

Girassol: A Mobile App to Measure Levels of Nomophobia in Adolescents and Young People

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Received: 7 December 2019 Accepted: 3 January 2020 Published: 15 January 2020

Abstract

This article presents an application to measure levels of technological dependence in adolescents and young people. The first phase of this research consisted of a Systematic Literature Review (SLR) to collect data on the detection and risks of excessive and harmful use of digital technologies. The data collected in SLR became the base for interviews with 05 psychologists and a survey with 566 individuals between 12 and 21 years of age. Based on field research and the "Internet Addiction Test" (IAT), which was adapted for this public, the Girassol application was developed. The first validation with 05 health/education professionals and 07 adolescents/young people was 83.3

Index terms— technological dependence; mental health; mobile applications; teenagers; young

1 Introduction

research [4] presented Brazil as the fourth country with the largest number of internet users. The daily use of the internet causes family conflicts resulting from the lack of dialogue, in addition to leading to superficial relationships, learning difficulties and anxiety disorders [6]. In recent years, virtual relationships are not only present as a means of communication, but also as an alternative in the demands of work and as entertainment during leisure time. It is demonstrated that technological dependence is easily perceived among adolescents, who maintain frequent contact through messaging on social networks sent by cell phones or computers. Additionally, the advances in technology have made traditional toys obsolete, and hindered the development of synesthetic experiences [5].

Digital technologies are increasingly affecting society, culture and the interaction between individuals, both positively and negatively [2]. Although feelings of anxiety, dependence and loneliness have not been confirmed in social media users, adolescents are sensitive to social influence [3]. This influence can also occur in virtual social networks, even indirectly, as the opinion of others is also manifested through comments on posts, and conversations in online chat rooms. Among the impacts and risks to mental health are: anxiety, depression, nomophobia, bullying and cyber bullying.

Therefore, this research concerns the new needs of adolescents in a virtual environment, the emotional problems sometimes caused by its use, and possible mental disorders caused or accentuated by games and online chats that influence adolescents and young people in carrying out risky activities. The objective was to carry out a SLR and, based on the results, propose an application (app) to assist in the identification of psychological problems caused by the overuse of technology. The empirical basis for the artifact was a field research to survey the impacts of digital technologies on the mental health of adolescents and young people.

2 II.

3 Research Methodology

The research was exploratory in nature, with a mixed approach, considering that the data obtained is qualitative and quantitative.

Initially, a SLR was carried out where the keywords for the research were defined, and thus the strings were formulated. Ten databases were selected for the SLR, which were Google Scholar, Scielo, Bireme

44 / VHL, Pub Med, Science Direct, Repository of the Federal University of Uberlândia, Repository of the
 45 University of Porto, Repository of the University of Lisbon, Repository of the University of Brasília and Pepsic.
 46 Inclusion and exclusion criteria were defined. The entire SLR followed a review protocol that is available at:
 47 https://drive.google.com/open?id=151Iz_FY_84RIEGphnMHf4Y6djSEZs1oACa. The review aimed to answer
 48 the question "What are the impacts of the overuse of digital technologies on the mental health of adolescents and
 49 young people?", And to answer this question, three other research questions were elaborated:

50 ? What are the risks of the excessive use of social networks in the lives of adolescents? ? How to detect
 51 mental health problems through postings and behaviors? ? What are the scales for detecting depression? Then,
 52 interviews were conducted with five psychologists chosen by a referral who work in a support center, a social
 53 project, educational institutions (public and private) and a private clinic.

54 The third stage consisted of a survey, the sample of which consisted of 566 adolescents and young people, aged
 55 12 to 21 years old, who study in 03 different public educational institutions (Municipal, State and Federal).

56 The data collection instruments used in the second and third stages of the research were, respectively, a
 57 questionnaire for psychologists (QP), composed of 12 open questions, and a questionnaire for adolescents (QA),
 58 with 25 closed questions. Both questionnaires were based on the results of the SLR. The free will of each
 59 individual was respected, and those who were not interested in providing data for the research were free to stop
 60 participating during the interview or survey.

61 The selection of psychologists was made using the snowballing technique. In the survey with students, a link to
 62 the online questionnaire (in schools where there were computers in the classrooms) were distributed, in addition
 63 to printed questionnaires when necessary.

64 The responses of the psychologists were examined using the content analysis technique, and the responses of
 65 adolescents and young people using basic statistics.

