

Validation of a scale to assess Facebook dependence

Eduardo Guedes¹, Mariana King Pádua¹, Hugo Kegler dos Santos², Douglas Rodrigues¹, Lucio Lage Gonçalves¹, Flávia Leite Guimarães¹, Antonio Egidio Nardi¹, Anna Lucia Spear King¹.

¹ Delete - Uso Consciente de Tecnologias, Instituto de Psiquiatria (IPUB), Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, Brasil.

² Departamento de Estatística-Instituto de Matemática e Estatística, Universidade Federal Fluminense (UFF), Rio de Janeiro, Brasil.

BACKGROUND INFORMATION: Facebook is a social network that has become part of the everyday life of contemporary humanity and is notably the most accessed digital tool, worldwide; through it, one can simultaneously relate to millions of people, as a source of information, communication or entertainment.

OBJECTIVE: To produce and validate a scale to evaluate Facebook dependence (FDS).

METHOD: Validation was performed in 5 phases: 1- initial scale construction with 20 questions, 2- expert evaluation, 3- application in 200 volunteers, 4- statistical analysis and results, and 5- elaboration of the final 18-question validated version of FDS.

RESULTS: We obtained a descriptive statistical analysis, a clear-cut separation of dependents vs. non-dependents and a successful factorial analysis. These results provided a validated version of FDS.

CONCLUSIONS: We were able to construct the validated final version of FDS with 18 questions appropriate to the clinical contexts and to be used in conducting research on Facebook dependence. This scale will contribute to future research related to this specific digital dependence, hopefully reducing harmful effects and improving quality of life.

KEYWORDS: digital dependence; human behavior; Facebook; social network.

Guedes E, Pádua MK, dos Santos HK, Rodrigues D, Gonçalves LL, Guimarães FL, Nardi AE, King ALS. Validation of Facebook Dependence Scale. MedicalExpress (São Paulo, online). 2019;6: mo19003

Received for Publication on Aug 3, 2018; First review on Aug 10, 2018; Accepted for publication on Sep 04, 2018; Online on Apr 17, 2019

E-mail: guedesdudu@gmail.com

INTRODUCTION

More than 2.2 billion humans are Facebook users, worldwide. Brazil has the world's 4th largest number of Facebook registrations, with India, USA and Indonesia in the lead.¹ More than 130 (out of 210) million Brazilians are active and frequent users; over 50% of them visit the site on a daily basis. Per se, this is sufficient evidence of the relevance of a tool capable of objective evaluation of Facebook dependence.

Social networks are contemporary communication tools; there are many benefits, but the damage caused by their abusive use must also be monitored.² Many abusive or dependent users report significant losses in their personal, professional, academic, social, and family lives.^{2,3}

Published reports⁴⁻⁷ correlate Facebook's dependence with reward and reward mechanisms. Some users have developed abusive relationships, stimulated by a false sense of satisfaction or as a way to feel better or more self-confident, with an increased level of arousal or flight. The word 'flight' is used throughout in its strict physiological sense, meaning evasion or escape from real or perceived danger.

There is a fine line between the limits of healthy satisfaction, as opposed to dependence on abusive use of social networks.⁸ Additionally, 'addiction' must be defined in a manner similar to its use in diagnostic manuals of mental disorders by the American Association of Psychiatry and World Health Organization.⁹ Previously conducted studies^{2,7,8} indicate a series of at least five typical dependence criteria that need be identified so that a person can be diagnosed as dependent.

DOI: 10.5935/MedicalExpress.2019.mo.003



Copyright © 2016 MEDICALEXPRESS. This is an open access article distributed under the terms of the creative commons attribution Non-Commercial License (creativecommons.org/licenses/by-nc/4.0/) which permits unrestricted non commercial use, distribution and reproduction in any medium, provided the original work is properly cited.

