

Article

## Telepsychological Mobile Applications in the Spanish Android Market

Ana-María Cubillo-Leivas<sup>1</sup>, Pablo J. Olivares-Olivares<sup>1</sup> and Ángel Rosa-Alcázar<sup>1</sup>

<sup>1</sup> Universidad de Murcia.

### ARTICLE INFO

Received: August 27, 2021  
Accepted: June 14, 2022

#### Keywords:

Telepsychology  
Behavioral intervention  
technologies  
Smartphone-based interventions  
Systematic review  
Android market

### ABSTRACT

**Background:** The use of Android mobile applications aimed at addressing users' psychological health is increasing. However, no review has been conducted on public Android commercial telepsychological applications in Spain. **Method:** A systematic search was carried out in the general applications section of Google Play Store based on 20 keywords in Spanish. Applications in Spanish or English that were relevant from the perspective of the search terms were included in the analysis. **Results:** Of the 1,000 applications retrieved, only 43.59% (337/773) met the inclusion criteria, of which 49.26% (171/337) were Spanish. Most of them were Self-applied treatment applications (52.96%, 29.59%, Spanish; 23.37%, English). A total of 69.44% (37.38% Spanish; 31.95% English) did not indicate the origin of the information and the academic link was anecdotal (3.25%). **Conclusions:** The low percentage of relevant applications, high prevalence of self-help applications, absence of references on the origin of the information, absence of academic support, and lack of certifications encouraged us to recommend caution to consumers and professionals in their adoption of these applications for the treatment of any psychological disorder.

## Aplicaciones Móviles Telepsicológicas en el Mercado Android Español

### RESUMEN

**Antecedentes:** La oferta de aplicaciones móviles dirigidas a abordar la salud psicológica de los usuarios es cada vez mayor. Sin embargo, no se ha realizado ninguna revisión amplia de la oferta comercial de aplicaciones telepsicológicas en España. **Método:** Se llevó a cabo una búsqueda sistemática en la sección general de aplicaciones de la Google Play Store en base a 20 palabras clave en castellano. Se incluyeron en el análisis las aplicaciones en castellano o inglés que fueran relevantes desde el punto de vista del término empleado en la búsqueda. **Resultados:** De las 1.000 aplicaciones recuperadas, solo el 43,59% (337/773) cumplía los criterios de inclusión, entre las cuales solo el 49,26% (171/337) estaban en castellano. Las aplicaciones de tratamiento auto-aplicado (52,96%; 29,59% castellano; 23,37% inglés) fueron las más numerosas. El 69,44% (37,38% castellano; 31,95% inglés) no indicaban la procedencia de la información, y la vinculación académica fue anecdótica (3,25%). **Conclusiones:** El bajo porcentaje de aplicaciones relevantes, la alta prevalencia de aplicaciones de autoayuda, la ausencia de referencias sobre el origen de la información, la ausencia de respaldo académico, o la falta de certificaciones, invita a recomendar cautela a consumidores y profesionales en su adopción en el tratamiento de cualquier trastorno psicológico.

#### Palabras clave:

Telepsicología  
Smartphone-based interventions  
Behavioral intervention  
technologies  
Revisión sistemática  
Android

An increasing number of people use smartphones, especially in the European and North American countries. In Spain, 79% adults have smart mobile devices and 87% of them regularly access the Internet on it; this proportion reaches 100% for young people between 18 and 36 years of age (Poushter et al., 2018). According to the 2020 report “Mobile in Spain and the World”, each smartphone owner uses it for, on average, 3 h 22 min per day, of which 2 h 93 min are spent on one of the applications installed on the device (Ditrendia, 2020).

The percentage of mobile apps aimed at improving psychological health already reached 17% of total apps in the market in 2017 (Research2guidance, 2017), with an estimated number of 10,000–20,000 (Clay, 2021; Marshall et al., 2020b); a wide range of applications including those aimed at psychological intervention, social support, or prevention (Lau et al., 2020; Radovic et al., 2016), with meditation, relaxation, or mindfulness applications being the most downloaded ones (Carlo et al., 2019).

While the general population seeks to manage the stress and anxiety associated with modern life using applications found through social networks, web searches, or recommendations from acquaintances (Schueller et al., 2018), the ubiquity of smartphones has made the apps potentially interesting tools for increasing access to psychological treatments (Bhugra et al., 2017; Bush et al., 2019; Prentice & Dobson, 2014; Torous, Nicholas et al., 2018). Covid-19 forced a surge of all kinds of telehealth services, a trend that seems to be consolidated after the removal of the lockdown urgency (Accenture Consulting, 2020).

Thus, the growing academic interest in the possibilities offered by interventions, that use information and communication technologies or behavioral intervention technologies (Mohr et al., 2013), has led to a growing interest in the use of telepsychology interventions (American Psychological Association, 2013) through mobile applications, focusing on highly prevalent disorders such as depression or anxiety disorders (Miralles et al., 2020). There is meta-analytical evidence on the efficacy of use of smartphone-based psychological interventions (Firth, Torous, Nicholas, Carney, Pratap et al., 2017; Firth, Torous, Nicholas, Carney, Rosenbaum et al., 2017; Lecomte et al., 2020; Linardon et al., 2019) in disorders such as depression, social anxiety disorder, or generalized anxiety disorder, with effect sizes ranging from  $g = .28$  to  $g = .58$  with respect to the control groups (Linardon et al., 2019).

However, recent systematic reviews and overviews of the market for mental health apps, accessible to the general English-speaking public, indicate that most app descriptions do not mention the source of the information they offer (Nicholas et al., 2015; Radovic et al., 2016; Shen et al., 2015; Sucala et al., 2017), few apps use an evidence-based theoretical framework (Alyami et al., 2017; Marshall et al., 2020a, 2020b; Sucala et al., 2017), fewer have peer-reviewed publications that provide evidence of their efficacy (Lau et al., 2020; Neary & Schueller, 2018), and fewer have accreditations (Martín Fernández et al., 2020), although many of these apps should be considered as medical devices (Gómez-Abril, 2018). This lack of peer-reviewed evidence of feasibility and/or efficacy and inadequate information about content sources makes it difficult to find appropriate telepsychological mobile applications in the commercial market and urges caution with app selection (Kertz et al., 2017; Lau et al., 2020; Marshall et al., 2020a; Nicholas et al., 2015; Shen et al., 2015). This is in addition to the challenges of data management and storage, as well as data security, privacy,

and adherence issues presented by these types of applications (Bauer et al., 2020; Baumel et al., 2019; Carlo et al., 2019; Gu et al., 2017; Huckvale et al., 2020; Linardon & Fuller-Tyszkiewicz, 2020; Ng et al., 2019; O’Loughlin et al., 2019; Qu et al., 2020; Torous et al., 2020; Torous, Wisniewski et al., 2018), which limit their effectiveness.

