CREATION, STANDARDIZATION AND SCIENTIFIC VALIDATION OF THE DIGITAL APPLICATION S-ONapp FOR THE ASSESSMENT AND TESTING OF SEXUAL DYSFUNCTIONS

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Abstract

Objective: **To create, standardize and scientifically validate the S-ONapp digital application for mobile phone users in order to diagnose sexual dysfunctions.**

Methods: **200 men and 200 women from the USA, Canada, Asia and Europe with sexual dysfunction accessed the S-ONapp application through the Google Play platform, following advertisements on social networks.**

Results: **Data indicates high fidelity on Cronbach`s Alpha for each scale of the application and high test retest reliability. Significant correlations were obtained after reporting/linking the S-ONapp digital application to another similar digital tool, such as Sexual-DSMapp Application, indicating a high structural validity.**

Conclusions: **The results obtained indicate that the S-ONapp application, through the two tools for assessing and testing sexual dysfunctions, has clinical robustness in diagnosing sexual dysfunctions.**

Key words: S-ONapp, mobile application, testing, evaluation, sexual dysfunction.

INTRODUCTION

S-ONapp is a new assessment and testing option in diagnosing sexual dysfunction via electronic modules, using a smartphone application[1]. The app is the reconstruction of a clinical testing session, initially standardised and validated in a format in which the client actively interacts with the digital material using his or her electronic device, without the physical presence of a specialist[2,3,4].

The existing digital apps for the assessment and testing of sexual dysfunction available in *Google Play* and *App Store* mainly target sexual education, testing sexual compatibility, sex-therapy coaching, as well as providing information on sex[5]. This niche requires the development of standardised apps for the assessment and testing of sexual dysfunction, in order to lead both client and clinician to a correct specialised diagnosis and subsequently to treatment after the evaluation[6,7].

This study proposes the creation, standardisation and scientific validation of the *Clinical Screening* as well as the *Sexual Stimulus Preference Questionnaire*, both instruments being part of the same app system, S-ONapp.

MATERIALS AND METHODS

The S-ONapp Clinical Screening includes six clinical assessment and testing scales: assessment of medical conditions, assessment of psychological conditions, assessment of maladaptive sexual style, assessment of couple issues, assessment of male sexual dysfunctions (ejaculation disorders, erectile dysfunction, sexual desire disorder and male dyspareunia) and assessment of female sexual dysfunctions (sexual desire disorder, arousal disorder, orgasm disorder and female sexual pain disorders).

The *S-ONapp Sexual Stimulus Preference Questionnaire* has three scales: assessment of arousal (stimulatory) preferences, assessment of attraction (pleasure) preferences and assessment of relaxation (relief) preferences.

The assessment and testing instruments are under licence and hosted by Google Commerce Ltd in the Google Play system and the APP Store of the Apple service, which consists of an online app store for the iOS and Android operating systems. The instrument can be downloaded on both operating systems from the following link: https://play.google.com/store/apps/details?id=com.sonegid.son&fbclid=IwAR1E9g36NbzIFgfuP2u7ph7bhi6tUX3ca1ioaZBNdyiK77l264-zrtt6DJE

Procedure

In the creation of the two digital tests in S-ON*app,* we began from the definition of the clinical population suffering from sexual dysfunction, after which items were proposed and formulated for the two instruments, participation instructions were described for test application, and a pilot test was created in order to be able to analyse item comprehension on the part of the participants.

Experts in linguistics, psychiatrists, clinical psychologists, gynaecologists, urologists and psychotherapists took part in generating the items. When the content of the two instruments was finalised and approved by the experts, the digital implementation phase began. This involved IT experts in the fields of graphic design, in order to facilitate the work of the testing participants.

In order to create and standardise the two digital clinical tests, the item bank was used[8], the implementation of the app for the assessment and testing of sexual dysfunction was proposed, and testing content was introduced in order to complete the app creation and implementation phase.

Participants

The participant selection procedure was non-probabilistic and performed online, based on convenience, by posting an advertisement on social media platforms, on the websites of sexual health service providers (www.sexology.ro) and by following the participation link in Google Play (https://play.google.com/store/apps/details?id=com.sonegid.son&fbclid=IwAR1E9g36NbzI FgfuP2u7ph7bhi6tUX3ca1ioaZBNdyiK77l264-zrtt6DJE) between February 28 and March 30, 2022.

200 men and 200 women were included in the study, as they all met the eligibility criteria, which were: having a sexual dysfunction diagnosis, being over 18 years of age, having completed secondary or tertiary education, having begun their sexual life before the study and not being diagnosed with mental and/or personality disorders or other neurodevelopmental issues or neurocognitive disorders. The male participants presented the following disorders: erectile dysfunction (24%), diminished sexual drive (12%) and ejaculation disorder (12%). The female participants presented the following disorders: diminished sexual drive (12%), orgasm disorder (26%) and dyspareunia (8%).