66 Due to the scarcity of related works, only six applications were selected: Depression Self-Assessment (AD),
 67 Break Free (BF), Hygia (H), Mental (M); Nomophobia (N), and Phone Addict Free (PAF). The only one of
 68 these found through academic literature was the prototype Hygia, which is a concept for a proposed system to
 69 monitor the individuals' depression levels. The others were found through more extensive research on Google
 70 and Play Store (app store for smartphones with the Android system). In the Play Store, it was possible to find
 71 several test apps with different themes, but the "depression self-assessment" was selected, where so far it has
 72 been the closest to the initial proposal of Girassol, the app presented in this work.

73 The apps classified as related were compared in seven (07) aspects: After making the comparison between
 74 Girassol and the six similar apps, it was noticeable that all of them are mobile applications, only the Hígia
 75 prototype fits as both mobile and web applications. Of the seven applications, five are monitoring tools, one does
 76 not have this functionality, and Girassol can be classified as a partial monitoring tool, as it classifies dependency
 77 through tests and not by observing posts and activities performed on the smartphone or any other device. It was
 78 also notable that only two of the applications (Selfassessment of depression, and Girassol) offer tests validated
 79 by qualified professionals, making them reliable applications. Chart 1 presents the comparison between the
 80 applications. The left column shows the aspects analyzed, and the top row shows the applications represented
 81 by their initials. The letters Y, N and P respectively mean: yes, no and partially.

82 4 Aspects x App

83 AD BF G H M N PAF Monitoring tool N Y P Y Y Y Y Alert/notificationfeature N Y N Y N Y N Test Application
 84 Y N Y N N N N Indication of dependency/depression level Y Y Y N P P P Test validityandreliability Y N Y N
 85 N N N Web application N N N Y N N N Mobile application Y Y Y Y Y Y Y Chart 1: Application comparison

86 The Girassol app was developed based on the findings from the three initial phases of the research, along with
 87 the authorization and support from the Delete Institute represented by director Anna LS King, for the use of
 88 the "Internet Addiction Test" (IAT), and a questionnaire prepared by psychologist Kymberly Young. Its main
 89 objective is to assess the levels of nomophobia of adolescents and young people.

90 5 Results and Discussions

91 In this section, the results of each stage of the research carried out are presented and discussed. The literature
 92 review was carried out between the years 2016 and 2017, where 37 papers were selected; the interviews with
 93 psychologists and the survey with teenagers took place in the second half of 2018.

94 6 a) Systematic Literature Review (SLR)

95 After reading the 37 papers selected in the SLR, cyberbullying and depression (or its signs and symptoms, such
 96 as psychological distress, anguish and suicidal thoughts) are highlighted as the main risks of the excessive use of
 97 social networks, as it can be seen in the word cloud shown in Figure 2, resulting from question 1 in the survey.
 98 The main signs mentioned in response to question 2 were the sudden changes in mood and behavior, coupled
 99 with the need to stay connected, using profiles that are always up to date, seeking more and more followers.
 100 Chart 2 displays the results found in the SLR for the 2nd search question.

7 Detection

8 Number of citations

Spend more time online, higher predisposition to attack and reduced academic performance.

Loss of ability to concentrate.

Long online evening sessions; lie to family and friends about the number of hours spent connected.

Negative social interactions; post negative content; use of emoticons in a written conversation to report their real emotional state.

Depressive symptoms when you have nothing to post.

9 Show risky behaviors.

Interacts only via the web; may start to develop schizophrenia by living in isolation.

High emotional problems, uses the internet to regulate mood, gain social support and release emotions.

Cannot disconnect from social networks or go offline; the time dedicated to the tool increases and the level of control over it decreases.

Anxiety for likes and comments; make posts without thinking first; impatience when they run out of Internet access; has abstinence and its effects; anguish and discomfort when use is not possible.

Compulsive internet use; need to be connected 24 hours a day; being obsessed and compelled to constantly check the phone; quickly seek to connect to the Internet anywhere.

Greater difficulty in overcoming challenges; being aggressive and socially dominant.

Have few or no real friends; see safer and less threatening online communication; hide in the anonymity of cyberspace.

Describe specific methods of suicide within the context of other topics.

Perform narcissistic postings.

Oversharing 1, stressed posts and preview trigger 2 posts.