For the Spanish mobile telepsychological application market, at the time of this review, no review had evaluated the characteristics of commercial offers in a wide way. Has the Spanish-speaking telepsychological market had the same poverty of appropriate mobile applications as the English-speaking market? There was a low percentage of relevant applications corresponding to a search topic, high prevalence of self-help apps, lack of empirical evidence, lack of academic linkage, and inadequate information about the origin of the content. Should Spanish consumers and professionals be cautious when looking for and thinking about using this tool?

Therefore, the main objective of the present study was to evaluate the Spanish market for telepsychological mobile applications through their descriptions to evaluate the general characteristics of the apps (idiom, category, price, age group, rating, number of ratings, number of downloads, year last update) and the characteristics defined in this research (relevance, audience, legal notice, confidentiality or privacy, ease of understanding, tone of language used, presence of a web address linked to the project, academic linkage, certification or registration as a medical device in the European Union or the United States, apparent purpose or aim of the application, and source of the information offered).

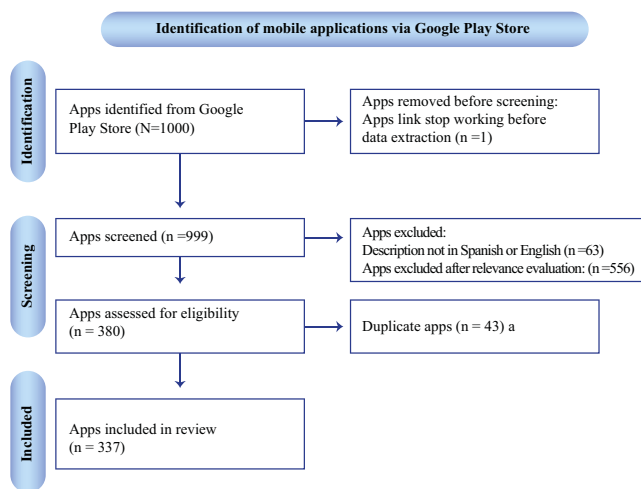
To this end, the research sought to answer the following questions: (a) were the apps relevant to the search terms used? Understanding if the application was related to the psychological disorder (keyword) for which it was searched; (b) What type of audience were they aimed at? Employers, family, friends, general, individuals with disorders, medical professionals in general, medical professionals-trainees, psychologists, nurses, parents, primary care providers, psychology students, school students, and teachers; (c) what tone was used to communicate the messages? Negative, neutral, or optimistic; (d) what were the costs associated with its use? Free, priced, or freemium (meaning that the app can be downloaded and used with restrictions for a delimited period); (e) what was their apparent purpose? Self-applied treatment, self-diagnosis, online treatment with support, mixed treatment (self-help plus online treatment), education, social support, professional apps, attract customers; (f) was the origin of the information provided to substantiate the justification of their use? Therapies with evidence, psychologist or mental health professionals, scale or questionnaire, personal experiences or histories, DSM criteria, national guidelines, or not indicated; (g) was there an academic link? Yes or no; (h) did they own websites associated with the project? Yes or no; (i) did the descriptions include references to privacy, data security, and medical devices? Yes or no.

## Method

We conducted a systematic search using a descriptive strategy. As a reference, we used previous studies (Lau et al., 2020; Radovic et al., 2016; Shen et al., 2015) to define the information retrieval strategy and categorization of applications. The review focused on Google Play Store because it was the main platform for the dissemination of applications aimed at psychological health

(Research2guidance, 2017). Moreover, Android devices, which host the Google Play Store platform, account for 85% of Spain's market share (Statista, 2020).

Inclusion criteria for the apps were (a) having a description in Spanish or English, although the search was conducted in Spanish and from Spain, English was included because it was the dominant language on the Internet (Statista, 2017), we expected to have a high proportion of results in English, and the team thought that removing English records would result in a loss of relevant information; and (b) relevant to the psychological disorder defined by the search keyword from the perspective of a mental health consumer. Excluded were those applications (a) whose URL did not work at the time of data extraction, (b) were duplicates, (c) whose descriptions were not in Spanish or English, and (e) were not relevant to the supposed psychological disorder. Figure 1 illustrates the selection flow.



**Figure 1.** PRISMA 2020 flow diagram of the Android mobile applications retrieved at Spanish Google Play Store

Note: a Exclusion of duplicates was applied in this phase because there were duplicated apps that were relevant to one keyword and not for another, and the automatic deletion of duplicated apps in the first phase could lead to a loss of relevant apps.

## Participants

Of the 1,000 URLs retrieved, only 999 were active at the time of retrieval of their information, 226 were duplicates, and after removal of these, 40.23% (311/773) were in English (EN), 52.65% (407/773) were in Spanish (SP), and only 7.12% (55/773) were in other languages. After removal of non-Spanish or non-English ones (55) only 46.93% (337/718) were categorized as relevant to the specific search topic. Among these, the proportion by language was 50.74% (171/337) and 49.26% (166/337) apps with description in Spanish and English, respectively.

## Instruments

A codebook was elaborated to code each variable using the matrix structure described in a previous codebook by Radovic et al. (2016) and updating it according to the research interests of the team. (See final coding book to variable description: [https://osf.io/f9k7h/?view\\_only=74fb5cd54618423a820163f326644be6](https://osf.io/f9k7h/?view_only=74fb5cd54618423a820163f326644be6))

The scraping web software *ScrapeStorm* (2021) was used to automatically recover all observational data available in the application profiles on the Google Play Store: name of the application, web address, developer, category, price, content rating, rating, number of ratings, description, date of the last update, number of downloads, and size.

## Procedure

During the last two weeks of February and the first two weeks of March 2021, 20 Spanish keywords were used to manually retrieve 50 mobile applications' web addresses (URLs) for each keyword from Google Play Store's general application section: anxiety, social anxiety, obsessive compulsive disorder, depression, bulimia, anorexia, mental health, psychological treatment, bipolar disorder, schizophrenia, trauma, school trauma, post-traumatic stress disorder, childhood trauma, bullying, personality disorder, autism, attention-deficit/hyperactivity disorder, phobia, and mutism. Ten of these keywords were the same as those used by Radovic et al. (2016) (mental health, depression, anxiety, schizophrenia, bipolar disorder, trauma, school trauma, post-traumatic stress disorder, childhood trauma, and bullying). The other ten were included based on the interests of the research team. The URL extraction was limited to 50 per keyword due to technical limitations, but the number was considered sufficient considering that consumers do not typically go below the 10th result for a search (Dogruel et al., 2014).

