REFACS

Revision
Rev. Fam., Ciclos Vida Saúde Contexto Soc.
http://seer.uftm.edu.br/revistaeletronica/index.php/refacs/index
ISSN: 2318-8413 DOI: 10.18554/refacs.v11i1.6439

Self-destructive behavior and information and communication technology

Comportamento autodestrutivo e tecnologia de informação e comunicação

Comportamiento autodestructivo y tecnología de información y comunicación

Ricardo Augusto dos Santos[1], Heloisa Cristina Figueiredo Frizzo[2]
Karin Aparecida Casarini[3], Bruna Caroline Voltarelli[4]

Received: 13/10/2022 **Accepted**: 09/02/2023 **Published**: 18/03/2023

Objective: to identify productions on the relationship between self-injurious/suicidal behavior and Information and Communication Technology. **Methods:** this is a review that considered the period from 2016 to 2021, in the descriptors "*comportamento autodestrutivo*" (self-destructive behavior), "*comportamento suicida*" (suicidal behavior) and "*Tecnologia de Informação*" (Information Technology) and their translated versions in English and Spanish and, in the databases PsycInfo, IEEE Xplore, Science Direct and PubMed. Categorization of the surveyed productions was used. **Results:** from a first search of 262 articles, nine of them were analyzed. Three categories were constructed: Mental health and suicide; Internet/mobile application based intervention; Personalized attention to youth/adolescents. Most studies sought to understand the importance of using Information and Communication Technologies through mobile applications, which can be used both as a complement to face-to-face therapies and in the direct prevention of self-destructive behavior. **Conclusion:** Information and Communication Technologies are a suicide prevention strategy.
Descriptors: Self-injurious behavior; Suicide; Information technology.

Objetivo: identificar as produções sobre a relação entre comportamento autolesivo/suicida e Tecnologia de informação e comunicação. **Método:** esta é uma revisão que considerou o período de 2016 a 2021, nos descritores comportamento autodestrutivo", "comportamento suicida" e "Tecnologia de Informação" e seus análogos em inglês e espanhol e, nas bases de dados PsycInfo, IEEE Xplore, Science Direct e PubMed. Utilizou-se categorização das produções levantadas. **Resultados:** a partir de uma primeira busca de 262 artigos, foram analisados nove destes. Três categorias foram construídas: Saúde mental e suicídio; Intervenções baseadas na internet/aplicativos móveis; Atenção personalizada a jovens/adolescentes. A maioria dos estudos buscou compreender a importância da utilização das Tecnologias da Informação e Comunicação por meio de aplicativos móveis, podendo ser utilizadas tanto no complemento às terapias face a face, quanto na prevenção direta ao comportamento autodestrutivo. **Conclusão:** as Tecnologias de Informação e Comunicação se constituem como estratégia de prevenção ao suicídio.
Descritores: Comportamento autodestrutivo; Suicídio; Tecnologia da informação.

Objetivo: identificar las producciones sobre la relación entre el comportamiento autolesivo/suicida y Tecnología de información y comunicación. **Método:** esta es una revisión que consideró el período de 2016 a 2021, en los descriptores "comportamento autodestrutivo" (comportamiento autodestructivo), "comportamento suicida" (comportamiento suicida) y "Tecnologia de Informação" (Tecnología de la Información) y sus análogos en inglés y español, en las bases de datos PsycInfo, IEEE Xplore, Science Direct y PubMed. Después las producciones se categorizaron. **Resultados:** a partir de una primera búsqueda de 262 artículos, se analizaron nueve. Se construyeron tres categorías: Salud mental y suicidio; Intervenciones basadas en la web/aplicaciones móviles; Atención personalizada a jóvenes/adolescentes. La mayoría de los estudios buscaban comprender la importancia del uso de las Tecnologías de la Información y la Comunicación a través de aplicaciones móviles, que pueden ser utilizadas tanto como complemento a las terapias presenciales como en la prevención directa de comportamientos autodestructivos. **Conclusión:** las Tecnologías de la Información y la Comunicación se constituyen como estrategia de prevención del suicidio**.**
Descriptores: Conducta autodestructiva; Suicidio; Tecnología de la información.

Corresponding Author: Heloisa Cristina Figueiredo Frizzo – heloisa.frizzo@uftm.edu.br

1. Psychologist. Uberlândia/MG, Brazil.
2. Department of Occupational Therapy and Postgraduate Program in Psychology at the Universidade Federal do Triângulo Mineiro (UFTM) and Postgraduate Program in Clinical Management at the Universidade Federal de São Carlos/SP. Uberaba/MG, Brazil.
3. Department of Psychology and Graduate Program in Psychology at UFTM. Uberaba/MG, Brazil.
4. Multidisciplinary Residency Program for Cancer Care at the Hospital das Clínicas, Faculdade de Medicina do Ribeirão Preto, Universidade de São Paulo. Ribeirão Preto/SP, Brazil.

INTRODUCTION

Suicide is a serious public health problem all over the world, killing more people than cancer, malaria, homicides and wars[1]. In the last 40 years, the suicide rate has increased by 60% in several countries, and is now the second leading cause of violent death among people aged 15 to 19 and the third leading cause of this type of death for people aged 15 to 29 in the world[1]. Suicide is a complex and multifaceted phenomenon, which implies the impossibility of understanding it only from the biopsychic and pathologizing perspective, relating to various religious, personal, social, moral and cultural meanings[2]. Suicidal behavior is considered as a continuum of self-harm, which involves suicidal ideation (ideas about death), suicidal plan (planning how to die), suicide attempt (execution of self-injury by various means), which can culminate in suicide[3].