Ethical aspects

The eligible participants gave their consent electronically, in the online consent form regarding the research objective and their participation to the testing session, as well as regarding certain aspects of EU Regulation (UE) 2016/679 on the protection of natural persons with regard to personal data processing and the free circulation of such data, and with regard to the abrogation of Law no. 506/2004 on personal data processing and private life protection, as well as with regard to the research team's

obligation to manage personal data safely and solely for the specified purposes. The data required were: email address (optional), sociodemographic data and subjective answers to questionnaires.

Statistics

Data analysis was performed using the SPSS software, version 26 (IBM Corp) with a significance threshold of 0.05. For the purpose of establishing sample size and research power estimation (0.90), Gpower 3.1. (Franz Faul, Kiel University, Germany) was used, having as parameters F tests/ANOVA. The equality of variance was verified with (Bartlett's Test of Sphericity and the Sampling Adequacy with the Kaiser-Meyer-Olkin test.

RESULTS

The app standardisation process, including the two instruments, *S-ONapp Clinical Screening* and *S-ONapp Sexual Stimulus Preference Questionnaire*, involved an analysis of the Inter-Item correlation matrix, for the purpose of identifying and implicitly removing redundant items; the most significant items measuring the targeted constructs were retained. Correlation values fell between 0.61 and 0.80.

Reliability analysis

The scores of Cronbach`s Alpha coefficients (Table 1) ranged between 0.86 and 0.97, indicating high internal consistency for the *S-ONapp Clinical Screening* and *S-ONapp Sexual Stimulus Preference Questionnaire* respectively. At the same time, the correlation coefficients obtained using the test-retest method ranged between 0.84 and 0.91, indicating high test–retest reliability.

The interscale correlation scores for S-ON*app* Clinical Screening and S-ON*app* Sexual stimulus preferences questionnaire indicated that all the variables were highly correlated, suggesting high levels of fidelity (Table 2). The correlation coefficients obtained ranged between 0.764 and 0.967 for the S-ON*app* Clinical Screening scales and between 0.798 and 0.853 for the S-ON*app* Sexual stimulus preferences questionnaire. These results suggest the items' strong internal validity.

Structural validity for *S-ONapp Clinical Screening* and *S-ONapp Sexual stimulus preferences questionnaire*

The Exploratory Factor Analysis was performed, using a principal component analysis and varimax rotation. Validity analysis was performed starting from Bartlett's Test of Sphericity (Table 3), used to verify the homoscedasticity. The Chi-Square value obtained for the *S-ONapp Clinical Screening* was 7341.924 with a p≤0.001 and for *S-ONapp Sexual stimulus preferences questionnaire* the Chi-Square value was 2013.082, with p≤0.001, meaning that all the random variables have the same finite

Table 1. Reliability values for S-ON*app* Clinical Screening and S-ON*app* Sexual stimulus preferences questionnaire

Screening Scale	Cronbach`s Alpha Internal Reliability	Test – retest reliability (r Pearson)	No. of items
S-ON*app* Medical	.89	.92	7
S-ON*app* Thinking/beliefs and behaviour	.95	.84	7
S-ON*app* Psychiatric disorders	.91	.78	5
S-ON*app* Couple problems	.95	.83	6
S-ON*app* Female sexual dysfunction	.98	.95	4
S-ON*app* Male sexual dysfunction	.97	.82	5
S-ON*app* Sexual stimulus preferences questionnaire – arousal preferences (stimulation)	.86	.89	9
S-ON*app* Sexual stimulus preferences questionnaire – attraction preferences (pleasure)	.90	0.91	10
S-ON*app* Sexual stimulus preferences questionnaire – preferences for relaxation	.88	0.90	9

Table 2. Interscale correlation scores for S-ONapp Clinical Screening and S-ONapp Sexual stimulus preferences questionnaire

		S-ONapp Clinical Screening.						S-ONapp Sexual stimulus preferences questionnaire		
		(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)
S-ONapp Clinical Screening.	(1) Medical	.1.00	.967	.956	.764	.865	.840			
	(2) Thinking/beliefs and behaviour	.967	1.00	.878	.895	.786	.772			
	(3) Psychiatric disorders	.956	.878	1.00	.894	.915	.932			
	(4) Couple problems	.764	.895	.894	1.00	.964	.941			
	(5) Female sexual dysfunction	.865	.786	.915	.964	1.00	.867			
	(6) Male sexual dysfunction	.840	.772	.932	.941	.867	1.00			
S-ONapp Sexual stimulus preferences questionnaire	(1) arousal preferences (stimulation)							1.00	.853	.798
	(2) attraction preferences (pleasure)							.853	1.00	.794
	(3) preferences for relaxation							.798	.794	1.00

Table 3. KMO and Bartlett's Test for the S-ONapp clinical Screening and S-ON*app* Sexual stimulus preferences questionnaire

S-ONapp Clinical Screening			*S-ONapp Sexual stimulus preferences questionnaire*
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.829**	.887
Bartlett's Test of Sphericity	Approx. Chi-Square	**7341.924**	**2013.082**
	Df	150	167
	Sig.	**.000**	**.000**

variance. The Kaiser-Meyer-Olkin (KMO) test (measure of Sampling Adequacy) (Table 3) was also performed. This test was conducted in order to investigate the strength of the partial correlations between the examined variables, highlighting how factors explain each other. The KMO value for *S-ONapp Clinical Screening* was 0.829 and 0.887, which can be considered an excellent result. The results indicate the appropriateness of data for the exploratory factor analysis.