After information extraction, first, the main researcher went through the language description and coded applications according to the language: Spanish, English, or other languages. Subsequently, each keyword was searched for, in both English and Spanish, in the title and description of the applications using a search function in Microsoft Excel 365. (See workbook to function description: [https://osf.io/f9k7h/?view\\_only=74fb5cd54618423a820163f326644be6](https://osf.io/f9k7h/?view_only=74fb5cd54618423a820163f326644be6)). Then, the main investigator evaluated the relevance of each app for the psychological disorder, which was searched, to exclude those that were irrelevant.

To evaluate the consistency of relevant classification, after evaluating the first 150 applications, the same reviewer reassessed a random sample of 38 items (25.33%, 38/150), obtaining a high Cohen's kappa index ( $\kappa=.87$ ) for a 95% confidence level ( $\alpha=.05$ ;  $SE=0.086$ ;  $CI_k$  at 95%=0.704-1.042). Two weeks after the categorization of all variables was completed, the same reviewer performed a new intra-observer reliability analysis with a random sample of 85 applications (25.2%, 85/337), obtaining a high average Cohen's kappa index ( $\kappa=.84$ ) for a 95% confidence level ( $\alpha=.05$ ;  $SE=0.04$ ;  $CI_k$  at 95%=0.671-1.008).

## Data Analysis

Descriptive analysis of the data was performed using Microsoft Excel 365 and SPSS version 25 statistical software. To evaluate intra-observer reliability, Cohen's kappa was calculated using Real Statistics Resource Pack software (Zaiontz, 2021).

To evaluate the existence of statistically significant differences ( $p<.05$ ) between the variables and the languages defined (Spanish and English), Pearson's chi-square tests were carried out. Similar analysis was done for the main purpose and source of information.

## Results

Of the 1,000 URLs retrieved, only one was lost during the extraction of information because its link stopped working; 63 were not written in Spanish or English; and 556 were irrelevant. Of the remaining relevant 380 applications in Spanish and English, 43 were duplicates, which resulted in a sample size of 337 relevant apps. Among these, 50.74% (171/337) and 49.26% (166/337) had their description in Spanish, and English, respectively; 23.15% (78/337; 11.27% SP; 11.86% EN) failed to mention search keywords in the title or description.

Regarding keywords used to retrieve applications, as shown in Table 1, only autism had 84% (42/50) relevant applications in Spanish, followed by anxiety (58%; 29/50), and mental health (50%; 25/50). If we include applications in English for autism had 94% (47/50) and attention-deficit/hyperactivity disorder had 76% (38/50; 11 SP; 27 EN) of the relevant applications, followed by anxiety and mental health, both 64% (32/50). Disorders with less relevant applications were mutism (2%, 1/50 SP), childhood trauma (2%; 1/50 EN), bullying (6% 3/50; 2 SP; 1 EN), and schizophrenia (14% 7/50; 2 SP; 5 EN), with interesting differences in proportion between Spanish (0%) and English (36%; 18/50) results for anxiety disorders that obtained no relevant applications in Spanish.

### Characteristics of the Relevant Applications

We evaluated whether there were statistically significant differences in the general characteristics of relevant applications between the results obtained in English and Spanish. Except for age group (Pan European Game Information [PEGI]) and year of

update, the rest of the characteristics showed statistically significant differences ( $p < .05$ ) between the results obtained in Spanish and English. The applications in Spanish had a higher proportion of applications with more than 10,000 downloads ( $p = .008$ ), a score higher than 4.1 ( $p = .004$ ), and 500 or more reviews ( $p = .000$ ), as shown in Table 2.

More than half of the applications (62.3%; 210/337) obtained 3.1 to 5 point ratings, although 57.6% (194/337) had 5,000 or less downloads and 59.06% (101/337) had no ratings. Around 60% (202/337) were up to date and updated in the last two years (2020, 2021). The most common Play Store categories were health and wellness with 45.99% (155/337; 77/171 SP; 78/166 EN), followed by medicine (16.62%; 56/337) and education (13.95%; 47/337). Although in Spanish results, education (17.54%; 30/171) had a higher proportion than medicine (10.53%; 18/171).

Among the characteristics coded manually by the researchers, we only found statistically significant differences in the type of audience ( $p = .006$ ) (Table 3). Generally, the majority were written in a neutral tone (79.59%; 38.27% SP; 41.12% EN) and were consumer-friendly (99.7%; 50.74% SP; 48.82% EN). Most were free (67.06%; 32.04% SP; 34.91% EN), with only 23.67% (13.91% SP; 9.76% EN) of applications offering their content partially for payment (freemium) and 9.17% (4.73% SP; 4.44% EN) requiring payment before downloading or using their services. Academic linkage was anecdotal, with only 11 apps (3.25%; 1.45% SP; 1.78% EN) being associated with a university institution or research project, and only 2 (0.59% EN) mentioned medical device certification. The finding was similar for the mention of legal advice (1.18%, 0.59% SP, and 0.59% EN) and confidentiality or privacy (16.27%, 8.88% SP, and 7.40% EN) in the description.

**Table 1.**  
Number of applications per search term.

Psychological disorders <sup>a</sup>	T_ES	SP <sup>b</sup>	Rel_ES	Rel_SP <sup>b</sup>	T_ESEN	SPEN <sup>b</sup>	Rel_SPEN	Rel SPEN <sup>b</sup>
	n	%	N	%	n	%	n	%
Anorexia	21	42	0	0.0	49	98	18	36.0
Anxiety	45	90	29	58.0	49	98	32	64.0
Attention-deficit/hyperactivity disorder	13	26	11	22.0	44	88	38	76.0
Autism	42	84	42	84.0	47	94	47	94.0
Bipolar disorder	20	40	8	16.0	49	98	28	56.0
Bulimia	23	46	2	4.0	49	98	15	30.0
Bullying	27	54	2	4.0	49	98	3	6.0
Childhood trauma	38	76	0	0.0	50	100	1	2.0
Depression	42	86	22	44.9	49	100	25	51.0
Mental health	40	80	25	50.0	47	94	32	64.0
Mutism	37	74	1	2.0	47	94	1	2.0
Obsessive compulsive disorder	21	42	5	10.0	41	82	19	38.0
Personality disorder	9	18	2	4.0	45	90	23	46.0
Phobia	24	48	8	16.0	43	86	13	26.0
Post-traumatic stress disorder	19	38	3	6.0	48	96	19	38.0
Psychological treatment	36	72	20	40.0	41	82	24	48.0
Schizophrenia	33	66	2	4.0	45	90	7	14.0
School trauma	39	78	5	10.0	50	100	5	10.0
Social anxiety	26	52	6	12.0	45	90	14	28.0
Trauma	8	16	1	2.0	49	98	16	32.0

Note. N=999 (n=50 for each keyword, except depression n=49); T\_SP and T\_SPEN, applications were obtained for each psychological disorder in Spanish (SP) and for the sum of Spanish and English (SPEN); Rel\_SP, number of relevant applications for each psychological disorder obtained in Spanish; Rel\_SPEN, number of relevant applications for each psychological disorder obtained in both Spanish (SP) and English (EN)

<sup>a</sup> Search was made in Spanish

<sup>b</sup> % calculated over the initial screened n=50 applications for each keyword, except for depression, n=49.

