

Nomophobia in the last decade: a systematic review

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Abstract

Introduction: Nomophobia means fear of running out of cell phone. Today, Nomophobia relates to the fear of running out of any digital resources.

Objective: To review literature on nomophobia from its earliest publications to the present day.

Method: Systematic literature review in the PubMed, Web of Science, PsycInfo, Portal CAPES, LILACS, COCHRANE databases, delimited to the period 2009 - 2019. After analysis of Titles, Abstract and Content, 30 manuscripts portrayed the three perspectives: (a) evolution of the term nomophobia; (b) its consolidation as a Digital Dependency; (c) impacts on human behavior.

Results: A total of 572 articles were initially selected and included in study 30, all of them revealing evolution, characteristics of digital dependence and behavioral impacts.

Discussion: Surveys have evolved geographically from 3 countries (2009 - 2016) to 17 (2017 - 2019), with 7 new scales to measure nomophobia, 13 NMP-Q revalidations, and an increase from 1000 to 13000 volunteers, answering the questionnaires in these two periods. The 30 articles inserted confirmed Nomophobia as digital dependence for its analogous characteristics to other dependencies and shaped behavioral impacts on humans. **Conclusions:** Qualitative, quantitative and geographic evolution, as well as the increase in scale, samples and their new profiles were observed. New approaches reinforced evolution, its profile as a digital addiction and demonstrated their impacts. This study offers a historical perspective on Nomophobia and opens new perspectives on research, such as differences between countries, professions, sexes, allowing a deeper understanding of the subject.

Introduction

Nomophobia stems from NO MOBILE PHOBIA (fear of running out of cell phone) created in the United Kingdom over the past decade and meant the fear of running out of cell phone due to loss, theft or phone connection issues. Today means fear of running out of access to cell phones, the Internet, social networking, messaging applications, which may represent extremely relevant developments in human dynamics including aspects related to psychological disorders associated with Nomophobia.

With the increased use of mobile phones, driven mainly by the mobility afforded by the fusion of the Internet with these mobile devices, the user population has increased exponentially providing a greater likelihood of nomophobic behavior. In addition to quantitative expansion, aspects of human behavior need to be investigated not only for their importance to people's quality of life, but also for possible influences on the collective environments in which they participate.

King, *et al.* [1] defined Nomophobia as a disorder of the modern world that could develop symptoms of anxiety, anxiety and nervousness caused by lack of access to cell phones, computers and other communication devices. In Brazil, in an unpublished Case Report King, *et al.* [2] presented the hypothesis of Nomophobia as digital dependence in an individual with Panic Disorder with Agoraphobia, relating cell phone dependence as an attenuator of the disorder.

Over the past decade, attention to nomophobic behavior has grown exponentially with research in countries like Iran, Italy, Spain, Portugal, India, Cina, Turkey among others, with differentiated approaches, using new measurement scales and analyzing new correlations Darvishi,

et al. [3], Aguilera-Manrique, *et al.* [4], Arpacı, *et al.* [5], Gutiérrez-Puertas, *et al.* [6]. Your investigation as Digital Pathological Addiction is necessary because symptoms such as discomfort, anxiety, anger or stress may emerge similarly in individuals with other types of addiction.

Bragazzi, *et al.* [7] demonstrated that individuals with high Nomophobia scores respond with stress and behavioral disengagement when confronted, revealing insights that require preventive and interventional measures in the population.

Argumosa-Villar, *et al.* [8] also reveal that Nomophobia impacts several areas of life, especially social, professional and academic relationships, due to the dependence on the use of smartphones. In the professional field, Oliveira, *et al.* [9] reported the presence of Nomophobia and its impacts on the organizational level.

The objective of this research was to review the literature on Nomophobia in the last ten years, from three perspectives: (a) the evolution of Nomophobia; (b) your belonging to the Digital Dependency; (c) impacts on human behavior.