Thus, suicide cannot be considered an accident, but as an available way out, through which the purpose is to find a way to deal with intense, unbearable and endless suffering[4]. Individuals who present suicidal behavior, for the most part, manifest internal attitudes of ambivalence, mixing the desire to end their own lives with requests for help, through their interpersonal relationships with verbal and behavioral signs that express their lethal intention[5]. In this way, suicidal behavior represents a crucial opportunity for helpful intervention.

Suicide prevention guidelines recommend safety planning along with treatment for patients who have suicidal ideations or who need mental health care[6]. However, this planning and follow-up is not always put into practice, given the transient nature of the state of suicide risk, stigma and geographic isolation, identified as three of the main complicating factors for the treatment of people who present suicidal behavior[7].

In this context, interventions based on the Internet and carried out through Information and Communication Technologies (ICT) have shown their ability to overcome difficulties, due to their around the clock availability (24 hours a day), privately, at low cost and no geographic limitations[8]. In addition to being a technology that can minimize the effects of social distancing, through video calls and other communication alternatives.

The use of ICTs is promising as a means of preventing and intervening with suicidal behavior. Thus, the present study aims to identify the productions on the relationship between self-injurious/suicidal behavior and Information and Communication Technology.

METHODS

This is a scope review, which is characterized by analyzing the extent, scope and nature of scientific production regarding a given research topic, based on broader questions and consisting of studies with different methodological designs[9]. The scope review has the role of understanding, in the corresponding production to the field of interest, the nature and main characteristics of the studies on the subject, being useful for describing the available evidence, identifying and analyzing knowledge gaps and clarifying the main definitions/ concepts[9].

To carry out the research, the protocol based on the Joanna Briggs Institute Approach (JBI) for scope reviews[10] was adopted: 1) Elaboration of the research question and objective; 2) Identification of relevant studies by defining inclusion and exclusion criteria; 3) Description of the selection process; 4) Search for texts; 5) Data collection, mapping, summarization and reporting of findings. The mnemonic "PCC"', suggested by the JBI, was used, which means P= Population, C= Concept and C= Context. This research understands that P = not applicable; C = Self-destructive/suicidal behavior; and C = Information and Communication Technology.

The descriptors considered were: Portuguese - "*comportamento autodestrutivo*" (self-destructive behavior), "*comportamento suicida*" (suicidal behavior) and "*Tecnologia de Informação*" (Information Technology); and their translated versions in English and Spanish; with a search in the following databases: PsycInfo, IEEE Xplore, Science Direct and PubMed, and the search in each of them was carried out using the selected descriptors and the Boolean AND operator. The search platforms included covered specific scientific productions on Psychology and Communication Technologies (PsycInfo and IEEE Xplore), health publications (PubMed), as well as on different areas of knowledge (Science Direct).

The inclusion criteria adopted were: articles published from 2016 to 2021, in Portuguese, English and Spanish, fully available online. Publications outside of the aforementioned time frame, that did not contemplate the theme, duplicate publications and restricted access were excluded from this research. Criteria related to characteristics of the population, such as age group, were not adopted in order to map publications aimed at the general population. Two authors selected the articles based on the inclusion criteria, with the collaboration of a third evaluator being requested whenever there were disagreements about the inclusion of a work.

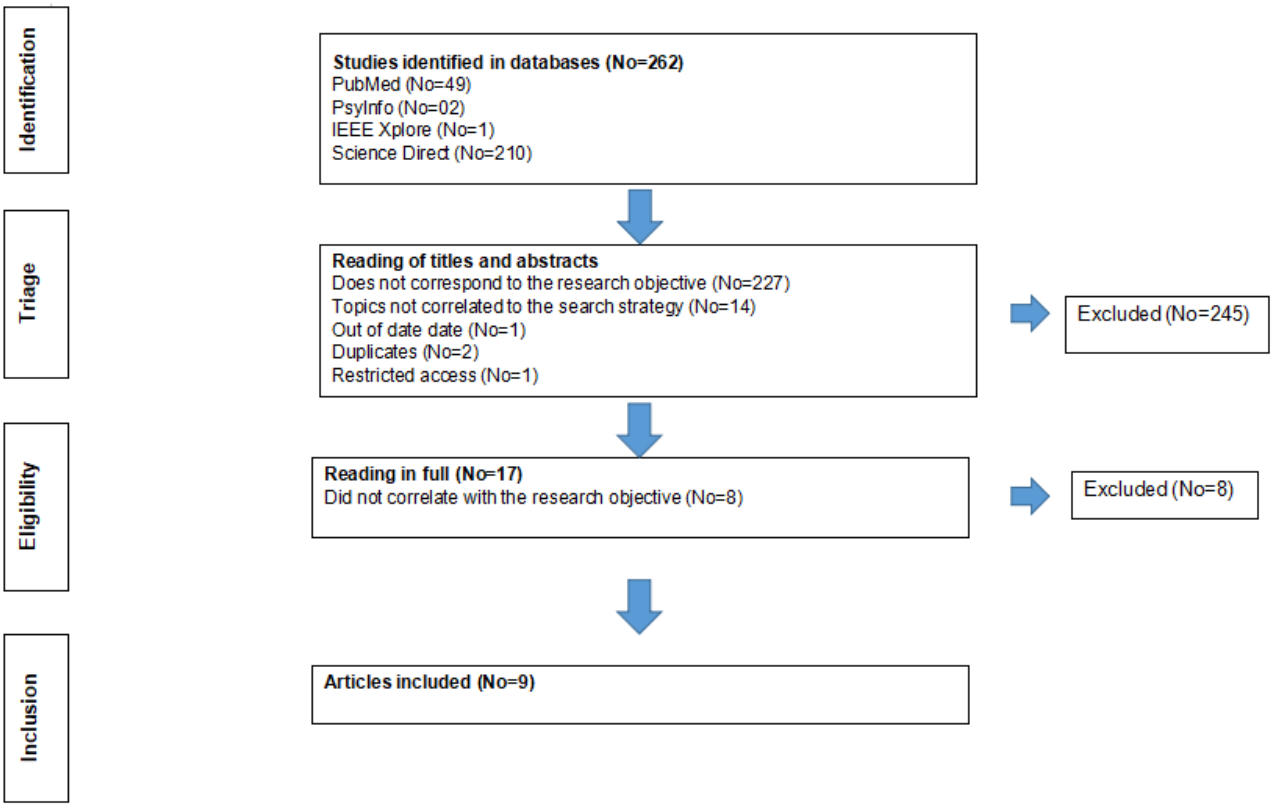
The Rayyan[11] software was used as a tool to assist in the review. The process of searching for studies took place between November 2, 2021 and November 4, 2021. After this step, the title and abstract of all selected articles were read, to identify the works that addressed the theme Self-destructive/Suicidal behavior and Information and Communication Technology,

