Profile of Adult Users Seeking Mental Health Apps for the Relief of Anxiety

Daniel Neto[1,2]*, Margarida Alves[3], Carla Spínola[2], Leonor Esteves[4], Helena Sofia Pinto[5] and Joaquim Gago[1,4]

[1]*NOVA Medical School, Faculdade de Ciências Médicas, Campo dos Mártires da Pátria 130, 1169-056 Lisboa, Portugal.*

[2]*Alquimia da Mente, Rua 5 de Outubro, Funchal, Portugal.*

[3]*Serviço de Psiquiatria, Centro Hospitalar De Setúbal E.P.E., Rua Camilo Castelo Branco, Aptd. 140, Setúbal, 2910-446 Setúbal, Portugal.*

[4]*Serviço de Psiquiatria, Centro Hospitalar de Lisboa Ocidental E.P.E., R. da Junqueira 126, 1300-598 Lisboa, Portugal.*

[5]*INESC-ID, Department of Informatic Engineering, Instituto Superior Técnico, Universidade de Lisboa, Rua Alves Redol, 9 1000-029 Lisboa, Portugal.*

Citation: Neto D, Alves M, Spínola C, et al. Profile of Adult Users Seeking Mental Health Apps for the Relief of Anxiety. Int J Psychiatr Res. 2023; 6(3): 1-5.

ABSTRACT

Anxiety disorders are among the most prevalent mental health disorders. In various settings, patients are using apps for the relief of their symptoms. Digital applications are recommended by international guidelines, but most apps available are not scientifically validated. Little is known about the profile of adult users searching for mental health apps, in the general population. In this study, we propose to identify the user profile of real-world users searching for mental health apps to reduce anxiety. We used the app TUYB Ansiedade® for this study and divided the users in three groups: health professional referral, social network and search engine. We got 453 completed first assessments, indicating that the users that found the app through Social Networks have higher values of anxiety, depression and lower perceived quality of life and resilience.

Our results support the conclusion that users searching and engaging with apps in social networks have a lower mental well-being profile and this should inform app developers, guidelines on app use for mental health and policy makers. The policies regarding Social Networks and app developers should be improved to account for the mental health of their users.

Keywords

Anxiety, Mental Health, Self-management.

Introduction

Almost one billion people worldwide suffer from a psychiatric disorder and in Europe mental disorders represent more than €460 billion in direct costs [1,2].

In Portugal, according to the National Epidemiological Study of Mental Health, 2013, the annual prevalence of anxiety and depressive disorders is 16.5% and 7.9% respectively and the lifetime prevalence for both disorders is 25.8% and 19.3%, respectively [3,4]. These values are higher than the values of the other Countries of the European Union that participated in the *World Mental Health Survey Initiative* [3]. This data is indirectly supported by the high consumption of benzodiazepines, which remains higher than the European average, which is considered an important public health problem [5,6].

The costs associated to anxiety and depressive disorders are very high, especially due to their prevalence. It was estimated that the annual costs of treating psychiatric disorders in the United States

of America in 1990 were US$147.8 billion, with anxiety disorders representing 31.5%, schizophrenia spectrum disorders about 22% and affective disorders about 20.6% [7,8]. In Portugal, mental disorders accounted for 12.0% of the years of life lost adjusted for disability (DALYs) and 18.0% of the years lived with disability (YLDs) in 2017, and are associated with days with "out-of-work" that are far above those of other high-income countries, with 20.2% of unproductive days in a month due to mental disorders. Depressive and anxiety disorders are in 4th and 6th position, respectively, of the health problems that most contribute to disability in the country [3,6]. These impressive data represent the need for the development and implementation of effective treatment strategies.

Although there are multiple strategies to treat anxious and depressive symptoms, most patients maintain disabling symptoms, even in periods of symptomatic remission. In the case of anxiety, it is devalued in the treatment of patients under follow-up. Another problem is the lack of sufficient means for the treatment of all patients. The percentage of patients without access to health care is high, with 81.8% for mild-severity disorders and 33.6% in severe cases [3]. The percentage of care provided is mostly by psychiatrists, with low availability in mental health services of nurses, psychologists and other technicians [3]. In addition, there is a lack of specialized non-medical mental health care in the National Health Service, which prevents the use of the above mentioned techniques for the treatment of the majority of patients.