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Key words: *nomophoba, digital dependence, smartphones, digital impacts, human behavior, digital technologies*

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Table 1. Quantitative distribution of articles searched

Bases	Found	Withdrawn by Title	For Abstract Analysis	Withdrawn by Abstract	Elegibles	Withdrawn after reading	Included for final Analysis
PubMed	197	143	54	29	25	12	13
LILAC's	01	0	01	01	0	0	0
Cochrane	02	0	02	01	01	01	0
Psycinfo	22	0	22	07	15	10	05
Web of Science	64	22	42	28	14	13	01
Portal Capes	286	143	143	82	61	50	11
Totais	572	308	264	148	116	86	30

Table 2. Quantitative distribution of inserted articles

Bases	Included	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
PubMed	13	03	06	02	0	0	01	0	0	0	01	0
LILAC'S	0	0	0	0	0	0	0	0	0	0	0	0
Cochrane	0	0	0	0	0	0	0	0	0	0	0	0
PsycInfo	05	0	01	01	01	01	0	01	0	0	0	0
Web of Science	01	01	0	0	0	0	0	0	0	0	0	0
P. Capes	11	05	02	02	01	0	01	0	0	0	0	0
Totais	30	09	9	05	02	01	02	01	0	0	01	0

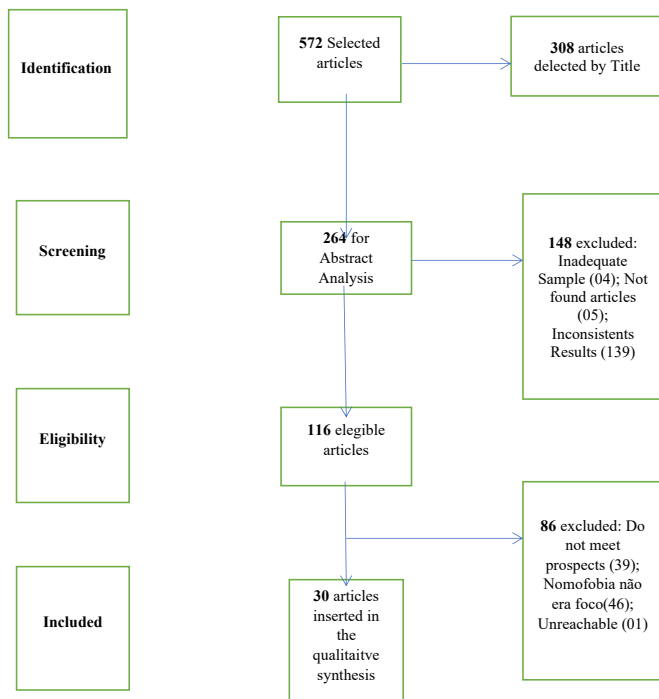


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)

Method

This review was guided by the Preferred Reporting Items for Systematics Reviews and Meta-Analysis (PRISMA) while the keywords were searched at Medical Subject Headings (MeSH) where two were found (digital dependence and smartphones).

We used the PubMed, Web of Science, PsycInfo, Portal CAPES, LILACS and COCHRANE databases, in the English language, from October 2009 to October 2019, with the term Nomophobia, considering the three informed perspectives. The inserted articles are in Figure 1, allowing to identify the mentioned perspectives.

Selected 572 manuscripts. Examined Titles and deleted 308 manuscripts. The remaining (264 manuscripts) were reviewed for

Abstracts. Deleted 148, leaving 116 eligible for reading, with elimination of 86 remaining 30 articles (Tables 1,2).

The study was developed at the Delete Laboratory - Digital Detox and Conscious Use of Technologies, linked to the Institute of Psychiatry of the Federal University of the Rio de Janeiro (IPUB / UFRJ) that treats and guides individuals with evidence of excessive use of technologies that are compromised in personal, professional, social and academic life.