which were selected and read in full. A categorization of similar studies was also carried out (which had a similar objective theme and methodology), grouped and analyzed together, and an analysis of the interpretation of the data of the articles was carried out, according to Clark and Braun (2006), creating thematic categories of the works found[12]. It was considered that the same article could be part of more than one category.

RESULTS

As shown in Figure 1, 262 articles were identified in the database search. The application of the eligibility criteria, after reading titles and abstracts, allowed the exclusion of 245 articles, of which 227 were excluded because they did not correspond to the research objective; 14 because they did not deal with the correlation between self-destructive behavior/suicide and Information and Communication Technology, two were duplicated and one had restricted access. Thus, 17 articles were explored in full with a view to the refined analysis of the pertinence to the study, with eight studies being excluded, for not working the proposed theme in a pertinent way (without data on the use of technologies in suicide prevention).

Figure 1. Study selection flowchart and inclusion process. Uberaba/MG, 2021.



Next, in Table 2, the nine eligible studies are presented, with regard to title, author/year/country, objectives, methods and conclusion. Subsequently, the description of the

objectives of the studies found is carried out from the reading and categorization of the themes found in their contents.

All nine selected articles were published between 2019 and 2021, with a concentration of productions in 2020. The articles found in this review were produced in different countries: two publications in the United Kingdom, two in the United States, two in Spain, two in Australia and one in Ireland.

Chart 1. Articles considered between suicidal behavior and information technology. Uberaba/MG, 2021.

Title	Authors, year, country	Objective	Methods	Conclusion
1) "Suicide prevention and depression apps' suicide risk assessment and management: a systematic assessment of adherence to clinical guidelines".	Martinengo, L., Van Galen, L., Lum, E., Kowalski, M., Subramaniam, M., Car, J.[13] Year: 2019 Country: United Kingdom	Evaluate 69 depression and suicide prevention apps available on Google Play and Apple's App Store	Systematic evaluation of applications through a list of 50 questions developed by the study team based on HONconde principles.	A growing number of apps offer suicide prevention strategies for people at risk, although few provide a comprehensive approach, including the HONconde principles. It is recommended that apps serve a complementary role to the ongoing patient-provider therapeutic relationship and not be used as a substitute for professional advice. Need for efforts by government regulatory agencies, the app development industry, healthcare providers, and the public to improve apps.
2) "Information and communication technology use in suicide prevention: scoping review".	Rassy, J., Bardon, C., Dargis, L. Côté, L. P, Corthesy-Blondin, L., Mörch, C. M., Labelle. [14] Year: 2021 Country: United Kingdom	Explore existing literature on the use of ICT in suicide prevention to answer the question: what are the best and most promising ICT practices for suicide prevention?	Scope review, conducted in the PubMed, PsycINFO, Sociological Abstracts and IEEE Xplore databases, covering the period from January 1st, 2013 to December 31th, 2018.	The use of ICTs plays an important role in suicide prevention, with the identification of promising programs. However, large-scale evaluation studies are needed to examine the effectiveness of these programs and strategies. In addition, safety and ethical protocols for ICT-based intervention are recommended.
3)"Mobile health technology interventions for suicide prevention: systematic review".	Melia, R., Francis, K., Hickey, E., Bogue. J., Duggan, J., O'Sullivan, M., Young, K. [15] Year: 2020 Country: USA	Examine the effectiveness of Mobile Health Technology (MHEALTH) tools currently available in suicide reduction.	Literature review, conducted in databases: Cochrane Central Register of Controlled Trials,	The small number of reported results indicates that tools may have a positive impact on specific suicide results. More research is needed to evaluate the effectiveness of independent MHEALTH technology based on suicide prevention.