**Table 2.**  
General characteristics of mobile applications retrieved from Google Play Store.

	SP		EN		TOTAL		<i>p</i> <sup>d</sup>
	n	%	n	%	n	%	
Age groups <sup>c</sup>							.385
PEGI 3	161	47.8	157	46.6	318	94.36	
PEGI 12	4	1.18	4	1.18	8	2.37	
Parental Control	5	1.48	2	0.59	7	2.07	
PEGI 18	0	0.00	2	0.59	2	0.59	
PEGI 16	1	0.30	0	0.00	1	0.30	
PEGI 7	0	0.00	1	0.30	1	0.30	
Number of downloads <sup>e</sup>							.008
1+	1	0.30	1	0.30	2	0.59	
5+	0	0.00	1	0.30	1	0.30	
10+	4	1.18	6	1.78	10	2.96	
50+	4	1.18	4	1.18	8	2.37	
100+	17	5.04	28	8.28	45	13.35	
500+	14	4.14	16	4.73	30	8.88	
1000+	31	9.17	39	11.54	70	20.71	
5000+	12	3.55	16	4.73	28	8.28	
10000+	32	9.47	37	10.95	69	20.41	
50000+	12	3.55	7	2.07	19	5.62	
100000+	23	6.80	9	2.66	32	9.47	
500000+	8	2.37	0	0.00	8	2.37	
1000000+	11	3.25	2	0.59	13	3.85	
5000000+	1	0.30	0	0.00	1	0.30	
10000000+	1	0.30	0	0.00	1	0.30	
User rating							.004
0 – 1	33	9.79	55	16.27	88	26.11	
1.1 – 2	3	0.89	3	0.89	6	1.78	
2.1 – 3	14	4.14	19	5.62	33	9.76	
3.1 – 4	49	14.50	49	14.50	98	28.99	
4.1 – 5	72	21.30	40	11.83	112	33.14	
Year of last update <sup>a</sup>							.075
2017	11	3.25	13	3.85	24	7.10	
2018	14	4.14	22	6.51	36	10.65	
2019	23	6.80	27	7.99	50	14.79	
2020	65	19.28	66	19.53	131	38.87	
2021	46	13.61	25	7.40	71	21.01	
Number of ratings <sup>c</sup>							.000
0+	101	29.97	134	39.64	235	69.73	
100+	25	7.40	17	5.03	42	12.43	
500+	11	3.25	6	1.78	17	5.03	
1000+	16	4.73	5	1.48	21	6.21	
5000+	6	1.78	2	0.59	8	2.37	
10000+	12	3.55	2	0.59	14	4.14	
Categories <sup>b</sup>							.043
Health and Wellness	77	22.84	78	23.08	155	45.99	
Medicine	18	5.33	38	11.24	56	16.57	
Education	30	8.88	17	5.03	47	13.91	

Note. n=337; SP: Spanish; EN: English.

<sup>a</sup> The years 2011, 2012, 2013, 2014, 2015 and 2016, obtained 3% or less.<sup>b</sup> The categories Entertainment, Lifestyle, Books & Reference, Educational, Communication, Tools, Parenting, Productivity, Adventure, Home & Home, Dating, News & Magazines, Simulation, and Social scored 5% or less.<sup>c</sup> “+” refers to “equal or greater”.<sup>d</sup> Pearson's X2 test for independence.<sup>e</sup> Pan European game information (PEGI).

**Table 3.**  
Manually coded characteristics of general mobile applications.

	SP		EN		TOTAL		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Audience <sup>a</sup>							.007 <sup>b</sup>
General	137	40.65	146	43.20	283	83.98	
Individual with disorder	31	9.17	10	2.96	41	12.13	
Language tone							.079 <sup>c</sup>
Neutral	129	38.27	139	41.12	268	79.53	
Optimistic	42	12.43	27	7.99	69	20.41	
Ease of understanding							.493 <sup>c</sup>
Consumer friendly	171	50.74	165	48.82	336	99.70	
Medical language	0	0.00	1	0.30	1	0.30	
Cost							.240 <sup>b</sup>
Free	108	32.04	118	34.91	226	67.06	
Price	16	4.73	15	4.44	31	9.17	
Freemium	47	13.91	33	9.76	80	23.67	
Legal notice mention							1.000 <sup>c</sup>
Yes	2	0.59	2	0.59	4	1.18	
No	169	50.14	164	48.52	333	98.81	
Confidentiality or privacy mention							.559 <sup>c</sup>
Yes	30	8.88	25	7.40	55	16.27	
No	141	41.83	141	41.72	282	83.68	
Web project							.227 <sup>c</sup>
Yes	66	19.53	75	22.19	141	41.72	
No	105	31.15	91	26.92	196	58.16	
Academic linkage							.768 <sup>c</sup>
Yes	5	1.48	6	1.78	11	3.26	
No	166	49.25	160	47.34	326	96.74	
Medical Device							.242 <sup>c</sup>
Yes	0	0	2	0.59	2	0.59	
No	171	50.7	164	48.66	335	99.41	

Note. *n*=337; SP: Spanish; EN: English.

<sup>a</sup> The categories psychologist, family, student in school, student psychology, friends, employers, nurses, unspecified, parents, PAP, medical professionals in general, medical professionals-trainees, and teachers scored 2% or less.

<sup>b</sup> Pearson's  $\chi^2$  test for independence.

<sup>c</sup> Fisher's exact test (bilateral side)

As can be seen in Table 4, differences between proportions of apparent purpose or aim were significant ( $p=.002$ ), with a higher proportion of self-applied treatment in Spanish results and more educational and self-diagnosis in English results. There were no significant differences between the source of information; the most common was applications that did not include any reference to the source of the content (69.44%; 37.38% SP; 31.95% EN), and only 10.65% reported therapies with evidence (4.44% SP; 6.21% EN).