In several areas of medicine, including psychiatry, the use of technology in treatment strategies for larger groups of patients has been investigated. In the case of mental health, digital applications are recommended by the national health service of the United Kingdom– NICE *National Institute for Health and Care Excellence Clinical Guidelines* [9]. These are not meant to replace face-to-face psychotherapy, but to allow access to simple self-regulation techniques for a larger number of individuals. There are also specific developed mobile applications with randomized studies that show benefit in the treatment of anxiety, depressive, bipolar, schizophrenic and substance use disorders [10,11].

In the past decade there was an explosion of mental health mobile apps (mHealth apps) available to users. Several meta-analyses were performed to identify their effectiveness. The results were not as initially expected, and even the ones with positive results, the effect size was small [12-17].

Little is known about the profile of adult users searching for mHealth apps. In this study, we propose to identify the user profile of real-world users searching for mental health apps to reduce anxiety.

Methods
This study is part of a PhD thesis, with prior three phases (first – qualitative study to identify the needs of patients and mental health professionals to inform the app development; second –

mHealth app development; third – pilot study of the app). The app developed was placed in digital stores with the name of "TUYB Ansiedade®" which was available to all users in Portugal. Users were divided according to three types of contact with the app: health professional referral, social network recommendation or search engine find.

The clinical trial had a real-world setting, double-blinded with randomization of app features. Two versions of the app were created, with the same core psychoeducation. The study has the approval of the Ethics Committee of the *Serviço de Saúde da Região Autónoma da Madeira, EPERAM* (Public Hospital) and the Ethics Committee of the *Universidade Nova de Lisboa* – NMS Nova Medical School | *Faculdade de Ciências Médicas*.

Initial Assessment
The initial assessment was conducted with a psychometric evaluation, which include the Hospital Anxiety-Depression Scale [18], Generalized Anxiety Disorder 7-item (GAD-7) [19], Patient Health Questionnaire-9 (PHQ-9) [20,21], Quality of life –The Short Form-36 (SF-36) [22], Connor-Davidson Resilience 10-item Scale (CD-RISC) [23,24].

Inclusion Criteria
Patients aged 18 years and above, able to provide informed consent to own and use a smartphone.

Exclusion Criteria
Being unable to access a computer or a mobile phone (smartphone).

Recruitment
The participants in this clinical trial were recruited from the app store (Apple® App Store® and Google® Play Store®), promoted with mental health professionals (version 1 and 2 of the app), in traditional social media (version 1 of the app), digital social networks (version 1 and 2 of the app) and paid ads in both stores and Google® search engine (version 2 of the app), restricting the country for Portugal.

Randomization
The randomization of the study will be performed through computerized algorithm.

Sample Size
We planned a trial with two groups to assess different app aspects and it's efficacy. If we consider the response of patients on the anxiety scale in the pilot project of anxiety management, and based on the t-test of paired samples, we would need 13 individuals per group in the sample group. Considering that this assay is considerably different from this project and approaching the estimated calculation through the results of the controlled study of *mycompass* [25] and considering a withdrawal of approximately 15%, the sample size would be 75, in a total of 150 patients in the study.

Table 1: Comparison between groups.