Results

Evolution of the term Nomophobia

New countries are studying this phenomenon, showing geographic expansion and contributing to the increase of articles. New approaches have generated new Nomophobia measurement scales, as well as existing revalidations existing scale such as NMP-Q. Surveyed samples (2017–2019) add up 13,000 volunteers. Compared to 2009 - 2016, with 1100 volunteers, there was an average monthly growth of 4000%. The number of articles inserted for the period 2017-2019 was 23, which corresponds to 77% of the total number of articles inserted (30) in less time than the period 2009 - 2016.

Highlight for analyzes of gender-differentiated nomophobic behaviors Arpaci, *et al.* [10] as gender is considered statistically significant in terms of smartphone-derived habits Anshari, *et al.* [11].

Nomophobia as a Digital Dependency

All 30 articles address Nomophobia as a Digital Dependency, as a modern age phobia, introduced into our lives as a product of interaction between people and mobile information and communication technologies, especially smartphones [12].

Yildiz [13] reveals, in research with 612 students, that there is significant relationship between smartphones addiction and Nomophobia. They may have the same characteristics as long as they are associated with problematic cell phone use. Similar results on the relationship between smartphone use and Nomophobia were found in a survey of 409 students in Malaysia Parasuraman, *et al.* [14].

Trom [15] in a literature review of 117 manuscripts concluded that anxiety, depression and low self-esteem confirm characteristics of Nomophobia as digital dependence

Impacts on Human Behavior

All inserted articles indicate behavioral impacts by Nomophobia, in professional and social activities, in relation to primary disorders, resulting in new interpersonal relationships.

Bartwal, *et al.* [16] point out that Nomophobia is an emerging behavioral problem which needs attention. Increasing awareness regarding the harmful effects of smartphones addiction is needed. In a survey of 451 students, they found 303 with average Nomophobia rates.

Parasuraman, *et al.* [14] innovate by addressing Nomofobia under 8 segments: namely, informed consent form, demographic details, habituation, mobile phone fact and EMR - Electromagnetic Radiation Details, mobile phone awareness education, psychomotor (anxious behavior) analysis, with 409 students, when 78% showed nomophobic symptoms.

Yasan, *et al.* [17] verified 4 dimensions of Nomophobia as: not being able to communicate, losing connectedness, not being able to access information, giving up convenience, in a survey of 141 students who demonstrated adherence to at least two of these dimensions.

The increased use of new technologies and virtual communication involves personal computers, tablets and mobile phones causing changes in daily habits and individual behaviors King, *et al.* [13].

These habits are also in organizations and should be dealt with by Psychology and Psychiatry, given the requirements of companies that oblige the availability of employees at any time and place, so there is a need to take care of the health and well-being of their employees Oliveira, *et al.* [9].

The quantitative distribution of the researched articles (2009-2019) in the 6 academic bases and debugging until inserted articles (Tables 1-3).

Discussion

Evolution of the Nomophobia Term

a) Geographic expansion

Nomophobia production evolved between 2009 and 2019, in two blocks: 2009 to 2016 (8 years) and 2017 to 2019 (less than 3 years). In