Although there was a low proportion of applications that mentioned therapies with evidence (10.7%; 36/337) and those supported by health professionals (8.3%;28/337), there was a significant positive relationship between the purpose and the information source ( $\chi^2_{42}=224.68$ ;  $p=.000$ ) with a higher proportion of therapies with evidence (14.5%; 26/179), and with health professionals behind (10.1%; 18/179), in self-applied treatment applications than in the other sources of information (DSM criteria [1.7%]; National Guidelines [1.1%]; Personal histories [4.5%], or

Questionaries [0%]). However, this proportion was far from those that did not indicate the source of the information they provided (68.2%; 122/179).

## Discussion

To our knowledge, this is the first review of the Spanish commercial telepsychological Android market that evaluates the main characteristics of the offers a consumer can find when looking for mobile applications related to psychological disorders in Spain. Following previous studies (Lau et al., 2020; Radovic et al., 2016; Shen et al., 2015), this research has analyzed the descriptions of the first 50 applications retrieved for 20 common mental health terms searched on Google Play Store, the main platform for the dissemination of this type of application (Research2Guidance, 2017), to offer a wide perspective of the Spanish telepsychological Android market.

**Table 4.**  
Mobile applications' apparent purpose and source of information.

	SP	SP	EN	EN	TOTAL	TOTAL	<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%	
Apparent purpose or aim <sup>a</sup>							.002 <sup>d</sup>
Self-applied treatment	100	29.59	79	23.37	179	52.96	
Education	32	9.49	55	16.27	87	25.82	
Self-diagnosis	12	3.55	18	5.33	30	8.88	
Source of information							.081 <sup>d</sup>
Not indicated	126	37.38	108	31.95	234	69.44	
Therapies with evidence	15	4.44	21	6.21	36	10.65	
Psychologists or mental health professionals	16	4.73	12	3.55	28	8.28	
Scale or questionnaire	6	1.78	7	2.07	13	3.85	
Personal experiences or histories	6	1.78	5	1.48	11	3.25	
DSM criteria	1	0.30	9	2.66	10	2.96	
National guidelines	1	0.30	4	1.18	5	1.48	

Note. *n*=337; SP: Spanish; EN: English.

<sup>a</sup> Apparent purposes: Online treatment with psychologist; Mixed Tra: self-help + online treatment with psychologist; social support; app for professionals; capture clients/patients; scored 3% or less.

<sup>d</sup> Pearson's X<sup>2</sup> test for independence.

Of the total 1,000 apps retrieved for the 20 chosen keywords, only 43.59% (337/773) met the inclusion criteria. In other words, almost six out of ten apps that users find on Google Play Store are not related to the psychological problem they were looking for. In spite of conducting the search from Spain and with Spanish keywords, only 50.7% (171/337) of the relevant apps were in Spanish. This means that a Spanish user with no English proficiency has a 22.12% (171/773) probability of finding an app corresponding to the search term. These results, although far from those obtained by Radovic et al. (2016) in the English-speaking market which retrieved 69.33% of relevant apps in the native language from the store they were looking for, are similar to those obtained by Lau et al. (2020) for wellness and stress-related applications (31%).

However, results are so different for different keywords that a Spanish citizen with no knowledge of English will have little chance of finding a relevant application for 19 of the 20 psychological disorder related terms entered in the Google Play Store search. Only the keywords with autism had 84% (42/50) of relevant applications in Spanish. Bilingual users, or those with sufficient proficiency in English, in addition to relevant results for the keyword autism (94%), can find applications relevant to attention-deficit/hyperactivity disorder (76%). Based on these results, we found bipolar disorder having 16% of relevant applications in Spanish, a percentage similar to that obtained by Nicholas et al. (2015) in the English-speaking market (19%). If we focus on the disorder of depression, in our study, 25 relevant applications were obtained (51%), of which 22 were in Spanish (44%), and 3 in English, a higher percentage than that obtained by Shen et al. (2015), who obtained 24% of relevant applications for this behavioral disorder in the English-speaking market. The idiosyncrasies of each market may be explained by the differences in interests, demand, and development of this type of applications.

There were also very few applications with academic links (3.25%), or with references to the origin of the information

(30.56%), with only 10.65% of relevant applications having references to therapies with empirical evidence, a lower value than that obtained by Sucala et al. (2017) (26.9%), or by Marshall et al. (2020a) (55.3%). This point is worrying given that most of the apps target a general audience (83.98%), and 52.98% of them offer treatment recommendations or self-help programs to manage psychological disorders, a similar finding as by other authors for the English-speaking market. Radovic et al. (2016) found 41% of apps for symptom relief, Shen et al. (2015) found 33.7% of apps for therapeutic treatment, and Nicholas et al. (2015) found 43% of apps for symptom monitoring. Furthermore, we found the follow-up or occasional support of a therapist as anecdotal, in line with the findings by Lau et al. (2020), with only 3.26% of applications offering online therapy or mixed treatment (2.97%), which combined self-help with psychologist support. This is despite the indication by previous research that the presence of a therapist improves patient adherence (Henson et al., 2019; Lau et al., 2020; Torous et al., 2020). This is relevant if we consider that non-adherence is one of the main problems of treatment with mobile applications (Bauer et al., 2020; Carlo et al., 2019; Huckvale et al., 2020; Linardon & Fuller-Tyszkiewicz, 2020; Ng et al., 2019) and few consumers use them for a sufficiently long period for them to be effective (Baumel et al., 2019).

However, the presence of mental health professionals involved in the development of this type of application does not seem to influence the motivation for their installation (Pinheiro et al., 2019), because other aspects, such as user-friendliness, aesthetics, user experience (Schueller et al., 2018), or application popularity (Gu et al., 2017) are determinants in their adoption. In that sense, the results suggest that developers use a neutral tone (79.59%) and a consumer-friendly style (99.7%), with a clear commitment to the general public (83.98%) and offer free apps (67.09%), similar findings as those by Radovic et al. (2016). Nonetheless, the high proportion of applications with a low number of downloads

(57.6% have less than 5000 downloads) and evaluations (69.7% have less than 100 reviews) seem to be common problems for this type of mobile application, which makes this market unstable with an app disappearing every three days (Larsen et al., 2016). This may be related to the fact that almost 60% of the analyzed applications have been updated in the last two years, which is also shown by Shen et al. (2015).