	Health Professional (N=101)	Social Network (N=91)	Search Engine (N=133)	P-value
Gender				
Female	78 (77.2%)	64 (70.3%)	98 (73.7%)	0.553
Male	23 (22.8%)	27 (29.7%)	34 (25.6%)	
Age				
Mean (SD)	38.4 (10.8)	37.2 (10.4)	37.5 (12.2)	0.789
Median [Min, Max]	38.5 [19.0, 68.0]	37.0 [19.0, 64.0]	36.0 [18.0, 71.0]	
Relationship status				
Married	44 (43.6%)	33 (36.3%)	49 (36.8%)	0.925
Single	41 (40.6%)	51 (56.0%)	71 (53.4%)	
Divorced	12 (11.9%)	5 (5.5%)	9 (6.8%)	
Widow	1 (1.0%)	0 (0%)	0 (0%)	
Education				
Mean (SD)	13.0 (3.30)	12.8 (3.26)	13.6 (3.67)	0.360
Median [Min, Max]	12.0 [6.00, 20.0]	12.0 [6.00, 20.0]	12.0 [6.00, 31.0]	
Employment status				
Employed	66 (65.3%)	55 (60.4%)	86 (64.7%)	0.403
Unemployed	27 (26.7%)	19 (20.9%)	15 (11.3%)	
Student	6 (5.9%)	15 (16.5%)	27 (20.3%)	
Sickness disability	0 (0%)	0 (0%)	1 (0.8%)	
Retirement	1 (1.0%)	0 (0%)	4 (3.0%)	
No activity	0 (0%)	2 (2.2%)	0 (0%)	
Days out of role				
Mean (SD)	4.42 (9.94)	2.38 (7.17)	1.64 (5.93)	0.218
Median [Min, Max]	0 [0, 30.0]	0 [0, 30.0]	0 [0, 30.0]	
Followed by GP				
No	45 (44.6%)	36 (39.6%)	57 (42.9%)	0.850
Yes	54 (53.5%)	51 (56.0%)	72 (54.1%)	
Followed by Mental Health Nurse				
No	94 (93.1%)	82 (90.1%)	119 (89.5%)	0.319
Yes	5 (5.0%)	4 (4.4%)	12 (9.0%)	
Followed by Psychologist				
No	80 (79.2%)	73 (80.2%)	93 (69.9%)	0.146
Yes	19 (18.8%)	15 (16.5%)	35 (26.3%)	
Followed by Psychiatrist				
No	72 (71.3%)	71 (78.0%)	101 (75.9%)	0.337
Yes	27 (26.7%)	16 (17.6%)	28 (21.1%)	
Psychiatric diagnosis				
Anxiety Disorder	22 (21.8%)	20 (22.0%)	31 (23.3%)	0.863
Depressive Disorder	9 (8.9%)	12 (13.2%)	22 (16.5%)	
Bipolar Disorder	2 (2.0%)	0 (0%)	4 (3.0%)	
Other	4 (4.0%)	6 (6.6%)	3 (2.3%)	
Taking psychiatric medication				
No	39 (38.6%)	44 (48.4%)	63 (47.4%)	0.241
Yes	41 (40.6%)	37 (40.7%)	40 (30.1%)	
Admissions (n)				
Mean (SD)	0.475 (2.60)	0.217 (1.21)	0.144 (0.696)	0.338
Median [Min, Max]	0 [0, 20.0]	0 [0, 8.00]	0 [0, 5.00]	
HAD-A				
Mean (SD)	11.1 (4.08)	12.6 (4.01)	11.6 (4.02)	**0.056**
Median [Min, Max]	12.0 [1.00, 19.0]	13.0 [3.00, 20.0]	12.0 [0, 20.0]	
GAD 7				
Mean (SD)	9.86 (4.96)	11.1 (5.02)	10.1 (4.47)	0.337
Median [Min, Max]	10.0 [0, 21.0]	10.0 [0, 21.0]	10.0 [0, 21.0]	
PHQ-9				
Mean (SD)	10.7 (6.54)	12.3 (6.99)	11.2 (5.89)	0.254
Median [Min, Max]	9.00 [0, 27.0]	11.0 [0, 27.0]	10.0 [0, 24.0]	
QoL Perception				
Mean (SD)	3.30 (0.889)	3.14 (0.797)	3.46 (0.774)	**0.023**
Median [Min, Max]	3.00 [1.00, 5.00]	3.00 [1.00, 5.00]	4.00 [1.00, 5.00]	
Health Satisfaction				
Mean (SD)	3.05 (1.05)	2.99 (1.02)	3.03 (0.992)	0.910
Median [Min, Max]	3.00 [1.00, 5.00]	3.00 [1.00, 5.00]	3.00 [1.00, 5.00]	
CD-RISC 10				
Mean (SD)	20.6 (8.31)	16.9 (8.03)	20.1 (8.46)	**0.003**
Median [Min, Max]	21.0 [1.00, 36.0]	17.0 [0, 34.0]	20.0 [1.00, 38.0]	

SD: Standard-deviation; Min: Minimum; Max: Maximum; HAD-A: Hospital Anxiety and Depression scale – anxiety subscale; GAD-7: Generalized Anxiety Disorder 7-item; PHQ-9: Patient Health Questionnaire 9; QoL: Quality of Life; CD-RISC: Connor-Davidson Resilience Scale (CD-RISC-10).

Statistical Approach

The statistical approach will be performed according to the variables under study. Initially, a descriptive analysis of demographic and clinical variables will be performed to detail the sample. The user profile was analyzed with demographic, clinical information, and engagement with the app, utilizing the Kruskal-Wallis Rank Sum Test, as the variables were compared with the referral type and were non normal distributed. The significance level will be set at 0.05 and the software used will be the RStudio version 2023.3.0.386 [26].

