = 256, bisexual = 60, gay/lesbian = 39, queer = 25, pansexual = 13, other terms = 28, and 24 responses were left blank).

Results and discussion

Exploratory factor analysis (EFA)

We assessed the normality of the data and several subscales were skewed. Given the non-normal distribution of the data, an EFA with a principal axis factoring method of extraction was conducted[54] using a promax (Kappa #4) rotation

method to allow the extracted factors to correlate.[55] Based on our *a priori* prediction that there would be six underlying factors, we fixed the number of factors to 6. Using a pairwise method of deletion, this analysis produced a scree plot and Eigenvalues (6.05, 3.92, 2.11, 1.80, 1.47, and 1.41, respectively; in combination these factors accounted for 64.46% of the variance). A parallel analysis ratified the statistical significance of these Eigenvalues, all of which were higher than the 95th percentile benchmark criterion Eigenvalues (criterion range: 1.46–1.23), based on 1000 permutations of parallel data from the raw data set. The pattern matrix loadings are presented in Table 2, and the item level descriptive data and zero-order correlations are in Table 3.

Bivariate correlation analysis

Factor scores were calculated to allow for an exploration of the relationships between the subscales of the new measure. Correlation coefficients for all relationships as well as means, standard deviations, and Cronbach's alphas of each factor are presented in Table 3. The three benefits factors were positively, moderately, and significantly related to each other ($r_s \geq 0.313$; $P_s \leq 0.01$). The relationships between the risk factors were all significant; 'worries and concerns' ($r = -0.239$, $P < 0.01$) and 'worry and knowledge of rights and ownership' were negatively correlated ($r = -0.145$, $P < 0.05$) and 'knowledge of rights and ownership' and 'concerns' were positively correlated ($r = -0.306$, $P < 0.01$). When examining the relationships between risk and benefit subscales, the only significant relationships were between 'sexual gratification' and 'concerns' ($r = -0.253$, $P < 0.01$), 'sexual gratification' and 'knowledge of rights and ownership' ($r = 0.176$, $P < 0.05$), and 'access to sexual information and culture' and 'knowledge of rights and ownership' ($r = 0.197$, $P < 0.01$).

Discussion

The data presented in Study 1 are initial evidence for the factor structure and reliability of the RBTSPS. These results support H1 as the EFA revealed the six underlying structures of the total scale, some of which are highly correlated, despite being statistically unique. The structure was ratified using a parallel analysis. Visual inspection of the items demonstrates that they all factored onto their hypothesised factors, suggesting the factors to also be conceptually unique. Study 1 also provides initial support for the reliability hypothesis (H2) as it provides evidence for the estimates of internal consistency for each of the scales (i.e. each factor demonstrated high internal consistency; $\alpha_s > 0.71$).

Study 2 is a confirmatory factor analysis of the factor structure established in Study 1, and will be used to confirm the structure of these factors and provide further evidence for the reliability of the RBTSPS.

Study 2

Materials and method

Ethics approval for this study was granted by the Human Research Ethics Committee at La Trobe University. A cross-sectional survey of adults (18 years and over) currently living in Australia was used to collect data via an online survey. The survey was distributed by the survey panel site Dynata (https://www.dynata.com) and participants could opt-in to the study by clicking on a link that led them to the questionnaire and were reimbursed for their time. Data were collected between October and November 2021.

Measures

The same RBTSPS measure was used in Study 2; however, minor changes were made to the scale. In this study, all items in all subscales were measured on a Likert-type scale from 0 (*not applicable to me*) to 5 (*strongly agree*). This change was made to facilitate usability for participants and interpretation in analysis. 'Not applicable' responses were coded as missing data. All subscales had acceptable estimates of internal reliability ($\alpha_s > 0.898$).

Participants and procedure

Participants were recruited through Dynata (a data recruitment platform) between October and November 2021. Participants were directed from the advertisement to a survey hosted by RedCap.com. They first read an explanatory statement outlining the survey and provided consent to participate in the study. Those who consented were redirected to the survey in which they completed a set of questions relating to demographics, sexualised technology use, and the benefits and risks of this practice. The sample consisted of 500 Australian participants (M_{age} = 27.82, s.d.. = 6.12; Gender: men = 208, women = 282, non-binary/gender-fluid = 5, other = 1, four participants did not respond; Sexuality: heterosexual = 442, bisexual = 28, gay/lesbian = 19, pansexual = 1, queer = 1, other terms = 9).