Few applications referred to privacy or confidentiality policies (16.27%), and fewer included legal notice (1.18%) in their descriptions. This is a general problem given that previous research also obtained a low proportion of legal advice (12%) or confidentiality mention (9%) in the English-speaking market (Radovic et al., 2016). These two elements are particularly important for consumers (Accenture Consulting, 2020) and their absence has a negative influence on their intention to disregard (Gu et al., 2017). In this regard, only two applications mentioned that they were registered as medical devices, although, all the applications categorized as self-applied treatment (52.96%) could be considered such because they have functions such as prevention, control, alleviation, diagnosis, or relief (Gómez-Abril, 2018). This is a requirement that app platforms or governments should demand, as it is done in Germany with their Digital Health Application Regulation (Digitale Gesundheitsanwendungen-Verordnung–DiGAV) (Herzog, n.d.; Sauermann et al., 2022), given the sensitive nature of the personal data that may be processed. It is also necessary to assess the health hazard implications for users when the information is erroneous, obtained from pseudo-therapies, or based on personal experiences and not on scientific evidence, as is the case with Internet-based information (Benigeri & Pluye, 2003). This is even though, as in the English-speaking market (Nicholas et al., 2015; Radovic et al., 2016), most of them are available in the health and wellness and medicine categories, which can generate confusion for the consumer.

Future research should evaluate telepsychological applications in concrete disorders, including the downloading and testing of these tools, as other studies have done (Kertz et al., 2017; Nicholas et al., 2015; O'Loughlin et al., 2019), to evaluate the quality of the content and their adherence to treatment guidelines and their impact on the users/patient's health. It would be interesting to evaluate the influence that the volume of previous downloads or number of ratings has on the adoption of telepsychological mobile applications among the Spanish population, as these two variables play an important role especially in the Google Play Store market (Strzelecki, 2020). Likewise, it would be relevant to determine if there is interest among Spanish patients with psychological disorders to use this kind of tools (Torous, Wisniewski et al., 2018), in the same way as among the psychologists (González-Peña et al., 2017).

It is worth mentioning that the data from this study should be considered with limitations in mind. The search for apps is limited by the descriptions and Google's search algorithms when returning results, which makes their reproducibility difficult but allows the comparison between the markets and evaluation of the evolution of the same. In addition, the coding was based solely on descriptions, without downloading or testing the apps, similar to other studies (Lau et al., 2020; Radovic et al., 2016; Shen et al., 2015; Sucala et al., 2017). The categorization, despite being carried out following a previously elaborated coding

book, contains a certain degree of subjectivity. Additionally, the calculated concordance indexes were intra-observer, i.e., the same researcher evaluated the same applications on different occasions. The time in which the review was carried out should not be overlooked. The Covid-19 pandemic may have influenced both the supply of applications and the search results due to the forced surge of all types of telehealth services (Accenture Consulting, 2020).

Despite the limitations mentioned above, the data collected in this research offers an overview of the Spanish Android market for telepsychological applications, which could be considered an immature market. Even though the search was conducted in Spanish, half of the relevant applications were in English. Regarding the integration of this type of tool in psychological therapy, the low percentage of relevant applications corresponding to the search terms, high prevalence of self-help apps, absence of references on the origin of the information presented, academic support, or lack of medical device certifications invites consumers and professionals to recommend caution in adopting these applications in the treatment of any psychological disorder (Alyami et al., 2017; Lau et al., 2020; Nicholas et al., 2015). Most importantly, it is the responsibility of the therapist to guide patients and be up-to-date when incorporating telepsychology services (American Psychological Association, 2013). Nonetheless, the fact that the proportion of applications, whose information refers to therapies with evidence, is greater in treatment-related applications, as also reported by Shen et al. (2015), is a wink of hope. This indicates that despite the general shortcomings and risks involved in using this type of applications, there is a part that offer promising applications (Lecomte et al., 2020) whose effectiveness must be analyzed, evaluated, and contrasted, as randomized controlled trials of mental health apps have high dropout rates that present a threat to their validity (Torous et al., 2020).

## References

- Accenture Consulting. (2020). *Digital Health Consumer Survey 2020, US Findings*. [https://www.accenture.com/\\_acnmedia/PDF-130/Accenture-2020-Digital-Health-Consumer-Survey-US.pdf](https://www.accenture.com/_acnmedia/PDF-130/Accenture-2020-Digital-Health-Consumer-Survey-US.pdf)
- Alyami, M., Giri, B., Alyami, H., & Sundram, F. (2017). Social anxiety apps: A systematic review and assessment of app descriptors across mobile store platforms. *Evidence-Based Mental Health*, 20(3), 65–70. <https://doi.org/10.1136/eb-2017-102664>
- American Psychological Association. (2013). Guidelines for the practice of telepsychology. *American Psychologist*, 68(9), 791–800. <https://doi.org/10.1037/a0035001>
- Bauer, M., Glenn, T., Geddes, J., Gitlin, M., Grof, P., Kessing, L. v., Monteith, S., Faurholt-Jepsen, M., Severus, E., & Whybrow, P. C. (2020). Smartphones in mental health: a critical review of background issues, current status and future concerns. *International Journal of Bipolar Disorders*, 8(1), 1–19. <https://doi.org/10.1186/s40345-019-0164-x>
- Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective user engagement with mental health apps: Systematic search and panel-based usage analysis. *Journal of Medical Internet Research*, 21(9), Article e14567. <https://doi.org/10.2196/14567>