Results

Both apps got a total of 2636 installs, with 2498 android® installs and 138 iOS® installs. Version 1 of the App got 1364 installs and version 2, 1272. The informed consent and user registration were done by 1070 users, and 453 (17%) completed first assessment. We had a retention rate of 3,9%, with 1,5% of retention rate at 90 days. The second assessment was done by 71 users (2,7%).

Table 1 shows the results divided in three groups according to the app search. The groups were defined as recommendation by a health professional, social network discovery or search in a traditional search engine (e.g., Google®). The demographic variables don't have statistically significant differences between groups. The clinical variables indicate that the users that found the app through Social Networks and finished the first assessment are in more suffering than the other users with higher values in all scales, except the Perceived Health Satisfaction (HAD-A p-value 0.056, GAD-7 p-value 0.337, PHQ-9 p-value 0.254, Perceived QoL p-value 0.024, Perceived Health Satisfaction 0.91 and CD-RISC10 0.003).

Regarding the positive cases of anxiety in our sample, we identified a total of 232 (71.4%) of users with a positive result in HAD-A and/or GAD-7. There was no statistically difference between the groups (p-value 0.690). For the positive cases of depression, we identified a total of 153 (47.1%) of users with a positive result in PHQ-9. There was no statistically difference between the groups (p-value 0.401).

Discussion

This study has explored the user profile of real-world adult users searching for mental health apps to reduce anxiety. We studied several demographic and clinical variables of users.

The results show that this study is not representative of the general Portuguese population, as the general population has a mean age of 44.6, 52% of females and 50% have less or equal to 9 years of education [27. We have a younger, female predominant and higher educated sample. The ratio of the population using mobile internet is 95% in 2022 [28].

Our results are in concordance with other studies, showing that younger individuals, predominantly female and higher educated, are searching and using health-related apps, in particularly mental

health apps for reducing anxiety [29-31].

To the best of our knowledge, our study is the first to identify differences in the users according to the way they are searching or recommended for app use. The results show that the users engaging with apps for anxiety in social networks, have higher symptomatic severity of anxiety, lower resilience, and lower perceived quality of life.

We had a retention rate of 3,9%, with 1,5% of retention rate at 90 days. Our retention rate is marginally higher than the average in Health & fitness 3,7%, but significantly higher than education 2.1%, but we need to consider that the users were informed of the research nature of the app [32]. This could point for higher use and retention rate.

This study has the limitations of sample size and the chosen design. There should be further studies to identify the profile of real-world users, to gather more consistent data on the population needs and inform app developers, guidelines on app use for mental health and policy makers. The policies regarding Social Networks should be improved in taking care of the mental health of their users.

Conclusion

Users searching and engaging with apps for anxiety through social networks, have higher anxiety symptoms, lower resilience, and lower perceived quality of life, compared to users referred by health professionals or results in search engines.

There should be further studies to identify the profile of real-world users, to gather more consistent data on the population needs and inform app developers, guidelines on app use for mental health and policy makers. The policies regarding Social Networks should be revised to improve the mental health care of their users.

References

1. Mental health matters. Lancet Glob Health. 2020; 11.
2. Estrela M, Herdeiro MT, Ferreira PL, et al. The use of antidepressants, anxiolytics, sedatives and hypnotics in Europe: Focusing on mental health care in portugal and prescribing in older patients. Int J Environ Res Public Health. 2020; 17: 1-12.
3. Caldas-de-Almeida JM, Xavier M, Cardoso G. National health epidemiological study mental. Lisbon Fac Medical Sciences. 2013.
4. Antunes A, Frasquilho D, Azeredo-Lopes S, et al. Disability and common mental disorders: Results from the World Mental Health Survey Initiative Portugal. European Psychiatry. 2018; 49: 56-61.

5. Nacional P. Mental Health in Numbers – 2015. 2015.

6. CNS. Sem Mais Tempo a Perder. National Health Council, Portuguese Republic. 2019; 130.

7. Greenberg PE, Sisitsky T, Kessler RC, et al. The economic burden of anxiety disorders in the 1990s. Journal of Clinical Psychiatry. 1999; 60: 427-435.

8. Rice DP, Miller LS. Health economics and cost implications of anxiety and other mental disorders in the United States. British Journal of Psychiatry. 1998; 173: 4-9.