Table 3. The following are 30 articles included

Article/Location/Data Base	Objective	Method	Sample/SDF	Evolution	NF=DD	HBI
Elyasi, F <i>et al.</i> , 2018. Iran PubMed	Translate and Validate NMP-Q (Nomophobia Questionnaire)	Englis to Persian, EFA, Varimax Rotation	425 students (Medical Science) Male=187 Female=238	Yes	Yes	Yes
Davishi, M <i>et al.</i> , 2019. Iran PubMed	Investigate dimensions from Nomophobia (NF)	Transversal study with NMP-Questionnaire.	100 students (Medical Sciences).	Four new dimensions of NF	Yes	Anger, Discomfort, Anxiety, Insecurity
Bragazzi, NL <i>et al.</i> , 2019 Italy PubMed	Explore coping styles in nomophobic subjects.	Transversal Study with youth with NMP-Q. Correlational Analysis with Brief COPE Questionnaire	403 individuals	New perspectives on NF reactions	Yes	Stress Denial Self-blame Self distraction Venting Use of emotional Instrumental Support
Gutiérrez-Puertas, L 2019. Spain/ Portugal PubMed	Comparative NF levels among Almeria and Bragança Nursing students	Comparative study using NMP-Q	258 individuals: 130 (Esp.) e 128 (Port.) Male= 49 Female= 209	Compare behavior of students from 2 countries.	Yes	Social impacts in human relationships
Al-Balhan, E.M <i>et al.</i> (2018). Kwait PubMed	Develop and Validate NMP-Q Arabic Version	Translate to NMP-Q Arabic and application.	451 students Male= 280 Female= 171 IM= 207	NMP-Q Arabic version produced	Yes	Broaden possibilities about NF in Arab culture.
Basu, S <i>et al.</i> , 2018. India PubMed	Develop and Validate MP Dependency Scale and to assess the burden and factors associated with MP addicton – like behavior	Quiz Application - Mobile Phone Addiction Scale - MPAS	388 students. Male=233 Female=155 IM=21	One more scale about from NF	Yes	Public health problems
Aguilera-Manrique, G, 2018 Spain PubMed	Analyze relationship between NF and Distraction associated with student use of SF during clinical practice	Cross-sectional study. NMP-Q adapted to Spain and questionnaire Use of SF associated with restrictive work policy.	304 Nursing students Male=82 Female=222 IM = 22,7	NF treatment with restrictions on use of SF at work.	Yes	In professional performance
Olivencia-Carrión, Ma <i>et al.</i> , 2018. Spain PubMed	Study the relationship between temperament, personality and NF	QANIP - Questionnaire Application and Temperament and TCI-R Character Inventory Revised Questionnaire	968 interwied Male=182 Female=785 IM= 23,19	NF x Temperament	Yes	Temperament Interference
Csibi, S, 2018 United Kingdom, Romania e Hungary PubMed	Validate Hungarian version of the Smartphone Application Dependency Scale-SABAS to track dependency risk.	Used SABAS, NMP-Q and BSSS - Brief Sensatino Serched Scale and Helph PHQ - 9 Questionnaire..	240 individuals Male=155 Female=85 IM= 25,4	Availability of one more scale for NF..	Yes	Yes
Lin C, 2018 Irã, Hong Kong, United Kingdom and Sweden PubMed	Confirm Persian NMP-Q construct validity using Confirmatory Factor Analysis	Linguistic validation for examination of unidimensionality of NMP-Q factors	3216 iranian teenagers	Comparison of male and female NF levels	Yes	Yes