- Benigeri, M., & Pluye, P. (2003). Shortcomings of health information on the Internet. *Health Promotion International*, 18(4), 381–386. <https://doi.org/10.1093/HEAPRO/DAG409>
- Bhugra, D., Tasman, A., Pathare, S., Priebe, S., Smith, S., Torous, J., Arbuckle, M. R., Langford, A., Alarcón, R. D., Chiu, H. F. K., First, M. B., Kay, J., Sunkel, C., Thapar, A., Udomratn, P., Baingana, F. K., Kestel, D., Ng, R. M. K., Patel, A., ... Ventriglio, A. (2017). The WPA-Lancet Psychiatry Commission on the Future of Psychiatry. *The Lancet Psychiatry*, 4(10), 775–818. [https://doi.org/10.1016/S2215-0366\(17\)30333-4](https://doi.org/10.1016/S2215-0366(17)30333-4)
- Bush, N. E., Armstrong, C. M., & Hoyt, T. v. (2019). Smartphone apps for psychological health: A brief state of the science review. *Psychological Services*, 16(2), 188–195. <https://doi.org/10.1037/ser0000286>
- Carlo, A. D., Hosseini Ghomi, R., Renn, B. N., & Areán, P. A. (2019). By the numbers: ratings and utilization of behavioral health mobile applications. *Nature Partner Journals Digital Medicine*, 2, 54. <https://doi.org/10.1038/s41746-019-0129-6>
- Clay, R. (2021). Mental health apps are gaining traction. *Monitor on Psychology*, 52(1), 55. <https://www.apa.org/monitor/2021/01/trends-mental-health-apps>
- Ditrendia. (2020). *Mobile en España y en Mundo 2020* [Mobile in Spain and in the World 2020]. <https://ditrendia.es/informe-mobile-2020/>
- Dogruel, L., Joeckel, S., & Bowman, N. D. (2014). Choosing the right app: An exploratory perspective on heuristic decision processes for smartphone app. *Mobile Media & Communication*, 3(1), 125–144. <https://doi.org/10.1177/2050157914557509>
- Firth, J., Torous, J., Nicholas, J., Carney, R., Prapat, A., Rosenbaum, S., & Sarris, J. (2017). The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. *World Psychiatry*, 16(3), 287–298. <https://doi.org/10.1002/wps.20472>
- Firth, J., Torous, J., Nicholas, J., Carney, R., Rosenbaum, S., & Sarris, J. (2017). Can smartphone mental health interventions reduce symptoms of anxiety? A meta-analysis of randomized controlled trials. *Journal of Affective Disorders*, 218, 15–22. <https://doi.org/10.1016/j.jad.2017.04.046>
- Gómez-Abril, J. (2018, February 22). *La App como producto sanitario* [The App as a medical device] [Conference presentation abstract]. MHealth BCN Conference, Barcelona, España. <https://www.fundacionisis.org/es/blogs/profesional/profesional/399-la-app-como-producto-sanitario-mhealth-bcn-conference>
- González-Peña, P., Torres, R., Barrio, V. del, & Olmedo, M. (2017). Uso de las nuevas tecnologías por parte de los psicólogos españoles y sus necesidades [Use of new technologies by Spanish psychologists and their needs] *Clinica y Salud*, 28(2), 81–91. <https://doi.org/10.1016/j.clysa.2017.01.001>
- Gu, J., Xu, Y. (Calvin), Xu, H., Zhang, C., & Ling, H. (2017). Privacy concerns for mobile app download: An elaboration likelihood model perspective. *Decision Support Systems*, 94, 19–28. <https://doi.org/10.1016/j.dss.2016.10.002>
- Henson, P., Wisniewski, H., Hollis, C., Keshavan, M., & Torous, J. (2019). Digital mental health apps and the therapeutic alliance: initial review. *British Journal of Psychiatry Open*, 5(1). <https://doi.org/10.1192/BJO.2018.86>
- Herzog, R. (n.d.). The new digital health law in Germany turning point or flash in the pan? *Research2Guidance*. <https://research2guidance.com/the-new-digital-health-law-in-germany-turning-point-or-flash-in-the-pan/>
- Huckvale, K., Nicholas, J., Torous, J., & Larsen, M. E. (2020). Smartphone apps for the treatment of mental health conditions: status and considerations. *Current Opinion in Psychology*, 36, 65–70. <https://doi.org/10.1016/j.copsyc.2020.04.008>
- Kertz, S. J., MacLaren Kelly, J., Stevens, K. T., Schrock, M., & Danitz, S. B. (2017). A Review of Free iPhone Applications Designed to Target Anxiety and Worry. *Journal of Technology in Behavioral Science*, 2(2), 61–70. <https://doi.org/10.1007/s41347-016-0006-y>
- Larsen, M. E., Nicholas, J., & Christensen, H. (2016). Quantifying App Store Dynamics: Longitudinal Tracking of Mental Health Apps. *Journal of Medical Internet Research mHealth and uHealth*, 4(3), e96. <https://doi.org/10.2196/mhealth.6020>
- Lau, N., O'Daffer, A., Colt, S., Joyce, M., Yi-Frazier, J., Palermo, T. M., Mccauley, E., & Rosenberg, A. (2020). Android and iPhone Mobile Apps for Psychosocial Wellness and Stress Management: Systematic Search in App Stores and Literature Review. *Journal of Medical Internet Research mHealth and uHealth*, 8(5). <https://doi.org/10.2196/17798>
- Lecomte, T., Potvin, S., Corbière, M., Guay, S., Samson, C., Cloutier, B., Francoeur, A., Pennou, A., & Khazaal, Y. (2020). Mobile apps for mental health issues: Meta-review of meta-analyses. *Journal of Medical Internet Research mHealth and uHealth*, 8(5), Article e17458. <https://doi.org/10.2196/17458>
- Linardon, J., Cuijpers, P., Carlbring, P., Messer, M., & Fuller-Tyszkiewicz, M. (2019). The efficacy of app-supported smartphone interventions for mental health problems: a meta-analysis of randomized controlled trials. *World Psychiatry*, 18(3), 325–336. <https://doi.org/10.1002/wps.20673>
- Linardon, J., & Fuller-Tyszkiewicz, M. (2020). Attrition and adherence in smartphone-delivered interventions for mental health problems: A systematic and meta-analytic review. *Journal of Consulting and Clinical Psychology*, 88(1), 1–13. <https://doi.org/10.1037/ccp0000459>
- Marshall, J. M., Dunstan, D. A., & Bartik, W. (2020a). Clinical or gimmickal: The use and effectiveness of mobile mental health apps for treating anxiety and depression. *Australian and New Zealand Journal of Psychiatry*, 54(1), 20–28. <https://doi.org/10.1177/0004867419876700>
- Marshall, J. M., Dunstan, D. A., & Bartik, W. (2020b). Apps With Maps-Anxiety and Depression Mobile Apps with Evidence-Based Frameworks: Systematic Search of Major App Stores. *Journal of Medical Internet Research Mental Health*, 7(6), Article e16525. <https://doi.org/10.2196/16525>
- Martín Fernández, A., Marco Cuenca, G., & Antonio Salvador Oliván, J. (2020). Evaluación y Acreditación de las Aplicaciones Móviles Relacionadas con la Salud [Evaluation and Accreditation of Mobile Applications Related to Health]. *Revista Española de Salud Pública*, 94(11 de agosto). [https://www.mscbs.gob.es/biblioPublic/publicaciones/recursos\\_propios/resp/revista\\_cdrom/VOL94/C\\_ESPECIALES/RS94C\\_202008085.pdf](https://www.mscbs.gob.es/biblioPublic/publicaciones/recursos_propios/resp/revista_cdrom/VOL94/C_ESPECIALES/RS94C_202008085.pdf)
- Miralles, I., Granell, C., Díaz-Sanahuja, L., van Woensel, W., Bretón-López, J., Mira, A., Castilla, D., & Casteleyn, S. (2020). Smartphone apps for the treatment of mental disorders: Systematic review. *Journal of Medical Internet Research mHealth and uHealth*, 8(4), Article e14897. <https://doi.org/10.2196/14897>
- Mohr, D. C., Burns, M. N., Schueller, S. M., Clarke, G., & Klinkman, M. (2013). Behavioral Intervention Technologies: Evidence review