			Medline, Buggage Psycinfo and in sources of gray literature	Future mobile health intervention assessments would benefit by addressing three methodological limitations: the lack of standardized suicide results measurement between studies, the trend of excluding potential participants due to high risk of suicide, and application regulations/definition.
4) "A mobile health approach for improving outcomes in suicide prevention (SafePlan)."	O'Grady, C., Melia, R., Bogue, J., O'Sullivan, M., Young, K., Duggan, J. [16] Year: 2020 Country: Ireland	Develop a mobile application to facilitate users' access to mental health support and safety planning.	The research was distributed to health professionals, seeking to determine which resources should be prioritized in a new mobile application related to suicide prevention.	The participatory process involving professionals (doctors, psychologists and information technology specialists) has resulted in the creation of a MHEALTH intervention technology that has the potential to increase accessibility to this type of mental health service to the target population. The application went through the initial test phase and relevant recommendations were implemented. It is ready to be tested with doctors and their patients.
5) "Suicide risk assessment using machine learning and social networks: a scoping review".	Castillo-Sánchez, G., Marques, G., Dorronzoro, E., Rivera-Romero, O., Franco-Martín, M., la Torre-Díez, D. [17] Year: 2019 Country: Spain	Review the state of the art on the use of machine learning method to detect suicide on social networks.	Scope review, conducted at the PubMed, Science Direct, IEEE XPLore and Web of Science.	75% of the included studies propose models to classify the text collected in suicide-related categories as the main form of machine learning operation for suicide detection.
6) "Suicide prevention mobile apps: descriptive analysis of apps from th emost popular virtual sotores".	Castillo-Sánchez, G., Camargo-Henríquez, I., Muñoz-Sánchez, J. L., Franco-Martín, M., De la Torre-Díez, I. [18] Year: 2019 Country: Spain	Descriptively analyze mobile applications focused on suicide prevention and determine relevant factors in its design and development. In addition, it sought to analyze its impact on the treatment of patients at risk of suicide.	20 applications were considered previously listed in the article "Mobile Applications for Suicide Prevention: Review of Virtual Stores and Literature". To find apps on this list, the most popular application stores	Although there are positive approaches to the use of applications for suicide prevention and monitoring, technical and human aspects have not yet been explored and defined. The design and development of applications that support suicide prevention should be strongly supported by health professionals to humanize these applications to increase the effectiveness of proposed strategies.

			(Android and iOS) were searched using the keyword "Suicide Prevention".	
7) "Deep neural networks detect suicide risk from textual Facebook posts".	Ophir, Y., Tikochinski, R., Asterhan, C. S. C., Sisso, I., & Reichart, R. [19] Year: 2020 Country: USA	Detect risk of suicide from the daily language of social media users.	Two artificial neural network models (ANN) were built: Single Task Model (STM), to predict the risk of suicide directly on Facebook posts, and multitasking model (MTM), which includes sets of theory based multiple layers of risk factors. 83,292 posts written from 1002 authenticated Facebook users were analyzed, along with valid psychosocial information.	The results suggest that analyzes based on everyday language machine learning can improve suicide risk predictions and contribute to the development of practical detection tools.
08) "An enhanced social networking intervention for young people with active suicidal ideation: safety, feasibility and acceptability outcomes".	Bailey, E., Alvarez-Jimenez, M., Robinson, J., D'Alfonso, S., Nedeljkovic, M., Davey, C. G., Bendall, S., Gilbertson, T., Phillips, J., Bloom, L., Nicholls, L., Garland, N., Cagliarini, D., Phelan, M., McKechnie, B., Mitchell, J., Cooke, M., & Rice, S.M. [20] Year: 2020	Evaluate the safety, feasibility and acceptability of an intervention with Most Affinity software among a sample of young people in treatment for larger depressive disorder who had also experienced suicidal ideation in the last four weeks. A secondary goal was to explore changes in the cognitive and	Twenty young people had access to Affinity for two months. Participants were evaluated at the beginning of the study and accompanied for 08 weeks.	Although historically concerns have been expressed about the security of online social networking interventions for people who experience suicidal ideation, particularly in relation to their potential to lead to suicide ideation and/or behavior, the results of this study provide pioneering evidence, suggesting that such interventions can be safely implemented when appropriate moderation protocols and risk management are in force. Affinity was not only considered safe, but also highly acceptable and viable to implement. This study suggests that future research projects with MOST

	Country: Australia	interpersonal targets of affinity intervention, as well as changes in self-reported depression and suicidal ideation.		software should not exclude participants based on the high risk of suicide. Researchers who elaborate and evaluate Internet-based interventions for suicide people should, in addition to providing evidence-based therapeutic content, consider taking advantage of the benefits provided by the Internet by allowing the creation of social networks point.
9) "Moderated online social therapy for young people with active suicidal ideation: qualitative study".	Bailey, E., Robinson, J., Alvarez-Jimenez, M., Nedeljkovic, M., Valentine, L., Bendall, S. & Rice, S. [21] Year: 2021 Country: Australia	Report qualitative data collected from participants in a study on your web-based social network experience and the consequent security features.	Semi-structured interviews were conducted with 17 young people who participated in the pilot study after 8 weeks of intervention exposure. The interviews were analyzed through thematic analysis, being the frequency of the responses characterized by the consensual qualitative research method. The results are reported according to the verification list of consolidated criteria for qualitative research reports.	The results not only support security and the potential therapeutic benefit of Affinity's social network aspect, but also highlight various implementation challenges. It is necessary to carefully balance the need for strict security and design resources, ensuring that the therapeutic benefit potential is maximized.

Table 2 presents the thematic categories elaborated after the in-depth reading of the articles, namely: *Mental health and suicide*; *Internet/mobile application based intervention*; *Personalized attention to youth/adolescents*.

Chart 2. Categories built considering suicidal behavior and information technology. Uberaba/MG, 2021.