Argumosa-Vilar, L et al, 2017 Spain PubMed	Demonstrate 4 Elements of Nomophobia	MPIQ Online Application	242 students Male=111 Female=131	Correlation NF versus psychological variables	Yes	Self esteem Extroversion Consciousness Emotional stability produced by NF
King et al, 2014 Brazil PubMed	Describe MP use and investigate emotional changes	Questionnaire on MP use compared Panic and Agoraphobia patients	120 volunteers Male=28 Female=92	Comparison of Panic with Agoraphobia and NF	Yes	Yes
King et al, 2010 Brazil PubMed	Verify SF Impacts on Panic Disorder	Case Report with 1 patient with Panic Disorder plus Agoraphobia and NF	1 patient	First Study on NF in Brazil	Yes	Mobile as patient safety impacting their behavior.
Jianling & Chang, 2018 China PsycInfo	Validate NMP-Q in China	Applied NMP-Q	966 users of SF	Results corroborate previous validations in Spain, Italy and Iran.	Yes	Impacts as in other applications
Anshari et al, 2016 Brunei PsycInfo	Investigate behavior and impact on SF use, including gender differentiation	Application of specific questionnaire with 6 sections and 31 questions	589 volunteers Male=312 Female=277	Gender is statistically significant in relation to the use of SF, consequently of NF.	Yes	Half of volunteers cannot live without SF. Women use more social networks.
Arpaci, I et al, 2017 Turkey PsycInfo	Investigate effects of mindfulness mediation in the relationship between genders, bonds and NF	Applied The Experiences in Close Relationships Scale, NF Questionnaire and Mindful Attention Awareness Scale	450 volunteers Male=131 Female=319 IM= 21,94	New NF Correlations with Gender, Mindfulness, and Bonds.	Yes	Demonstrates mindfulness impact on NF
Yldirim, C & Correia, AP, 2015) USA PsycInfo	Validate use of the NMP-Q	Exploratory qualitative research, semi-structured interviews and application NMP-Q Questionnaire	301 young adults	Investigate different nomophobic characteristics between men and women..	Yes	Greater susceptibility among women regarding NF
King, ALS et al, 2013 Brazil PsycInfo	Studying NF as an auxiliary behavior in identifying anxiety	Application of Nomophobia Rating Scales, Medication and CBT	1 patient	Observation of nomophobia as a sign of another mental disorder	Yes	Habit Changes May Reveal Mental Disorders
Arpaci et al, 2019 Turkey Web of Science	Investigate impact of individual mindfulness difficulties in NF	Applied the NF Questionnaire and Mindful Attention Awareness Scale - MAAS	491 students Male=152 Female=339 IM= 22,08	Mindfulness as NF therapy by statistical correlation demonstrated	Mindfulness technique excluded, NF is manifested by dependence on SF	NF can be attenuated with mindfulness
Fitz, N et al, 2019 India Portal CAPES	Test about batching notifications could improve psychological well-being	Online application with own application.	237 volunteers Male=192 Female=45 IM=30,3	Human reactions to digital communications	Yes	Digital communications impact HB
Coskun, S & Muslu, GK, 2019 Turkey Portal CAPES	Define problematic use of mobile phones (PMPU) and Fear of Missing Out (FoMO) among adolescents.	Applied Scale for problematic mobile phone use – PU and Fear of Missing Out Scale – FoMOS)	1630 students Male=724 Female=896	Two other scales broadening findings about NF	Yes	Students with the highest PMPU scores and FoMO has lower motivation / performance
Rosales-Huamani, JA, 2019 Peru Portal CAPES	Identify new symptoms through increased use of SF	Applied Test of Mobile Phone Dependence – TMD Brief	461 students Male=97 Female=364	Mais uma escala para estudar NF	Yes	Anxiety, compulsion to use SF and feeling of panic.
Bartwal & Nath, B (2019) India Portal CAPES	Identify NF levels in medical students	Applied NMP-Q	451 students Male=171 Female=280 IM=20,7	NF on job	Volunteers showed SF dependence	78 volunteers: NF severe; 303: average; 70: lightweight impacting activities
Adawi, M et al, 2019 Italy Portal CAPES	Identify NF levels	Applied NMP-Q and Brief Symptom Inventory - BSI	403 volunteers Male=160 Female=243 IM=27,91	New behavioral relationships with NF	To be without SF Contact Causes Irritability and Anxiety	Attention Deficit, Negative Social Impacts, At Work And Academic Life
Yasan, AK & Yildirim, S , 2018 Turkey Portal CAPES	Investigate student with NF under 4 sub-dimensions	Applied Turkish Nomophobia Questionnaire	146 students Male=55 Female=91	NF's New Approach: Analyze Not Being Able to Communicate, Lost Connectivity, Not Accessing Information, and Convenient Dropout	Strong correlation between NF and Internet use	Lack of digital communication interferes with HB
Yildiz, D, 2018 Turkey Portal CAPES	Investigate predictors of NF and SF dependence among adolescents	Applied NMP-Q and Turkish NF Questionnaire.	612 students IM between 12 and 18.	Correlation between demographic variables and academic performance	SF addiction está associada à NF	There is significant relation between SF addiction and NF
Oliveira, TS et al, 2018 Brazil Portal CAPES	NF in the environmental organization	Case Report	Report without sample	Collective treatment of NF	Nomophobic dependent behaviors	Organizational collective impacts