Confirmatory factor analysis (CFA)

This data set was used to conduct a CFA and develop an index of the data's fit to the model of five separate dimensions, using Jamovi (ver. 2.3; The Jamovi Project, 2022). The model showed an adequate fit to the data, $\chi^2(284) = 1101.00$ $P < 0.001$; CFI = 0.939; TLI = 0.930, RMSEA = 0.077 (90% CI, 0.073–0.082; SRMR = 0.037). All the items loaded onto the expected factors ($\beta_s > 0.81$, $P_s < 0.001$; see Table 2 for standardised factor loadings).

Bivariate correlation analysis

As in Study 1, factor scales were calculated to analyse the relationship between each of the subscales. All benefits subscales were interrelated positively and strongly with

Table 2. Pattern matrix loadings (EFA, Study 1) and standardised item loadings (CFA, Study 2) for items in the RBTSPS.

#	Item	Exploratory factor analysis (EFA)						Confirmatory factor analysis (CFA)
		Factor 1 SG	Factor 2 C	Factor 3 Co	Factor 4 A	Factor 5 W	Factor 6 K	Stand. item loadings
Sexual gratification								
SG1	Share explicit messages	**0.895**	0.055	0.002	0.046	0.015	−0.004	0.920
SG3	Receive images	**0.886**	0.002	0.027	−0.008	−0.09	−0.039	0.930
SG2	Share erotic images	**0.885**	−0.042	−0.021	−0.013	0.055	0.087	0.939
SG4	Webcam	**0.732**	−0.048	−0.044	−0.067	0.026	0.060	0.830
Concerns (about sharing explicit content)								
C4	Could cause me problems in the workplace	0.053	**0.900**	−0.035	0.027	−0.134	−0.039	0.909
C1	Could cause problems with family and friends	0.000	**0.805**	0.042	−0.113	0.162	0.119	0.950
C3	Could cause legal problems	−0.052	**0.787**	0.021	−0.008	−0.015	0.048	0.909
C2	Could cause embarrassment	−0.051	**0.773**	0.004	0.086	0.017	−0.005	0.911
Connection								
Co2	Closer	−0.039	0.082	**0.929**	−0.046	−0.041	−0.071	0.869
Co1	As emotionally connected to someone online as in person	−0.073	0.055	**0.658**	−0.078	−0.056	0.048	0.862
Co5	Sexually connected	0.125	−0.040	**0.615**	0.029	0.050	−0.019	0.874
Co4	Emotionally connected to partner (due to online communication)	0.065	−0.012	**0.590**	0.086	0.025	−0.015	0.806
Co3	Honest	−0.082	−0.103	**0.463**	0.072	0.099	0.053	0.842
Access								
A1	Info online improves sexual experience	−0.032	0.019	−0.081	**0.940**	−0.016	0.000	0.895
A2	Info online makes me more comfortable about sex	−0.059	0.042	−0.018	**0.885**	0.040	0.063	0.814
A5	The internet has enabled me to explore new sexual cultures	0.027	−0.027	0.076	**0.598**	0.053	−0.001	0.845
A6	Tried new things in sex life	0.078	−0.067	0.240	**0.521**	−0.061	−0.043	0.895
Worries (about privacy)								
W3	Worry personal sharing contact details online	−0.115	−0.053	−0.017	−0.003	**0.846**	0.095	0.921
W4	Worry about purchasing sex toys online	0.065	0.015	0.017	0.072	**0.763**	0.102	0.841
W2	Worry about data hacking	−0.011	−0.006	0.006	−0.049	**0.588**	−0.223	0.905
W1	Worry about online porn use	0.085	0.054	0.034	−0.002	**0.487**	−0.149	0.765
Knowledge of rights and ownership								
K4	Uploading sexually explicit images/videos means that website owns that image/video	−0.041	0.088	0.054	−0.017	0.008	**0.728**	0.898
K1	Sharing explicit mages/videos means I no longer control where it appears	0.128	−0.019	0.018	−0.017	0.069	**0.595**	0.869
K3	Sharing explicit or naked images or videos could potentially lead me to lose my job	−0.091	−0.270	0.097	−0.059	−0.122	**0.493**	0.881
K5	Sharing explicit images/videos to a website means I lose rights to removal requests	0.022	0.063	−0.063	0.107	−0.080	**0.484**	0.864
K2	Sharing explicit or naked images or videos of other people risks criminal prosecution	0.081	0.044	−0.067	0.022	0.058	**0.427**	0.895

Acceptable factor loadings (i.e. <0.4, and that do not cross-load onto other factors[56]) are presented in boldface. CFA (Study 2) loadings are based on an analysis of only the items in the final scale.
SG, sexual gratification; A, access to sexual information and culture; C, concerns; Co, connection; K, knowledge of rights and ownership; W, worries.

each other ($r_s > 0.641$, $P_s < 0.01$), as were all of the risks subscale ($r_s > 0.513$, $P_s < 0.01$).