1. **Mood swings**, where the social network would be a means for the person to feel better or safer, with a higher threshold for arousal or flight. This stage is usually masked by a false sense of satisfaction experienced when navigating social networks.
2. **Self-relevance**, where the user cannot detach his thinking from social networks. Even when outside the network, he actually imagines circumstances of his past or future which should, or must be publicized; in this fashion, the tool begins to slowly assume command of his life.
3. **Tolerance**, which indicates the time devoted to the tool and the level of control it has over the user. In general, dependents typically spend ever increasing hours on the social networks, updating photos or posting comments, as a way to seek the same pleasurable sensations previously experienced with shorter periods of time. Without realizing, the dependent user is losing control of the situation and gradually, begins to replace real day-to-day programs with more time navigating.
4. **Abstinence** symptoms and its effects. In general, dependent users with no internet access become angry, anxious and fearful; this changes sleep or eating patterns and may even lead to signs of depression.
5. **Life conflicts**, when excessive use of social networks compromise real-life relationships with family, friends, fellow students and co-workers.¹¹ This is frequently the moment where the problem becomes self-evident. However, more often than not, dependent users feel unable to reduce or stop. This is the point of loss of control over behavior, which can compromise performance, educational, professional or other.

The purpose of this study is to generate and validate a specific scale to assess Facebook dependence (FDS)

■ MATERIALS AND METHODS

Scale construction and validation was carried out in 5 phases:

- (1) Compilation of 20 questions, by six experts, trained teachers in the area of digital dependence.¹¹ These questions were based on published studies,^{4,6} The concept was to cover the five elements outlined above: mood swings, self-relevance, tolerance, abstinence and real-life conflicts.
- (2) Critical evaluation and primary validation of the questions by six other specialists, who evaluated the content of the scale regarding presentation, clarity, pertinence and comprehension of the instrument.

- (3) Scale application to 200 volunteers, 100 abusive and daily Facebook users (Main Group) and 100 non-abusive users (Control Group).
- (4) Statistical analysis of data and results.
- (5) Adjustments based on the collected data and construction of the final validated version.

There is no specific recommendation to define the number of experts who should participate in the validation of a scale, which is left at the discretion of the researcher. More specialists generate greater disagreement, whereas a smaller the number (less than 3) leads to a serious risk of 100% agreement.

The original 20-question scale was offered to the volunteers with three answer options: never/rarely, 0 points; often, 1 point; always, 2 points. After having answered all the questions, volunteers were asked to add up their points and find their level of dependence: < 7 points, no dependence; 7-16 points, light; 17 to 26 points, moderate and > 27 points, severe.

We included Brazilian residents with any occupation, male and female, aged between 17 and 65 years, active Facebook users. We excluded illiterate persons or individuals with any mental impairment that prevented their participation.

To participate in the FDS validation study, volunteers were recruited from (i) the Delete Nucleus patients with a complaint of abusive, daily (for many hours) use of Facebook; (ii) their companions, (iii) students, employees and any others who agreed to participate. Recruitment was through posters at the institution, verbal communication and through the social networks.

As noted above, the scale was applied to 200 selected volunteers, divided into two groups: Main Group (n = 100) and Control group (n = 100). The Internet Addiction Test (IAT)¹² was used to divide them into a **Main Group**, with an IAT score ≥ 50 points and daily use (many hours) of Facebook, and a **Control Group** with IAT score < 50 points and less than daily use of Facebook.

We used 95 Main Group and 90 Control Group participants. Discarded results presented incomplete scales or gave up participating. Collected results were entered into a database for statistical analysis.

In the analysis of the results we used the R program, version 3.4.2¹³ and the “dplyr”,¹⁴ “psy”¹⁵ and “paran”¹⁶ packages. Observed data were considered significant when a $p < 0,001$ occurred.