Parasuraman, S et al, 2017 Malaysian Portal CAPES	Study the mobile phone addiction behavior and awareness on eletromagnetic radiation.	Multivariate NF according to 8 dimensions.	409 students Male=198 Female=211 IM= 22,88	More correlation with NF	Yes	Volunteers with wrist and hand pain. Students developer dependence of SF
Trom, D, 2016 USA Portal CAPES	Classifying NF as a SF Addiction Disorder	Literature Review on PsycInfo and Google Scholar	117 manuscript studied	DSM – Diagnostic and Statistical Manual of Mental Dosorder inclusion proposal	Symtons as anxiety, depression and low self-esteem confirm NF as DD	Compulsive use of SF cause significant impairment of social, physical and cognitive functions
Shin, L , 2014 Korea an USA Portal CAPES	Investigate Internet dependent usage severity and factors involved	Comparative among students of 2 countries.	597 volunteers 283 USA 314 Korea >18 anos Mobile Internet Usage Index - MIUI	Comparison between culturally different countries	Yes	Unemployed and young students are more susceptible to digital addiction. Korean women are more dependent than American americanas

the former, articles produced in the US, UK and Brazil prevail, while in the latter period (2017-2019) other countries emerged, such as Italy, Spain, Portugal, Kwait, India, Iran, Romania, China, Turkey, Hungary , Peru, Sweden, Israel, Hong Kong, meaning geographic evolution, revealing greater interest in Nomophobia.

This expansion is also located in comparative studies between students from different countries, such as Spain and Portugal, aiming to identify specificities between them Gutierrez, *et al.* [6] similar to what occurred among students in United Kingdom, Romania and Hungary Csibis, *et al.* [18].

Similarly Shin, *et al.* [19] compared the severe use of mobile Internet by Americans and Koreans, characterizing geographic expansion, and finding different dependent behaviors among them, in addition to significant differences between male and female outcomes, which also occurred in research in Brunei Anshari, *et al.* [11].

In Iran, Elyari, *et al.* [20] translated and validated the Yldirim & Correia Nomophobia Questionnaire - NMP-Q (2015) obtaining high reliability (Cronbach's Alpha = 0.983) corroborating results in Spain Gutierrez-Puertas, *et al.* [6], Italy Bragazzi, *et al.* [7] and India Basu, *et al.* [21]

b) Number of articles

From 2017 to 2019 were found 33% (188) of the articles indicated by the databases (572) meaning about 6 articles per month. From 2009 to 2016 were 67% (384), meaning 4 articles per month. In the final numbers of articles for qualitative analysis, 24 were produced from 2017 to 2019, meaning 0.8 article per month, while from 2009 to 2016, 0.04 article per month. Comparing these rates it is expressive growth of publications.

c) Increase in the number of Nomophobia Scales

There was scale growth, as well as renowned scale revalidations, in India Bartwal, *et al.* [16] and Iran Elyasi, *et al.* [20], where the Nomophobia Questionnaire - NMP-Q Yldirim, *et al.* [11] was appropriate to their respective cultures, strengthening the evolution of the theme and the scales themselves.

In China, with 966 smartphone users, the NMP-Q reported by Jianlig & Chang (2018) was revalidated with results similar to Spain Aguillera, *et al.* [4] and Italy Adawi, *et al.* [22].

Other validated scales have ratified Nomofobia's expansion, such as Scale for Problematic Mobile Phone Use - PU that measures overuse of mobile phones, correlation between mobile phone and mental variables

and possibilities of negative effects of prolonged mobile phone use, in addition to the Fear of Missing Out Scale - FoMOS Coskun, *et al.* [23].