Name of category	References/Articles
Category 1 *Mental health and suicide*	- Martinengo, L., Van Galen, L., Lum, E., Kowalski, M., Subramaniam, M., & Car, J. [13] - Melia, R., Francis, K., Hickey, E., Bogue. J., Duggan, J., O'Sullivan, M., & Young, K. [14] - Bailey, E., Robinson, J., Alvarez-Jimenez, M., Nedeljkovic, M., Valentine, L., Bendall, S. & Rice, S. [21]
Category 2 *Internet/mobile application based intervention*	- Martinengo, L., Van Galen, L., Lum, E., Kowalski, M., Subramaniam, M., & Car, J. [13] - Rassy, J., Bardon, C., Dargis, L. Côté, L. P., Corthésy-Blondin, L., Mörch, C. M., & Labelle, R. [14] - O'Grady, C., Melia, R., Bogue, J., O'Sullivan, M., Young, K., & Duggan, J. [16] - Bailey, E., Alvarez-Jimenez, M., Robinson, J., D'Alfonso, S., Nedeljkovic, M., Davey, C. G., Bendall, S., Gilbertson, T., Phillips, J., Bloom, L., Nicholls, L., Garland, N., Cagliarini, D., Phelan, M., McKechnie, B., Mitchell, J., Cooke, M., & Rice, S.M. [20] - Eleanor Bailey, Jo Robinson, Mario Alvarez-Jimenez, Maja Nedeljkovic, Lee Valentine, Sarah Bendall, Simon D'Afonso, Tamsyn Gilbertson, Ben McKechnie, Simon Rice.
Category 3 *Personalized attention to youth/adolescents*	- Melia, R., Francis, K., Hickey, E., Bogue. J., Duggan, J., O'Sullivan, M., & Young, K. [15] - O'Grady, C., Melia, R., Bogue, J., O'Sullivan, M., Young, K., & Duggan, J. [16] - Castillo-Sánchez, G., Marques, G., Dorronzoro, E., Rivera-Romero, O., Franco-Martín, M., & la Torre-Díez, D. [17] - Bailey, E., Alvarez-Jimenez, M., Robinson, J., D'Alfonso, S., Nedeljkovic, M., Davey, C. G., Bendall, S., Gilbertson, T., Phillips, J., Bloom, L., Nicholls, L., Garland, N., Cagliarini, D., Phelan, M., McKechnie, B., Mitchell, J., Cooke, M., & Rice, S.M. [20] - Bailey, E., Robinson, J., Alvarez-Jimenez, M., Nedeljkovic, M., Valentine, L., Bendall, S. & Rice, S. [21]

Category 1. *Mental health and suicide*

In this category were grouped the works that correlated mental disorders (depression, anxiety, eating disorders) with suicide. There was a highlight for factors proven associated with suicidal behavior, such as sleep disorder[22], difficulty dealing with the regulation of emotions[23], family history of suicide[24], pain and chronic diseases[25]. The works aimed at the development of ICT related to the theme of diagnosis and prevention of self-destructive behavior also considered this diversity of conditions that can trigger it.

It was possible to check in the articles of Martinengo *et al* (2019)[13], Melia *et al* (2020)[15] and Bailey *et al* (2021)[21]. The emphasis on recognizing the correlation between suicide and prior mental disorder, considering that there is a greater risk of a person to be aware of their own life due to personal or family history of mental disorders and psychiatric comorbidities.

In addition to the factors associated with mental health that have been presented, other issues also interposed among those who need psychological support and the services capable of preventing self-inflicted damage, such as financial difficulties, geographical location and social stigma that prevent access from access care for people who have suicidal behaviors and ideations[20]. In this sense, ICTs can become powerful tools in prevention strategies, because of

their ability to provide access to service quickly, confidentially and of low cost to their users, surpassing geographic barriers through internet communication networks[15].

Category 2. ***Internet/mobile application based intervention***

This category presents actions based on the use of internet tools, such as applications and social media since these new media have been shown as a platform with potential for suicide prevention due to their reach, accessibility, acceptability and cost-effectiveness, being proven that most users feel more comfortable discussing online mental health conditions than in face to face meetings, considering the internet as a convenient and accessible means[15] and thus understand Information and Communication Technology as a relevant intervention, which assists against social stigma regarding people with self-destructive behavior and geographical isolation, two of the main identified barriers that can prevent individuals from seeking professional help[13].

In this sense, Martinengo *et al* (2019)[13], Rassy *et al* (2021)[14], O'Grady *et al* (2020)[15], Bailey *et al* (2020)[20] and Bailey *et al* (2021)[21], emphasize the relevance and importance of this modality of intervention for people who present behaviors that require care in mental health, such as suicidal ideation and self-destructive behaviors.

The main ICTs found in the studies were: MHEALTH, health technology tool for access to specialized professionals[15]; various mobile applications, free access, free in application stores, in order to offer guidelines and support in the face of self-destructive behaviors[13]; Artificial Neural Network Technologies (ANN), built for the purpose of predicting the risk of suicide, from everyday language of social media users[19]; and the online social network entitled Affinity, specific to supporting young people who experienced suicidal ideations, who were receiving care at a mental health care service[20-21].

Category 3. ***Personalized attention to youth/adolescents***

In this category, the work that identified risk behaviors among young people and adolescents was grouped, highlighting possible windows of opportunity to create strategies - among them, the ICTs - in suicide care and prevention. This population group deserves prominence for the high incidence of suicide registered annually, with constantly increasing values[26]. It is known that among young people the risk of suicide varies unpredictably, which can make some services unable to offer real-time help and support in times of crisis[27].