9. National Institute for Health Care and E. Depression in adults: treatment and management Full guideline. 2018.

10. Proudfoot J, Clarke J, Birch MR, et al. Impact of a mobile phone and web program on symptom and functional outcomes for people with mild- to-moderate depression. BMC Psychiatry. 2013; 18: 312.

11. Menon V, Rajan TM, Sarkar S. Psychotherapeutic applications of mobile phone-based technologies: A systematic review of current research and trends. Indian J Psychol Med. 2017; 39: 4-11.

12. Eisenstadt M, Liverpool S, Infanti E, et al. Mobile Apps That Promote Emotion Regulation, Positive Mental Health, and Well-being in the General Population: Systematic Review and Meta-analysis. JMIR Ment Health. 2021; 8: e31170.

13. Stratton E, Lampit A, Choi I, et al. Trends in Effectiveness of Organizational eHealth Interventions in Addressing Employee Mental Health: Systematic Review and Meta-analysis. J Med Internet Res. 2022; 24: e37776.

14. Gál É, Ştefan S, Cristea IA. The efficacy of mindfulness meditation apps in enhancing users' well-being and mental health related outcomes: a meta-analysis of randomized controlled trials. J Affect Disord. 2021; 279: 131-142.

15. Qin M, Chen B, Sun S, et al. Effect of Mobile Phone App-Based Interventions on Quality of Life and Psychological Symptoms Among Adult Cancer Survivors: Systematic Review and Meta-analysis of Randomized Controlled Trials. J Med Internet Res. 2022; 24: e39799.

16. Tsai Z, Kiss A, Nadeem S, et al. Evaluating the effectiveness and quality of mobile applications for perinatal depression and anxiety: A systematic review and meta-analysis. J Affect Disord. 2022; 296: 443-453.

17. Wu J, Ma Y, Zuo Y, et al. Effects of Mindfulness Exercise Guided by a Smartphone App on Negative Emotions and Stress in Non-Clinical Populations: A Systematic Review and Meta-Analysis. Front Public Health. 2022; 9: 773296.

18. Pais-Ribeiro J, Silva I, Ferreira T, et al. Validation study of a Portuguese version of the Hospital Anxiety and Depression Scale. Psychol Health Med. 2007; 12: 225-237.

19. Bártolo A, Monteiro S, Pereira A. Factor structure and construct validity of the Generalized Anxiety Disorder 7-item (GAD-7) among Portuguese college students. Cad Public Health. 2017; 33: e00212716–e00212716.

20. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001; 16: 606-613.

21. Lamela D, Soreira C, Matos P, et al. Systematic review of the factor structure and measurement invariance of the patient health questionnaire-9 (PHQ-9) and validation of the Portuguese version in community settings. J Affect Disord. 2020; 276: 220-233.

22. Ferreira PL. Development of the Portuguese version of MOS SF-36. Part II --Validation tests. Acta Med Port. 2000; 13: 119-127.

23. Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience. J Trauma Stress. 2007; 20: 1019-1028.

24. Almeida MH, Dias S, Xavier M, et al. Exploratory and Confirmatory Validation of the Connor-Davidson Resilience Scale (CD-RISC-10) in a Sample of Individuals Registered in Job Centers. Acta Med Port. 2020; 33: 124-132.

25. Proudfoot J, Clarke J, Birch MR, et al. Impact of a mobile phone and web program on symptom and functional outcomes for people with mild- to-moderate depression, anxiety and stress: a randomised controlled trial. BMC Psychiatry. 2013; 13: 312.

26. Posit team. RStudio: Integrated Development Environment for R. Boston, MA: Posit Software, PBC; 2023.

27. https://censos.ine.pt/xportal/xmain?xpgid=censos21_populacao&xpid=CENSOS21

28. https://www.anacom.pt/render.jsp?contentId=1739268

29. Sawrikar V, Mote K. Technology acceptance and trust: Overlooked considerations in young people's use of digital mental health interventions. Health Policy Technol. 2022; 11: 100686.

30. Bach RL, Wenz A. Studying health-related internet and mobile device use using web logs and smartphone records. PLoS One. 2020; 15: e0234663.

31. Paradis S, Roussel J, Bosson JL, et al. Use of Smartphone Health Apps Among Patients Aged 18 to 69 Years in Primary Care: Population-Based Cross-sectional Survey. JMIR. 2022; 6: e34882.

32. https://www.statista.com/statistics/259329/ios-and-android-app-user-retention-rate/