In a study by Arpaci, *et al.* [10] to identify the relationship between mindfulness and Nomophobia, another scale was used: the Nomophobia Questionnaire – NF, also used in USA with analogue results [17].

To identify Nomophobia symptoms (anxiety, compulsion and anxiety and panic) Rosales – Huamani, *et al.* [24] used the Test of Mobile Phone Dependence - TMD Brief confirming these symptoms of dependence on Nomophobia. This has been confirmed in Iran, for anxiety, using the NMP-Q (Darvishi *et al.*, 2019).

In Spain, Argumosa-Villar, *et al.* [8] used the Mobile Phone Involvement Questionnaire (NMPQ), finding a correlation between self-esteem, extroversion and awareness with emotional stability related to Nomophobia, innovating in treating Nomophobia related to psychological and not only demographic variables.

Csibis, *et al.* [18] used Smartphones Applications Based on Addiction Scale - SABAS, concluding that severity, anxiety and stress of depression are associated with problematic use of smartphones. In the same review, Csibis *et al.* [18] also indicated for the evaluation of Nomophobia, the Smartphone Addiction Scale - Short Version - SAS - SV.

In India, Basu, *et al.* [21] developed and validated the Mobile Phone Addiction Scale (MPAS) with 388 medical students.

Besides the validation of new scales, others already used were revalidated in other languages as did Gutiérrez – Puertas, *et al.* with the NMP-Q.

Along the same lines, Al-Balhan, *et al.* [25] developed psychometric evaluation of the Arabic version of the NF Questionnaire (NF) in a pilot study at Kuwait University. This expansion also took place in 12 other countries between 2017 and 2019.

d) Sample Profiles / Target Audience

With the geographical expansion and need for adaptations and understanding of Nomophobia, new applications of measurement instruments in research have found different target audiences, such as doctors, nurses, students from different disciplines, public and private organizational managers, among others.

Quantitatively, it was observed that from 2017 - 2019 the sum of volunteers exceeded 13,000 versus just over 1,000 between 2009 and 2016, ratifying the significant increase of participants in Nomophobia research as a strong element of evolution.

e) Nomophobia between the sexes

Initially Nomophobia did not discuss results by gender. Between 2017 and 2019 the concern to assess prevalence by sex arises consistently.

Darvishi, *et al.* [3] investigated Nomophobia among students in Iran, seeking to identify feelings of anger, discomfort, anxiety and insecurity in the correlation of this phenomenon with age, gender, educational level and duration of smartphone use. Women feel less angry than men when they are without digital access and, consequently, less discomfort.

Anshari, *et al.* [11] had already concluded that sex is statistically significant in smartphone use, in a survey of 589 participants. Women make greater use of social networks, messaging and cell phones, with more marked misuse than men.

Arpaci, *et al.* [10] also identified greater impact on women in the relationship of mindfulness with Nomophobia.

Yldirim, *et al.* [12] found results that ratified that women are more susceptible to nomophobia than men, also identified in the US and Korea by the greater dependence of women on men [19].

Different reactions between male and female outcomes provide a new perspective for Nomophobia analysis.

Nomophobia as a Digital Dependency

The definitions between Nomophobia and Digital Dependence converge significantly because according to King, *et al.* [1] Nomophobia refers to the feelings of discomfort or anxiety experienced by individuals when they are unable to use their mobile phones or use affordances these devices provide. Patologic Digital Dependence is when running out of digital devices bring symptoms of nomophobia such as anxiety, discomfort, panic, among others.

Lin, *et al.* [26] found that problematic cell phone use has increased markedly over the past five years and is related to the phobia of being without them (nomophobia).

Impacts on human behavior

a) In professional activities

The use of mobile phones simultaneously with work activities may compromise performance activities.

Aguilera-Manrique, *et al.* [4] identified nursing students in Spain using smartphones during internship activities, revealing a statistically positive relationship between Nomophobia and smartphone-associated distraction.