- and recommendations for future research in mental health. *General Hospital Psychiatry*, 35(4), 332–338.  
<https://doi.org/10.1016/j.genhosppsy.2013.03.008>
- Neary, M., & Schueller, S. M. (2018). State of the Field of Mental Health Apps. *Cognitive and Behavioral Practice*, 25(4), 531–537.  
<https://doi.org/10.1016/j.cbpra.2018.01.002>
- Ng, M. M., Firth, J., Minen, M., & Torous, J. (2019). User engagement in mental health apps: A review of measurement, reporting, and validity. *Psychiatric Services*, 70(7), 538–544.  
<https://doi.org/10.1176/APPI.PS.201800519/ASSET/IMAGES/LARGE/APPI.PS.201800519F1.JPEG>
- Nicholas, J., Larsen, M. E., Proudfoot, J., & Christensen, H. (2015). Mobile Apps for Bipolar Disorder: A Systematic Review of Features and Content Quality. *Journal of Medical Internet Research*, 17(8), Article e4581. <https://doi.org/10.2196/JMIR.4581>
- O’Loughlin, K., Neary, M., Adkins, E. C., & Schueller, S. M. (2019). Reviewing the data security and privacy policies of mobile apps for depression. *Internet Interventions*, 15, 110–115.  
<https://doi.org/10.1016/j.invent.2018.12.001>
- Pinheiro, M., Serra, M., & Pereira-Azevedo, N. (2019). Predictors of the Number of Installs in Psychiatry Smartphone Apps: Systematic Search on App Stores and Content Analysis. *Journal of Medical Internet Research Mental Health*, 6(11), Article e15064.  
<https://doi.org/10.2196/15064>
- Poushter, J., Bishop, C., & Chwe, H. (2018). *Social Media Use Continues to Rise in Developing Countries, but Plateaus Across Developed Ones*. Pew Research Center’s Global Attitudes Project.  
<https://www.pewresearch.org/global/2018/06/19/social-media-use-continues-to-rise-in-developing-countries-but-plateaus-across-developed-ones/>
- Prentice, J. L., & Dobson, K. S. (2014). A review of the risks and benefits associated with mobile phone applications for psychological interventions. *Canadian Psychology*, 55(4), 282–290.  
<https://doi.org/10.1037/a0038113>
- Qu, C., Sas, C., Daudén Roquet, C., & Doherty, G. (2020). Functionality of Top-Rated Mobile Apps for Depression: Systematic Search and Evaluation. *Journal of Medical Internet Research Mental Health*, 7(1), Article e15321. <https://doi.org/10.2196/15321>
- Radovic, A., Vona, P. L., Santostefano, A. M., Ciaravino, S., Miller, E., & Stein, B. D. (2016). Smartphone Applications for Mental Health. *Cyberpsychology, Behavior, and Social Networking*, 19(7), 465–470.  
<https://doi.org/10.1089/cyber.2015.0619>
- Research2guidance. (2017). *mHealth Economics 2017 – Current Status and Future Trends in Mobile Health*.  
<https://research2guidance.com/product/mhealth-economics-2017-current-status-and-future-trends-in-mobile-health/>
- Sauermaann, S., Herzberg, J., Burkert, S., & Habetha, S. (2022). DiGA – A Chance for the German Healthcare System. *Journal of European Continuing Medical Education*, 11(1), Article 2014047  
<https://doi.org/10.1080/21614083.2021.2014047>
- Schueller, S. M., Neary, M., O’Loughlin, K., & Adkins, E. C. (2018). Discovery of and interest in health apps among those with mental health needs: Survey and focus group study. *Journal of Medical Internet Research*, 20(6), Article e10141. <https://doi.org/10.2196/10141>
- ScrapeStorm. (2021). AI-Powered Web Scraping Tool & Web Data Extractor. <https://www.scrapestorm.com/>
- Shen, N., Levitan, M. J., Johnson, A., Bender, J. L., Hamilton-Page, M., Jadad, A. R., & Wiljer, D. (2015). Finding a depression app: A review and content analysis of the depression app marketplace. *Journal of Medical Internet Research mHealth and uHealth*, 3(1), Article e3713. <https://doi.org/10.2196/mhealth.3713>
- Statista. (2017). *Solo un 5% del contenido de Internet está en español* [Only 5% of Internet content is in Spanish]. <https://es.statista.com/grafico/11383/solo-un-5-del-contenido-de-internet-esta-en-espanol/>
- Statista. (2020). *¿En qué países es más popular Android y en cuáles Apple?* [In which countries is Android most popular and in which Apple?]. <https://es.statista.com/grafico/22758/cuota-de-mercado-de-los-sistemas-operativos-para-moviles/>
- Strzelecki, A. (2020). Application of Developers’ and Users’ Dependent Factors in App Store Optimization. *International Journal of Interactive Mobile Technologies (IJIM)*, 14(13), 91–106.  
<https://doi.org/10.3991/ijim.v14i13.14143>
- Sucala, M., Cuijpers, P., Muench, F., Cardoso, R., Soflau, R., Dobrean, A., Achimas-Cadariu, P., & David, D. (2017). Anxiety: There is an app for that. A systematic review of anxiety apps. *Depression and Anxiety*, 34(6), 518–525. <https://doi.org/10.1002/da.22654>
- Torous, J., Lipschitz, J., Ng, M., & Firth, J. (2020). Dropout rates in clinical trials of smartphone apps for depressive symptoms: A systematic review and meta-analysis. *Journal of Affective Disorders*, 263, 413–419. <https://doi.org/10.1016/J.JAD.2019.11.167>
- Torous, J., Nicholas, J., Larsen, M. E., Firth, J., & Christensen, H. (2018). Clinical review of user engagement with mental health smartphone apps: Evidence, theory and improvements. *Evidence-Based Mental Health*, 21(3), 116–119. <https://doi.org/10.1136/eb-2018-102891>
- Torous, J., Wisniewski, H., Liu, G., & Keshavan, M. (2018). Mental Health Mobile Phone App Usage, Concerns, and Benefits Among Psychiatric Outpatients: Comparative Survey Study. *Journal of Medical Internet Research Mental Health*, 5(4), Article e11715.  
<https://doi.org/10.2196/11715>
- Zaiontz, C. (2021). *Real Statistics Using Excel* (Release 7.3.3) <https://www.real-statistics.com/>