Being vulnerable as to the opinion of others; dependent on likes -feel the need to "cure" one's profile.

10 Complaint of situational problems.

Chart 2: Detection of risks and problems for mental health 1 Excessive sharing 2 Among the works selected in the literature review to answer this question, two of them [6] [1] pointed out eight signs to help identify dependence on the Internet/Digital Technology: excessive concern with the internet, need to increase the connected time (online), the presence of irritability and/or depression, exhibiting repeated efforts to decrease the time of internet use, when internet use is reduced, presents emotional lability, remain more connected than scheduled, work and social relationships at risk from overuse, and lying to others about time spent online.

The Beck Depression Inventory (BDI) emerged as the most cited to detect depression, related to question 3. Graph 1 shows the scales found during SLR surveys.

The results and references for the Systematic Literature Review protocol are available in the link presented in section 2 of this article.

11 Graph 1: Scales for detecting depression b) Interviews with psychologists

The interview with psychologists aimed to analyze the results of the SLR and its veracity, identifying how close the contents found in the SLR are to the current reality. And after the interviews, it was possible to recognize the relationship between the behavior of young people on the virtual network and the relationship with the real world, helping in the development and adaptation of questions for the survey and for the test.

Relevant results obtained in the interviews signaled the fact that the majority of psychologists interviewed have received adolescents/young people with problems arising from the excessive use of digital technologies. The drop in school performance was mentioned as one of the main problems. Social isolation is one of the behaviors presented that signal the risk of depression in adolescents. Bullying/cyberbullying cases were mentioned as unpleasant experiences lived by adolescents/young people. The complete questionnaire and the psychologists' answers to this research are available through the link: <https://drive.google.com/open?id=12y9qCebxQsClejGuWw2WzMSskbzUYqzg>.

12 c) Survey with Adolescents and Young people

This research had 359 part-time students (morning), 152 part-time students (afternoon), and 53 full-time students (morning and afternoon) participants. Graph 2 shows the number of students participating, per shift, in each grade.

Graph 2: Number of student respondents per grade and shift Among the results obtained in the survey with adolescents and young people, 21% indicated that when posting a photo, the most important thing is to achieve many likes and comments, as shown in Graph 3. The achieve this, 273 (48%) of the participants allow strangers to have unrestricted access to their profiles on the networks, according to Graph 4. Another relevant fact was

157 that only 8.3% never received complaints due to the time connected, as shown in Graph 5, although 42% stated
158 that they spend five hours or more accessing social networks daily and 23% confirmed that they spend all the
159 time on the internet, according to Graph 6. Graph 7: Feeling of loneliness when offline

160 The worrying factor is that, of 566 adolescents and young people, 93 (16%) expressed feelings of loneliness
161 when there is no internet access, according to Graph 7, and only 10% denied that they spend more time than
162 planned on social networks, according to Graph 8. 22% confessed frequent delays in their appointments due to
163 the connected time, according to Graph 9.

164 13 d) Application Girassol (Sunflower)

165 Girassol was developed with the intention of detecting the exact moment to intervene and treat problems caused
166 by the overuse of the internet and other technology derivatives. It consists of an application with 18 questions
167 adapted from the "Internet Addiction Test" (IAT), with the due written authorization from Delete Institute. The
168 app aims to assist parents, educators and health professionals in detecting a possible technological dependence,
169 which is often disguised as a leisure activity, hobby and means of communication with other people.

170 The IAT is the first validated and reliable measure in this matter. The changes made to the questionnaire
171 were linked to the results of the SLR and the interviews with the psychologists, with the Figure ?? shows the
172 flow of all planning and contact with the Institute for adapting the dependency test.