Most studies grouped in this category emphasize the importance of creating suicide prevention strategies aimed at young people and adolescents, currently considered the group

of highest risk for self-destructive behavior[15-17,19-20]. In this population, it is often noted the difficulty in asking for help and seeking support in traditional mental health services.

There is also the possibility that difficulties to maintain youth financing for access to mental health care prevent the availability of services, as well as practical barriers for the development of services as difficulties to deal with the prejudice that this theme brings, population vulnerability to the potential adverse effects of research involving these groups, the competence of participants in understanding and declaring consent in research on the subject and the difficulty of researchers to address some of the key points of the problem[20].

DISCUSSION

All articles found took into account the urgency and relevance of suicide as a serious public health problem and most of them sought to understand the importance of using ICTs through mobile applications, as possible complement to face to face and/or how prevention of self -destructive behavior through social networks.

Along this line, it was possible to verify that all selected articles (nine) were published between 2020 and 2021, with a concentration of productions by 2020. The concentration of studies from 2020 may be related to the COVID-19 pandemic, when ICTs became more common in society. The effects of social isolation, adopted as one of the ways to prevent the spread of contagion by the virus, brought emotional consequences to people, with increased vulnerabilities and suffering, especially among those suffering from mental illness. Context in which there was an increase in the prevalence of mental disorder and suicide. Consequently, studies point to a tendency to increase suicide attempts from the beginning of the pandemic[28-29]. This trend reinforces the recognition of other risk factors, as well as previous mental disorder, associated with suicidal ideation and self-destructive/suicide behavior, such as social isolation, unemployment, fear of contagion, significant losses, death/grief, and others.

In this context, the use of ICTs in Brazil and worldwide has been thought of as a way to minimize the negative effects of social distancing. Information and Communication Technologies have been identified as a crucial resource for preventing self-destructive behavior; specially social networks, which constitute a technology widely used by adolescents and young people, the most vulnerable group[30].

No South American publications were found. As much as this is not the direction of analysis of this research, the lack of studies on relevance themes, such as self-destructive/suicide behavior and Communication and Information Technology in the Latin

American context, demonstrates the importance of expanding scientific productions, considering the culture and specificity of this region, with special highlight for Brazil.

By the categories built was found the use of ICTs in two different ways, the first being as a complement to face-to-face therapy, accompanied by professionals specializing in mental health, called as tools of Mobile Health Technology (MHEALTH) through the application known with Safeplan[15- 16]. According to the Global Observatory for MHEALTH, mobile health technology is defined as "medical and public health practice supported by mobile devices"[31:14] such as mobile phones, digital personal assistants and other wireless devices. Their access is restricted, that is, only individuals who have suicidal ideations and are in the process of treatment can access them. The second form of use deals with available free access applications, free in application stores, which aims to offer guidelines and support in the face of self-destructive behaviors.

On the other hand, studies regarding the test of the creation of a social network prepared by professionals specialists in mental health and self-destructive behavior prevention, entitled Affinity, were found. This social network is an interactive online platform designed as a complement to traditional face to face interventions for young people with suicidal ideation[20], closely accompanied by mental health specialists. However, it was not possible to point out the effectiveness of the platform in relation to minimizing suicidal ideation and self - destructive/suicidal behavior[20]. Also, one of the guidelines for users of this digital environment was the non-permission of conversations or discussions about self-destructive thought experiences, even if they were requested by users, due to the concern of researchers with the safety of participants.

Most studies analyzed took into account the risk of suicide by correlating it to mental health problems[13,15,19], but not limiting it only to mental disorders, but taking into account the model of current society, the relationship of perception of experience in relation to the change in lifestyle and stress and its high multifactorial complexity[18,32]. Users who had self-destructive behavior were younger, relatively poorer and made more social media posts[19], showing the presence of factors not limited to mental illness that are strongly associated with the construction of thought, motivation, and suicide behavior[20].

Among the studies that contemplate open access social media, the research conducted in communities and thematic pages on the social network Facebook™[19], which sought to use artificial intelligence to predict risk of suicide through everyday languages posted by users of platform. Limitations were identified in posting analysis, such as symbols and images which information cannot be processed through machines, highlighting an obstacle these

technologies must overcome, which may not establish the connection between symbols, images and other problems not related to mental health (poverty, number of publications, socialization difficulties), but which are part of the signs demonstrated by users who express suicidal plans and may not have access to mental health services in timely time[19].

Also, there was reflections on the benefits of integrating machine learning methods into mental health practices as a promising path for advancement in detecting and preventing self-destructive behavior[19]. In the future, it could be possible to develop practical monitoring tools capable of automatically tracking and analyzing online communication clues in a discreet and intelligent way, integrating information from medical records. Thus it will be possible to alert family members and mental health caregivers regarding high suicide risk levels that were detected.

In a study found on Suicide Risk Management adopted in free access applications, among 69 apps available on Google Play, App Store and Apple, researchers found important flaws on devices such as: imprecise of nonexistent phone numbers to hotlines in case of attempted suicide and absence of complete evidence-based strategies for preventing self-destructive behavior and only five of the 69 applications presented such resources[13]. Another study found a high percentage of application only available in English and only half of the free applications were constantly updated[17], showing failures in the application of basic guidelines and/or ineffective referrals.

In all studies found, there were promising results on the use of ICTs not as a replacement for face-to-face treatment, but as a tool to assist in the care of people with high risk of suicide, as well as a support alternative for detecting patients with suicidal ideations. However, as much of these tools are still in development, it is evident the need for further research in this area, as technologies emerge and incorporate in the daily life of society, such as machine learning and use of mobile apps.