■ RESULTS

The following are the results of the descriptive statistics, the tests of hypotheses of differences of means, and the factorial analysis

Descriptive Statistics. Table 1 shows the results of the descriptive statistics of the sample. For each characteristic, the absolute number of elements with the characteristic and the proportion within its group are displayed. Results confirm the random nature of the volunteer selection, although this was not a research objective of the project

Scores for the 20-question original scale. The Main Group scored (mean ± standard deviation) 11.8 ± 8.7 points, while the Control group scored 5.8 ± 5.7 points. Student's t-test yielded a t-statistic = 5.5, corresponding to a p < 0.001. This difference ratifies the presence of dependence in the Main Group and its absence in the Control Group.

Factor analysis. The Bartlett sphericity test was used to test correlation of the variables i.e. the questions)

with each other. In this test, the null hypothesis is that the correlation matrix is equal to the identity matrix. For the answered questionnaire data set, a statistic of 1807.3 was obtained leading to a p < 0.001; this implies that the covariance matrix is not equal to identity.

The Kaiser-Meyer-Olkin (KMO) criterion tested the adequacy of using the factor analysis. The value found was 0.875; values above 0.8 are considered satisfactory.

The results for the Bartlett test and the KMO allowed us to proceed to the factorial analysis for the questionnaire variables.

Factor loads were evaluated to determine the number of relevant factors. We used three criteria: Factorial Load, Screeplot and Parallel Analysis.

Table 1. Descriptive statistics of sample.

		Sex					
		Male				Female	
Controls		28 (31.1%)				62 (68.9%)	
Main		35 (36.8%)				60 (63.2%)	
		Age range					
		15-25	26-36	37-47	48-58	59-69	
Controls		29 (32.2%)	23 (25.6%)	11 (12.2%)	11 (12.2%)	16 (17.2%)	
Main		45 (47.4%)	23 (24.2%)	20 (21.1%)	5 (5.3%)	2 (2.1%)	
		Instruction levels					
		Middle	Superior	Graduate	Master	Doctoral	NI
Controls		21 (23.3%)	26 (28.9%)	37 (41.1%)	2 (2,2%)	3 (3.3%)	1 (1.1%)
Main		54 (56.8%)	26 (27.4%)	9 (9.5%)	5 (5.3%)	0 (0%)	1 (1.1%)

NI: not informed

Table 2. Factorial loads of the Principal Components (PC).

	PC1	PC2	PC3	PC4	PC5
Standard deviation	2.80	1.18	1.16	1.12	1.05
Proportion of variance	0.39	0.07	0.07	0.06	0.06
Cumulative proportion	0.39	0.46	0.53	0.59	0.65
	PC6	PC7	PC8	PC9	PC10
Standard deviation	0.05	0.04	0.03	0.03	0.03
Proportion of variance	0.05	0.04	0.03	0.03	0.03
Cumulative proportion	0.70	0.74	0.77	0.80	0.83
	PC11	PC12	PC13	PC14	PC15
Standard deviation	0.74	0.71	0.67	0.61	0.58
Proportion of variance	0.03	0.03	0.02	0.02	0.02
Cumulative proportion	0.86	0.89	0.91	0.93	0.94
	PC16	PC17	PC18	PC19	PC20
Standard deviation	0.56	0.50	0.48	0.43	0.39
Proportion of variance	0.02	0.01	0.01	0.01	0.01
Cumulative proportion	0.96	0.97	0.98	0.99	1.00

It is adequate to use Factorial loads with cumulative proportion above 0.9, and in worst case, above 0.8.^{14,16,17}

The second criterion is the Screeplot of the correlation matrix, where we eliminate factors related to Eigenvalues > 1. Figure 1 presents this criterion:

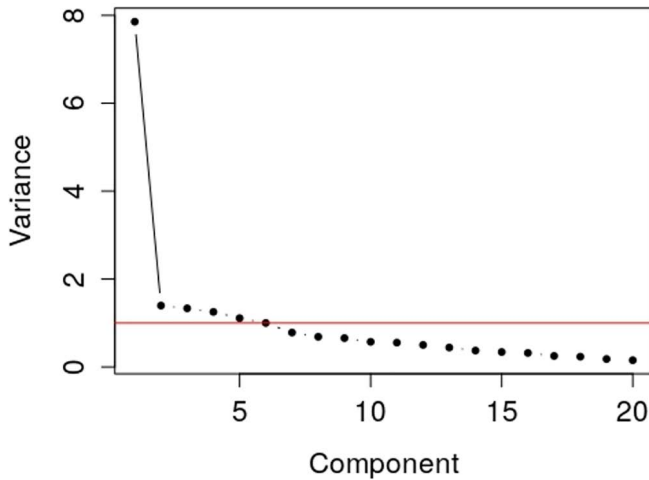


Figure 1 - Screeplot of components. Points above the red line present variances > 1; these are the relevant components.

By this criterion, we must use 5 factors, and in this case, the commonalities of the 20 variables (FDS(n) questions) are presented in the table 3:

Analyzing the commonalities, two questions (highlighted in bold) should be excluded because they present commonalities < 0.5. The deleted questions were: “How often do you believe everything posted on Facebook?” and “How often do you usually play on Facebook?”

The third usable criterion to determine the number of factors would be the Parallel Analysis. By this criterion, the number of factors found was equal to 1, which does not allow us to adequately verify the factorial loads. Parallel analysis was therefore left out.

Thus, after the three analyzes, we opted for the Screeplot result that points to 5 factors and to the withdrawal of 2 items from the scale.

The last step of the study was to calculate Cronbach’s alpha,¹⁸ in order to measure the internal consistency of

the questionnaire. The value found was 0.908, which is considered excellent.¹⁷ This means that the questions used for the scale are aligned with each other, qualifying it as positive to measure Facebook dependence.

DISCUSSION

The set of data obtained with the collection of volunteer questionnaire responses was satisfactory considering the number of items in the scale (initially with 20 items) and the number of valid questionnaires (185).

The internal consistency by Cronbach’s Alpha¹⁸ presented a value of 0.908, indicating the alignment of the questions and satisfactory levels of the structuring of the scale to measure Facebook dependence.

Factor analysis could be performed due to the appropriately low p value of the Bartlett sphericity test, indicating that there is a correlation between the variables, allowing the creation of the factors.

The KMO criterion confirmed the adequacy of the factorial analysis with 18 of the 20 items of the scale with values above 0.8, which is considered satisfactory.

By the criterion of the Parallel Analysis, the factor loads had a number of factors equal to 1 and could not be adequately verified. For this reason, we performed a more precise investigation through the Screeplot that indicated 5 factors leading to the withdrawal of 2 items from the original scale, because they displayed a communality of less than 0.5. The deleted questions were: “How often do you believe everything posted on Facebook?” and “How often do you usually play on Facebook?”

The exclusion of the two questions did not affect the validity of instrument, because the remaining issues effectively measure the dimensions of dependence; in this manner, the 18-question scale became more adequate to the objective of evaluating Facebook dependence.

Limitations of the study: (a) the execution of the project through an institution providing care at no cost may have introduced specific sociodemographic biases. (b) the lack of any similar instrument to allow us to make comparisons.

Future studies may perfect the original model, making it more accurate and effective.

Table 3. Communalities of items for 5 factors.

FDS1	FDS2	FDS3	FDS4	FDS5
0.754	0.795	0.744	0.580	0.736
FDS6	FDS7	FDS8	FDS9	FDS10
0.604	0.661	0.658	0.681	0.568
FDS11	FDS12	FDS13	FDS14	FDS15
0.458	0.688	0.703	0.757	0.760
FDS.16	FDS.17	FDS.18	FDS.19	FDS.20
0.630	0.300	0.599	0.645	0.630

■ CONCLUSION

Statistical results showed that the items in the final version of the scale presented alignment between them, qualifying it as adequate to measure Facebook dependence, now validated, with 18 items.