173 The test identifies the level of dependency, which varies between "normal user" and "dependent user". Each
174 question has a score from 0 to 5, which generates a final score, which fits into some level of internet dependency.
175 In the total score, values up to 18 mean that the individual has no dependence, 19 to 33 is an average user,
176 34 to 63 is a risk user, and above 64 points strongly suggest that the individual should seek professional help.
177 Figure ?? presents some screens planned for the application prototype, while Figure 5 presents the screens already
178 implemented and updated for the Girassol application, which is available for download in the play store, through
179 the link: [https://play.google.com/store/apps/details?id=com.san tiago.girassol](https://play.google.com/store/apps/details?id=com.san+tiago.girassol). When opening the application,
180 the user is directed to the home page of the app which features 3 buttons -about, contact and test -, below the
181 buttons, there is a banner redirecting to the Delete Institute website, which provided support for the adaptation
182 of the questionnaire. On the "About" screen, there is information about the app, such as the problem that
183 encouraged its development, purpose and adaptation of the IAT questionnaire. In the contact screen there are 02
184 e-mails for contact, one to seek information about the work developed, and the other to contact for questions about
185 the original test, authorization, and treatment of technological dependence. On the test screen, the questions
186 and six answer options are presented, where the respondent must mark the one that most represents his or her
187 practice or behavior. When selecting an answer, the individual must click on "next". It is possible to return to the
188 menu or previous question by pressing "back". If the respondent tries to advance to the next question without
189 answering the current one, the app displays a message asking for the answer. At the end of the test, the result
190 screen displays the respondent's score. It contains the type of user, a short explanatory phrase, and the score
191 obtained on the test.

192 The architecture follows the MVC model (modelview-controller), divided into a view layer, which presents
193 the screens to the user, and two controllers; one responsible for collecting the views and the other responsible
194 for the test (this captures the responses and generates the results). The model layer was not necessary in the
195 implementation because the test is already loaded into the code. Figure 6 illustrates the app Girassol architecture.
196 The questionnaire was stored in a json -light format for data exchange -, which is loaded in the application when
197 the user selects the test option. In addition, the app has only an internal database, so no data is stored.

198 14 i. Validation

199 Two validations were carried out for the Girassol application. The first took place in January 2019, and the
200 second took place in December of the same year.