Oliveira, *et al.* [27] report that Nomophobia can reveal itself in organizations due to the demands of employee availability at all times, wherever they may be.

b) Social commitment

Nomophobia is an emerging social behavioral problem that needs attention because of its varying degrees of severity, with impairment due to cell phone dependence [16].

Trom, *et al.* [15] classifies Nomophobia as a disorder and states that compulsive smartphone use causes significant impairment of social, physical and cognitive functions.

Nomophobia affects different areas, especially social, professional and academic relationships, due to the dependence on smartphone use Argumosa-Villar, *et al.* [8].

Fitz, *et al.* [28] approached smartphone well-being in research, showing anxiety and FoMO - Fear of Missing Out, when participants received no notifications, affecting social behavior, while those receiving them regularly felt more productive and satisfied.

c) Relationship with primary disorders

The relationship between anxiety and stress of depression has been demonstrated in a systematic review, concluding by the relationship with Nomophobia [18].

King, *et al.* [1] refer to Nomophobia as a feeling of discomfort or anxiety experienced by individuals when unable to use cell phones or use their facilities.

People with panic disorder showed significant increases in anxiety, tachycardia, respiratory changes, tremors, sweating, panic, fear and depression, relative to the lack of their cell phones King, *et al.* [29].

Rosales-Huamani, *et al.* [24] using the TDM Brief Test of Mobile Phone Dependence with 461 students confirmed symptoms related to Nomophobia: (a) anxiety; (b) compulsive use of smartphones; (c) feeling of anxiety and panic.

Increased anxiety besides irritability when not in contact with the digital device were symptoms identified by Adawi, *et al.* [22] characterizing Nomophobia as technological dependence.

However, according to Csíbis, *et al.*, an inverse relationship between depression and excessive smartphone use is possible. In this case, the emptiness of depression would be partially or temporarily supplied by digital attractions.

Due to its amplitude and relationship with anxiety, depression and low self-esteem, Trom, *et al.* classifies Nomophobia as smartphone dependence, proposing inclusion in the DSM - Diagnostic and Statistical Manual of Mental Disorder.

d) Transformation of interpersonal relationships

The transformation of individuals through digital practices and the manifestation of Nomophobia also alters interpersonal relationships.

Digital technologies can change the way we form relationships, with positive and negative effects, depending on how we use or abuse them.

Olivencia-Carrión, *et al.* [27] showed that cooperation significantly reduces nomophobic levels, with a relationship between nomophobia and personality.

Limitations

There are many manuscripts published that discuss Nomophobia, but it was necessary to select them according to the delimitation defined in this review, mainly the three selected perspectives: (a) evolution of the term nomophobia; (b) its consolidation as a Digital Dependency; (c) impacts on human behavior. Another limitation is the novelty of the Nomophobia theme, which, on the other hand, becomes a new opportunity for researchers.

Conclusions

Results showed geographical evolution of Nomophobia, evolving from 3 countries (2009 - 2016) to 17 countries (2017 - 2019) with consistent research results, registering an increase of about 20 times more articles between the two periods, substantial increase of 7 news scales and 13 validations of NMP-Q in several countries (Table 3). New sample profiles and analysis of differences between men and

women drew attention to the need to assess this difference about nomophobic behaviors between the two sexes. The study demonstrates that Nomophobia is Digital Dependence, due to its pathological characteristics. In all inserted articles the impact of the Nomophobia on professional and social activities presenting significant relationships with primary psychological disorders, redesigning interpersonal relationships, was reported. These results confirm the achievement of the research objectives.

Author participation

Gonçalves prepared the literature review and wrote the article; Nardi supervised and guided the preparation of the text. Bortolanza and Pádua realizaram pesquisas; King supervised the literature review and the final form of the text. All authors contributed and approved the final version.

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Conflict of interest

All of authors declare that has no conflicts of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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