New research using the present scale will allow the expansion of its validity for the evaluation of dependence of Facebook users, in addition to allowing comparisons between the results of different research reports.

■ AUTHOR CONTRIBUTION:

E Guedes: reviewed the literature, applied the scales and wrote this article.

MK Padua: applied the scales, worked the database and wrote this article.

HK Santos: analyzed statistically and wrote this article.

D Rodrigues: analyzed statistically and wrote this article.

LL Gonçalves: wrote this article.

FL Guimarães: applied the scales, worked in the database, wrote this article.

AE Nardi: Co has guided and wrote this article.

ALS King: Guided, planned, applied scales, worked the database, wrote this article.

■ CONFLICT OF INTEREST

All authors declare no conflict of interest.

■ THANKS

This work was supported by: Carlos Chagas Filho Foundation for Research Support of the State of Rio de Janeiro (FAPERJ); Institute of Psychiatry (IPUB) of the Federal University of Rio de Janeiro (UFRJ); Delete - Conscious Use of Technologies.

■ REFERENCES

1. The Statistics Portal (2018). Retrieved June 02, 2018, from <http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>
2. King ALS, Nardi AE, Cardoso A (Organizers). *Nomofobia - Computer addiction, internet, social networks? Dependence on the cell phone? The impact of new technologies interfering with human behavior.* Publisher Atheneu, RJ, 2015.
3. King ALS, Guedes E, Nardi AE. *Digital Label.* Porto Alegre: EducaBooks, 2017.
4. King AL, Nardi AE. New technologies: use and abuse. In: Brazilian Association of Psychiatry; Nardi AE, Silva AG, Quevedo JL, organizers. PROPSIQ Update Program in Psychiatry: Cycle 3. Porto Alegre: Artmed / Panamericana; 2013. p. 9-27. (System of Continuing Medical Education at a Distance, v. 2).
5. King ALS, Padua MK, Guedes E, Nardi AE. *Digital Ergonomics.* Porto Alegre: EducaBooks, 2018.
6. King ALS, Valença AM, Silva AC, Sancassiani F, Machado S, Nardi AE. *Nomophobia: Impact of Cell Phone Use Interfering with Symptoms and Emotions of Individuals with Panic Disorder Compared with a Control Group.* Clin Pract Epidemiol Ment Health, 2014;10:28-35. DOI:10.2174/1745017901410010028
7. Nardi AE, Silva ACO, Valença AM, King ALS, Sardinha A, Martiny C, et al. *Panic Disorder Theory and Clinic.* 1a. ed. Porto Alegre: Artmed, 2012. v. 1. 202p.
8. King ALS, Valencia AM, Nardi AE. *Nomophobia: The Mobile Phone in Panic Disorder With Agoraphobia Reducing Phobias or Worsening of Dependence?* Cogn Behav Neurol. 2010;23(1):52-4. DOI:10.1097/WNN.0b013e3181b7eabc.
9. American Psychiatric Association DSM-IV-TR. *Diagnostic and Statistical Manual of Mental Disorders.* 5th edition, Artes Medicas, Porto Alegre, 2000.
10. Guedes E, Nardi AE, Guimarães FMC, Machado S, King ALS. *Social networking, a new online addiction: a review of Facebook and other addiction disorders.* Medical Express 2016, 3 (1): M 160101. DOI: 10.5935/MedicalExpress.2016.01.01.
11. Gonçalves LL. *Digital dependence: technologies transforming people, relationships and organizations.* Bar Books, Rio Janeiro, 2017.
12. IAT-The Center for Internet Addiction Recovery, Copyright 2009-2010 by The Center for Internet Addiction; Web Site Designed by Next Sunrise Studios, Bradford PA.
13. R Core Team (2017). *A: A language and environment for statistical computing.* R Foundation for Statistical Computing, Vienna, Austria. 2017. Retrieved from URL <https://www.R-project.org/>.
14. Wickham H, Francois R, Henry L, Müller K. *dplyr: A Grammar of Data Manipulation.* R package version 0.7.4. 2017. Retrieved from <https://CRAN.R-project.org/package=dplyr>
15. Bruno Falissard (2012). *psy: Various procedures used in psychometry.* R package version 1.1. 2017. Retrieved from <https://CRAN.R-project.org/package=psy>
16. Alexis Dinno (2012). *paran: Horn's Test of Principal Components / Factors.* R package version 1.5.1. <https://CRAN.R-project.org/package=paran>.
17. Hatzinger, R., Hornik, K., Nagel, H., & Maier, M.J. (2014). *A: Einführung durch angewandte Statistik (2nd ed.).* München: Pearson Studium.
18. Hair JF, Babin B, Money AH, Samouel P. *Métodos de Pesquisa em Administração.* Translation: Lene Belon Ribeiro. Porto Alegre: Bookman, 2005.