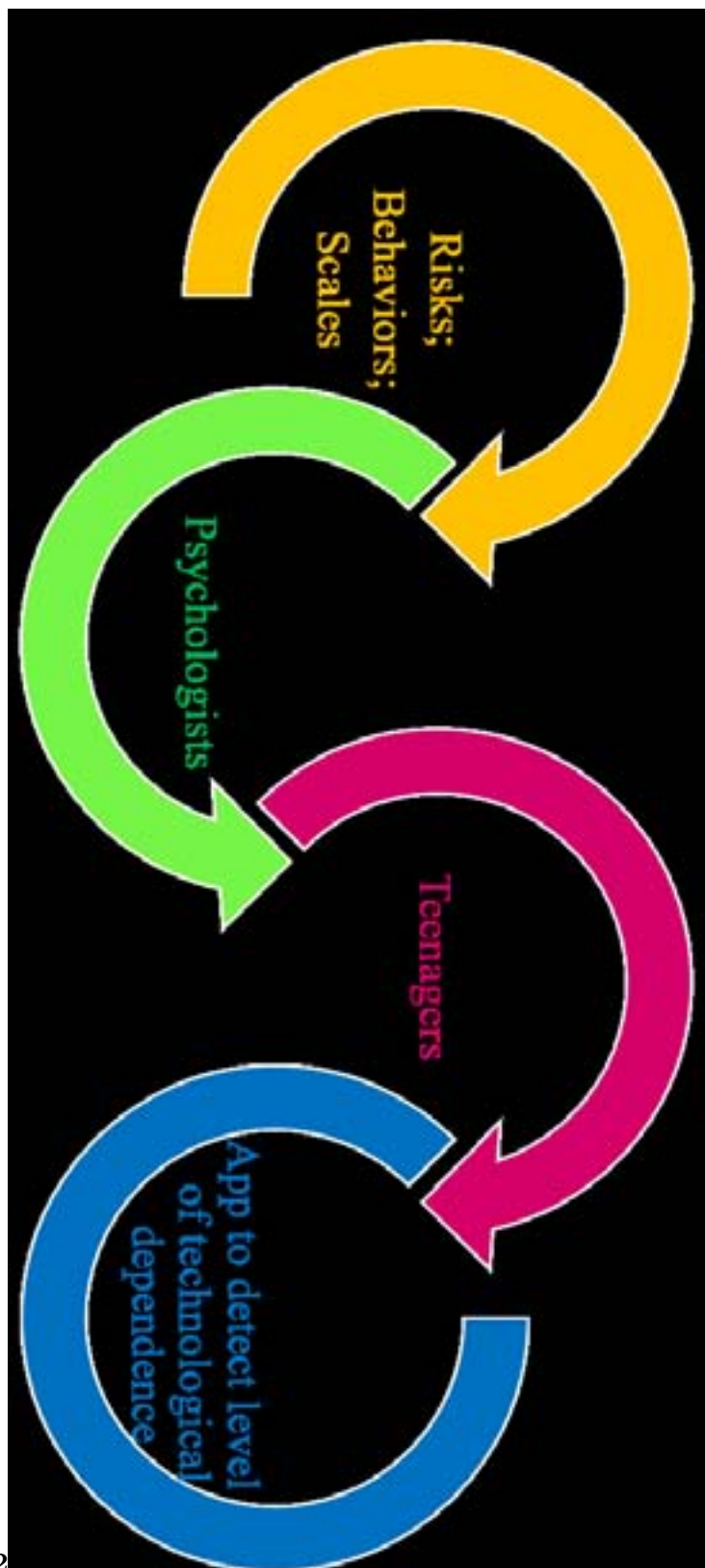
201 15 a. First Validation

202 The first validation saw the collaboration of two professionals in the field of education and three in psychology.
203 This assessment was signed 100% positive by the experts. Everyone said that it would be an appropriate tool to
204 use in schools and one of them indicated its use in offices, serving as a way to perform a screening and identify
205 possible patients.

206 For the validation by the specialists, three affirmative sentences were produced: User psy01 agrees that the
207 app is able to detect cases of addiction because, through punctuation, the teenager sees what he does not want
208 to hear, since he usually does not care when people around him say that he is spending a lot of time on his cell
209 phone; it can serve as a "reality check".

210 The first validation also counted with the collaboration of seven individuals, aged between 15 and 21, with the
211 individual score ranging from 5 to 67 points. All adolescents and young people approved the benefits brought
212 by the application, highlighting its ease of use and the usefulness of the proposal, as well as contributing with
213 suggestions.

214 The questionnaire for the adolescents and young people consisted of six phrases to be answered with 'Yes' or
215 'No'. The phrases elaborated were:



2

Figure 2: Figure 2 :

34



Figure 3: 3 :Graph 4 :

5



Figure 4: Graph 5 :

8



Figure 5: Graph 8 :



Figure 6:

34



Figure 7: Figure 3 :Figure 4 :

5



Figure 8: Figure 5 :

6



Figure 9: Figure 6 :

5



Figure 10: Chart 5 :

User	About the utility of the app			
	1	2	3	4
educ01	Yes	Yes	Yes	Schools
educ02	Yes	Yes	Yes	Schools
psy01	Yes	Yes	Yes	Both
psy02	Yes	Yes	Yes	Schools
psy03	Yes	Yes	Yes	Schools

Chart 3: Evaluation of the app from the experts' point of view

Figure 11:

5											4				2					
4																				
3	User	01	02	03	1	Yes	Yes	Yes	Yes	Yes	3	Yes	4	Yes	Yes	Yes	Yes	6	Yes	Above
04	05	06	07	08	Yes	Yes	Yes	Between	Yes	Yes	Yes	Yes	Yes	Yes	Between	Yes	Yes	64		
Chart 6: 1 1 2 0		19	and	33	2	Yes	Yes	Yes	Yes	Yes	Yes	34	and	63	5	Yes	Yes	Yes	Yes	
Less than 19		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
		Yes	1							Yes		Yes						Yes		

Figure 12:

247 Two of the respondents mentioned that they liked the application, and especially the idea of alerting and
 248 offering the opportunity to identify when to deal with the problem of technological dependence.

249 .1 IV.

250 .2 Final Considerations

251 The results of this research empirically proved the signs and problems arising from the overuse of digital
 252 technologies and brought as main contribution the Girassol application, which helps to identify the right moment
 253 to intervene in order to reduce the negative impacts of digital technologies on the mental health of adolescents
 254 and young people.

255 The app was evaluated twice. Between these evaluations there were several updates, among them: new
 256 function suggested in the first validation, on-screen data update, complementary information at the end of
 257 the questionnaire, presenting phrases for a better understanding after identify the dependency level, where
 258 professional help is indicated in case of risk.

259 This work is important to draw the attention of parents and educators to the way in which adolescents and
 260 young people are using technology and to help identify the moment when it is necessary to intervene to reduce
 261 the negative impacts on their mental health. For future work, we intend to continue with the updates and follow
 262 the suggestions made by experts and improve the usability of the app.

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