Analysis of the communalities indicates high values, between 0.591 and 0.891, for both instruments. These data highlight the amount of variance shared by each variable with all the other variables.

The factor analysis confirmed the six-dimensional structure of the *S-ONapp Clinical Screening*. The six highlighted factors of the clinical Screening explain a total of 86% of the variance among the analysed items. The Eigenvalues are between 4.3 and 2.4. The factors obtained represent the scales of the Clinical Screening, as follows: (F1) Clinical with 7 items, (F2) Thinking and behaviour with 7 items, (F3) psychological disorders with 5 items, (F4) Couple problems with 6 items, (F5) Female sexual dysfunctions with 4 items and

(F6) Male sexual dysfunctions with 5 items. The rotated component matrix includes coefficients between 0.719 and 0.895 for each item related to the factors obtained.

Similar factor analysis was also conducted for the *Sexual stimulus preferences questionnaire,* confirming the three-dimensional structure. The three factors explain 89% of the variance among the items. The factors obtained represent the scales included in the *Sexual stimulus preferences questionnaire.* The Eigenvalues fell between 3.1 and 1.9. Thus, the factors obtained are as follows: (F1) Arousal preferences (stimulation) with 9 items, (F2) Attraction preferences (pleasure) with 10 items and (F3) Relaxation preferences (relief) with 9 items. The rotated component matrix includes coefficients between 0.691 and 0.859 for each item related to the factors obtained.

The S-ON*app* Clinical Screening and S-ON*app* Sexual stimulus preferences questionnaire were also compared with other similar questionnaires for each scale. High correlations, between 0.892 and 0.971, were found with other questionnaires, such as Sexual-DSM*app*, indicating a good theoretical-experimental foundation.

DISCUSSIONS

The *S-ONapp* clinical screening has six clinical assessment and testing scales which have been standardised and validated within the study: assessment of medical conditions, assessment of psychological conditions, assessment of maladaptive sexual style, assessment of couple issues, assessment of male sexual dysfunctions (ejaculation disorders, erectile dysfunction, sexual desire disorder and male dyspareunia) and assessment of female sexual dysfunctions (sexual desire disorder, arousal disorder, orgasm disorder and female sexual pain disorders). The *S-ONapp Sexual Stimulus Preference Questionnaire* has three scales: assessment of arousal (stimulatory) preferences, assessment of attraction (pleasure) preferences and assessment of relaxation (relief) preferences. This complex assessment method is more appropriate for all individuals wishing to undergo clinical assessment and testing with regard to their sexual life, couple relationship, as well as quality of sex life.

The results of the study indicate high internal validity for the app. Thus, the Cronbach's Alpha internal consistency coefficients obtained for *S-ONapp* clinical screening were high, placing between 0.89 and 0.95, while the test-retest correlation coefficient (test-retest reliability) was above 0.84. In the case of the *S-ONapp Sexual Stimulus Preference Questionnaire*, the Cronbach's Alpha fidelity coefficients obtained were high, ranging between 0.86 and 0.90 for all scales, while test-retest coefficients exceeded 0.89. Results indicate high values for correlation between variables, indicating high scale reliability for each questionnaire.

The S-ON*app* digital app was related to a similar digital instrument, the *Sexual-DSMapp Application[9]*. The correlation coefficients which resulted exceed 0.85, also indicating the high structural validity of this application. At the same time, the Kaiser-Meyer-Olkin test indicates high structural validity. The significance probability of the Bartlett spherical test indicates a good structural validity. Factorial analysis has confirmed the existence of the six factors pertaining to the S-ON*app* clinical screening scales, as well as of the three factors pertaining to the S-ON*app* Sexual Stimulus Preference Questionnaire.

CONCLUSION

The acute need for clinical assessment, screening and intervention services in sexual dysfunction, using a smartphone app[10], meant to reduce the cost of travelling to specialised clinics and time spent in waiting rooms, determines the need for the digitisation of specialised services[11] in the field of sex therapy, protecting patients by reducing user risks to a minimum[12]**.** Thus, the S-ON*app* application, through its psychodiagnostic attributes, especially in a pandemic context[13], has proven its usefulness and efficiency in optimising couples' sexual dynamics, as well as in preventing sexual disorders[14].

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Funding Information

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