All relationships between the benefits and risks subscales were positive and significant. Each factor demonstrated

Table 3. Factor-level bivariate correlation coefficients, estimates of internal consistency, and descriptive data (means, s.d.) for items in the risk and benefits of technologised sexual practice scale in Study 1 ($n = 445$) and Study 2 ($n = 500$).

Factor	Correlation coefficients[A]						Descriptive data (Study 1)			Descriptive data (Study 2)		
	1	2	3	4	5	6	*M*	s.d.	*α*	*M*	s.d.	*α*
1. Sexual gratification	–	0.690**	0.641**	0.280**	0.365**	0.307**	2.77	1.18	0.909	3.77	1.95	0.921
2. Connection	0.313**	–	0.673**	0.401**	0.473**	0.434**	2.93	0.91	0.785	3.96	1.08	0.909
3. Access	0.363**	0.419**	–	0.454**	0.345**	0.508**	3.50	0.91	0.849	4.15	1.09	0.898
4. Concerns	−0.253**	−0.073	−0.064	–	0.590**	0.708**	2.58	0.97	0.881	4.52	1.14	0.918
5. Worries	−0.149*	−0.042	−0.105	0.342**	–	0.513**	1.71	0.44	0.795	4.01	1.15	0.901
6. Knowledge of rights and ownership	0.176*	0.078	0.197**	−0.306**	−0.304	–	1.84	0.60	0.711	4.37	1.08	0.899

*$P < 0.05$, **$P < 0.01$.
[A]Coefficients for Study 1 presented below the diagonal, coefficients for Study 2 presented above the diagonal.

high internal consistency ($\alpha_s > 0.89$). Correlation coefficients for all relationships as well as means, standard deviations, and Cronbach's alphas of each factor are in Table 3.

Discussion

The results of Study 2 confirmed the factors of the RBTSPS established by the EFA and provided further evidence for the reliability of the scale. This result replicates the findings of Study 1, and completely supports the factor structure (H1) and reliability of the measure (H2).

General discussion

The findings of this paper present evidence for the 6-factor structure of the RBTSPS, with each subscale yielding good reliability estimates (supporting H1 and H2, respectively). By developing the RBTSPS, we argue that both the positive and negative experiences and perceptions of technologised sexual practice can be studied quantitively; in a way that is sex-positive and challenges the existing risk-centric quantitative research that inherently problematises digitally mediated sex. The items constituting the six subscales of this scale were developed by considering the existing literature of the concerns, worries, and legalities relating to the use of technology for sexual practice, as well as the opportunities for sexual gratification, connection, and access to education and culture. The results of this paper provide preliminary evidence for the utility of using survey instruments for understanding these constructs.

Interestingly, the results from the bi-variate correlation analyses in Study 1 and Study 2 revealed two distinct pattern of results. For Study 1, 'concerns (about sharing explicit content)' was negatively associated with all benefits subscales; suggesting that as agreement with 'concerns' increased, perceptions of each benefit decreased, and vice versa. This pattern was not replicated in Study 2, with 'concerns' positively associated with the benefit subscales. This was unexpected; however, these findings may highlight the complexity of the potential outcomes of technologised sexual practice; a body of research has emphasised that for engaging in sexual practice, the consequences of risk and pleasure are not mutually exclusive. Engaging with technology to facilitate sexual and intimate practice may facilitate access to sexual education and culture, connection, and pleasure, despite, or even because of, their concerns about sharing sexually explicit content. The difference in results may suggest that this is more true of the sample in Study 2. It may also be informed by the time in which the studies were conducted; Study 1 occurred during the beginning of the COVID-19 pandemic and subsequent lockdowns in Australia in 2020, and Study 2 was conducted in late 2022. The results from Study 1 may be reflective of the heightened collective anxiety of the beginning of the pandemic, as thus the benefits of sex were less accessible and the potential for online harm was more prevalent due to the reliance on technology during this time. As compared to the sample of Study 2, who may have been more adjusted to the pandemic. However, it likely demonstrates the inability to neatly categorise perceptions of technologised sexual practice as either beneficial or risky, but rather as outcomes that may inform each other or exist on a continuum.