Annex 1- Validated final version:**Scale to assess Facebook Dependence (FDS)**

Date: ____ / ____ / ____ Age: _____

Name of Volunteer: _____

Gender: F () M ()

Works: Yes () No ()

Unemployed: Yes () No ()

Level of Instruction: () Middle () Upper () Graduate () Master () Doctoral

Signature of Volunteer: _____

Email: _____

Phone: . _____

Interviewer: _____

This test is a scale with 18 questions that measures mild, moderate and severe Facebook dependence levels.

Please enter the number corresponding to the answer next to the question, as follows:

a - Never/Rarely (0)

b - Frequently (1)

c - Always (2)

Questions:

How often do you use Facebook throughout your day?

How often do you feel the need to access Facebook?

How often do you feel anxious when you realize that you have no access to Facebook?

How often do you feel some kind of physical discomfort, such as chest tightness, a sore throat, palpitation, shortness of breath or dizziness when you realize that you have no access to Facebook?

How often are you afraid of not having access to Facebook?

How often do you feel rejected when no one "likes" or shares something you posted on Facebook?

How often do you feel devalued or unimportant when you see that your friends get more "likes" than you do on Facebook?

How often do you stop doing activities in real life like practicing physical exercises or other to stay in the virtual reality of Facebook?

How often do you usually post comments on Facebook?

How often do you usually post photos of yourself in various places or in various situations on Facebook?

How often do you check Facebook on your device when you are with friends or with your partner?

How often do you check Facebook when you are with your family?

How often do you invite people you know to be your friend on Facebook?

How often do you accept to be a "Friend" of people you do not know or invite people you do not know to be a "Friend" on Facebook?

How often do you need to post photos of your body on Facebook to stand out?

How often do you to improve your self-esteem put photos showing a reality a slightly different from your real life?

How often do you feel depressed when you see on Facebook that your friends have a more interesting lives than yours?

How often do you use Facebook to avoid the feeling of being alone?

Results:

Once you have answered all the questions, add up the numbers you selected for each answer to get a final score. The higher the score, the higher the dependency level of Facebook and related issues.

Use this scale to evaluate your score.

6 points or less: No signs of Facebook abuse; You are in full control over its use.

7 - 16 points: Mild - Possible light level of addiction to Facebook. You may have occasional problems due to a beginning of abusive use of Facebook in certain situations. You may have future impacts on your personal, social, family, professional or academic life by using Facebook more often than necessary. Be aware that abusive use of Facebook may eventually harm your life.

17 - 26 points: Moderate - Possible moderate level of addiction to Facebook. You begin to have frequent problems due to the abusive use of Facebook in several situations. You should consider and evaluate the impacts on your personal, social, family, professional, or academic life by using Facebook more strongly than recommended. You should try learn to deal with Facebook more consciously.

27 - 36 points: Severe - Facebook use is already causing significant problems in your life at a serious level. You must evaluate the consequences of these impacts that may already be causing physical and emotional losses in the personal, social, family, professional or academic areas, significantly impairing their quality of life. We recommend seeking guidance through professional help in specialized centers.