Technology continues to augment sexual and intimate practice by creating, enhancing, and mediating both existing and emerging ways of connecting with others. Existing scholarship on technology's impact on sexuality has predominantly concentrated on its risks and negative outcomes.[14–16,42] Nevertheless, there is a growing body of research that explores how technology can enhance sexual pleasure and autonomy in a way that is sex-positive and technology-positive.[6,8,9,31] However, this research underscores the scarcity of quantitative studies in this space and emphasises the necessity for systematic, exploratory, and hypothesis-driven research to comprehend technology's role in sexual experiences and cultures.

Limitations, implications, and future directions

Sexual and intimate practice is a sensitive topic; thus, some participants may have felt too uncomfortable to report their engagement in particular behaviours or experiences, particularly those that may be considered to be harmful or shameful. Despite the anonymous nature of the studies, the results may have been influenced by social desirability bias (i.e. an under-reporting of socially sensitive content).

As stated in the introduction, most research exploring the benefits and risks of technologised sex have come from qualitative designs. Qualitative data means that participants can provide rich descriptions of and context to their responses, which is a frequent critique of quantitative research designs. However, these two research methods do not have to exist separately. The RBTSPS aims to provide social science researchers with a measure that can elucidate data from large, representative samples of experiences and perceptions of the positive and negative outcomes of technologised sexual practice.

Although the items created for this scale could not possibly encapsulate the seemingly infinite perceptions of the risks and benefits of the use of technology to facilitate sex, responses to the existing items are the first of their kind that may allow insight into these perceptions. For example, there are no items measuring perceptions of how participants may perceive technology as harmful to their sexual and mental health, and increase physical violence despite their substantial academic and media attention. We instead focused on the potential harmful consequences of sharing sexually explicit content, worries about privacy, and their knowledge of rights and ownership of explicit content of themselves, as these outcomes were pertinent to our broader project. The risk outcomes were also limited to three in the interest of brevity and reduction of the likelihood of participant dropout when responding to items targeting socially sensitive topics. We encourage future research to develop additional scales to measure other potential harms, and benefits, of technologised sexual practice that are not captured by the RBTSPS.

While the two samples are adequate in size to test the predictions of this paper (n_s = 445 and 500), it is worth noting that they are neither stratified nor representative of the general population, thus impacting the generalisability of these findings. Researchers using these scales may wish to consider validating the measure in their samples of interest before use. In addition, we note that there are some differences between the demographic profiles of the two data sets, including variations in age, gender, and sexuality. While these differences are coincidental, the underlying factor structure of our new measure remains the same for each sample. This provides some preliminary evidence of the external validity, and potential for generalisability, for the measure and its subscales.

The scale may also be used in mixed methods studies or as supplementary data when conducting qualitative analyses, and may be used in range of study areas including sexual health, sexual behaviour, sexual education, online connection, online safety, and digital literacy. For instance, quantified risk and benefit scores could be used to predict relevant behaviours, or to create profiles of people who differently perceive technologised sex outcomes. It may be used to understand specific online sexual behaviours, existent and emerging technologies, and the perception of their risks and benefits, in a way that challenges and disrupts the research that aims to problematise or pathologise the use of technology for sex and intimacy.

Conclusion

In developing the RBTSPS, we aimed to provide a way to quantitatively explore the perceptions and experiences of both the benefits and risks of using technology for sex and intimacy. Quantitative research is a time efficient, cost-effective method of data collection, with survey designs that are representative of and accessible to both unique communities as well as national and international samples.[57]

Taken together, an acceptance of the sexual risk/harm paradigm in which technologised sex is attributed innate danger, is insufficient to encapsulate the seemingly infinite and ever-expanding array of sexual and intimate practices facilitated by modern technologies. Whilst the significant harm, distress, and abuse that has the potential to occur via such technologies is not to be understated, the development of this scale aims to shift the discourse of technology facilitated sex from that of inherent danger and risk to one that understands, embraces, and respects the capacity for technologies to establish and enhance sexual pleasure.

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