Many studies have raised ethical and security issues regarding web-based suicide prevention practices, concerns ranging from professionals' lack of skill with new technological tools to in-depth evidence-based studies that provide guidelines for safe use of the ICTs and self -destructive behavior.

CONCLUSION

The use of ICTs showed the ability to expand accessibility of follow-up and therapeutic interventions for individuals who are at risk of suicide, which would otherwise be impossible. Therefore, facilitating health care with an appropriate professional sensitive approach is a potential way to prevent suicide risk, considering that these are affordable technologies that minimize geographic, temporal and economic barriers. However, it is important to pay attention to the user's safety when accessing ICTs, as well as guarantee of responsiveness of the service and the attention team through the need for ethical care and management of the suicidal crisis.

As limitations of this study, there are several different keywords that can be used and may generate different results depending on the application of the terms similar to descriptors. Thus it is recommended the application of more systematized methodologies in the elaboration of future projects that analyze the same theme, which can facilitate the elaboration of projects with practical implications in the daily life of people suffering from suicidal behavior.

In any case, as important contributions from this study there are aspects such as the lack of Latin American productions, the low number of studies and the correlation with the COVID-19 pandemic, which are evidence of the ICT relationship risk of suicide.

REFERENCES

1. World Health Organization. Suicide in the world: global health estimates [Internet]. 2019 [cited in 2 Nov 2021]. Geneva: WHO; 2019. 32 p. Available from: https://apps.who.int/iris/handle/10665/326948
2. Minois G. História do suicídio: a sociedade ocidental diante da morte voluntária. [S.I.]: Editora Unesp; 2018. 426 p.
3. Bertolote JM. O suicídio e sua prevenção. 2. ed. [S.I.]: Editora Unesp; 2016. 144 p.
4. Werlang, BSG, Macedo, MMK, Krüger, LL. Perspectiva psicológica. In: N. Botega BSG, Werlang BSG, organizadores. Comportamento suicida. São Paulo: Artmed; 2004. p. 45-58.
5. Meleiro AMAS, Correa H. Comportamento suicida. In: Meleiro AMAS. Psiquiatria: estudos fundamentais. São Paulo: Guanabara Koogan, 2018. p. 633-649.
6. Stanley B, Brown GK, Brenner LA, Galfalvy H, Currier GW, Knox KL et al. Comparison of the safety planning intervention with follow-up vs usual care of suicidal patients treated in the emergency department. JAMA Psychiatry [Internet]. 2018 [cited in 14 Nov 2021]; 75:894. DOI: http://dx.doi.org/10.1001/jamapsychiatry.2018.1776
7. Kennar BD, Biernesser C, Wolfe Kristin L, Foxwell AA, Lee SJ, Rial K. Developing a brief suicide prevention intervention and mobile phone application: a qualitative report. J Technol Hum Serv. [Internet]. 2015 [cited in 14 Nov 2021]; 33:345-57. DOI: http://dx.doi.org/10.1080/15228835.2015.1106384
8. Merchant A, Hawton K, Stewart A, Montgomery Paul, Singaravelu Vinod, Hawton Keith, et al. Correction: a systematic review of the relationship between internet use, self-harm and suicidal behaviour in young people. Plos One [Internet]. 2018 [cited in 2 Nov 2022]; 12(8):e0193937. DOI: http://dx.doi.org/10.1371/journal.pone.0193937

9. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. International Journal Of Social Research Methodology 2005; 8(1):19-32. DOI: http://dx.doi.org/10.1080/1364557032000119616
10. Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil, H. Chapter 11: Scoping Reviews (2020 version). In: Aromataris E, Munn Z (Editors). JBI, 2020. Available JBI Manual for Evidence Synthesis. Available in: https://synthesismanual.jbi.global https://doi.org/10.46658/JBIMES-20-12
11. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Scoping Reviews Rayyan - a web and mobile app for systematic reviews. Syst Rev. [Internet]. 2016 [cited in 2 Nov 2021]; 5:(210). DOI: https://doi.org/10.1186/s13643-016-0384-4
12. Braun V, Clarke V. Using thematic analysis in psychology: Qualitative Research In Psychology. Syst Rev. [Internet]. 2006 [cited in 14 Nov 2021]; 17(1):1-12. DOI: http://dx.doi.org/10.1191/1478088706qp063oa
13. Martinengo L, Galen LV, Lum E, Kowalski M, Subramaniam M, Car J. Suicide prevention and depression apps' suicide risk assessment and management: a systematic assessment of adherence to clinical guidelines. BMC Medicine [Internet]. 2019 [cited in 11 Nov 2021]; 17:1-12. DOI: https://doi.org/10.1186/s12916-019-1461-z
14. Rassy J, Bardon C, Dargis L, Côté LP, Corthésy-Blondin L, Mörch CM, et al. Information and communication technology use in suicide prevention: scoping review. Jornal of Medical Internet Research [Internet]. 2021 [cited in 14 Nov 2021]; 23(5):25288. DOI: http://dx.doi.org/10.2196/25288
15. Melia R, Francis K, Hickey E, Bogue J, Duggan J, O'Sulivan M, et al. Mobile health technology interventions for suicide prevention: systematic review. JMIR Mhealth Uhealth [Internet]. 2020 [cited in 14 Nov 2021]; 8(1):e12516. DOI: http://dx.doi.org/10.2196/12516
16. O'Grady C, Melia R, Bogue J, O'Sulivan M, Young K, Duggan J. A mobile health approach for improving outcomes in suicide prevention (SafePlan). JMIR Mhealth Uhealth [Internet]. 2020 [cited in 14 Nov 2021]; 22(7):e17481. DOI: http://dx.doi.org/10.2196/17481
17. Castillo-Sánchez G, Marques G, Dorronzoro E, Rivera-Romero O, Franco-Martín M, La Torre-Díez I. Suicide risk assessment using machine learning and social networks: a scoping review. J Med Syst. [Internet]. 2020 [cited in 14 Nov 2021]; 44(14):1-15. DOI: http://dx.doi.org/10.1007/s10916-020-01669-5
18. Castillo-Sánchez G, Camargo-Henríquez I, Muñoz-Sánches JL, Franco-Martín M, La Torre I de. Suicide prevention mobile apps: descriptive analysis of apps from th emost popular virtual sotores. JMIR Mhealth Uhealth [Internet]. 2019 [cited in 14 Nov 2021]; 7(8):13885. DOI: http://dx.doi.org/10.2196/13885
19. Ophir Y, Tikochinski R, Asterhan C, Sisso I, Reichart R. Deep neural networks detect suicide risck from textual facebook posts. Sci Rep (Nat Publ Group) [Internet]. 2020 [cited in 14 Nov 2021]; 10(1):e16658. DOI: http://dx.doi.org/10.1038/s41598-020-73917-0
20. Bailey E, Alvarez-Jimenes M, Robinson J, D'Alfonso S, Nedeljkovic M, Davey C. An enhanced social networking intervention for young people with active suicidal ideation: safety, feasibility and acceptability outcomes. Int J Environ Res Public Health [Internet]. 2020 [cited in 14 Nov 2021];17(7):2435. DOI: http://dx.doi.org/10.3390/ijerph17072435
21. Bailey E, Robinson J, Alvarez-Jimenes M, Nedeljocovic M, Valentine L, Bendall S. Moderated online social therapy for young people with active suicidal ideation: qualitative study. J Med Internet Res. [Internet]. 2021 [cited in 14 Nov 2021]; 23(4):e24260. DOI: http://dx.doi.org/10.2196/24260
22. Bernert R, Kim J, Iwata N, Perlis M. Sleep disturbances as an evidenced-based suicide risck factor. Curr Psychiatry Rep. [Internet]. 2015 [cited in 14 Nov 2021]; 17(3):1-15. DOI: http://dx.doi.org/10.1007/s11920-015-0554-4
23. Moskiwitz AM, Dewitt K, White N, Melia R, Zhao D, Berbert RA. Nightmares and emotion regulation deficits as predictors of risk for suicidal ideation and history of self-

directed violence among military veterans. Sleep [Internet]. 2017 [cited in 14 Nov 2021]; 40(1):413. DOI: http://dx.doi.org/10.1093/sleepj/zsx050.1107
24. O'Connor R, Smyth R, Ferguson E, Ryan C, Williams J. Psychological processes and repeat suicidal behavior: a four-year prospective study. J Consult Clin Psychol. [Internet]. 2013 [cited in 14 Nov 2021]; 81(6):1137-43. DOI: http://dx.doi.org/10.1037/a0033751
25. Cassidy F. Risk factors of attempted suicide in bipolar disorder: a four-year prospective study. Suicide Life Threat Behav. [Internet]. 2011 [cited in 14 Nov 2021]; 41(1):6-11. DOI: http://dx.doi.org/10.1111/j.1943-278x.2010.00007.x
26. World Health Organization. World health statistics 2018: monitoring health for the SDGs, sustainable development goals [Internet]. Geneva: WHO; 2018 [cited in 2 Nov 2021]. 100 p. Available from: http://apps.who.int/iris/bitstream/handle/10665/272596/9789241565585-eng.pdf?ua=1
27. Kleiman E, Turner B, Fedor S, Beale E, Huffman J, Nock M. Examination of real-time fluctuations in suicidal ideation and its risk factors: results from two ecological momentary assessment studies. J Abnorm Psychol. [Internet]. 2017 [cited in 14 Nov 2021]; 126(6):726-38. DOI: http://dx.doi.org/10.1037/abn0000273
28. Liu Y, Cao L, Li X, Jia Y, Xia H. Awareness of mental health problems in patients with coronavirus disease 19 (COVID-19): a lesson from an adult man attempting suicide. Asian Journal Of Psychiatry [Internet]. 2020 [cited in 14 Nov 2021]; 51:102106. DOI: http://dx.doi.org/10.1016/j.ajp.2020.102106
29. Reger MA, Stanley IH, Joiner TE. Suicide mortality and coronavirus disease 2019: a perfect storm?. JAMA Psychiatry (Chic Ill., Online) [Internet]. 2020 [cited in 14 Nov 2021]; 77(11):1093. DOI: http://dx.doi.org/10.1001/jamapsychiatry.2020.1060
30. Zheng L, Wang O, Hao S, Ye C, Liu M, Xia M et al. Development of an early-warning system for high-risk patients for suicide attempt using deep learning and electronic health records. Transl Psychiatr. [Internet]. 2020 Feb [cited in 14 Nov 2021]; 10(1):1-10. DOI: https://doi.org/10.1038/s41398-020-0684-2
31. World Health Organization. MHealth: new horizons for health through mobile technologies [Internet]. Geneva: WHO; 2011 [cited in 14 Nov 2021]. 111 p. Available from: http://apps.who.int/iris/bitstream/handle/10665/44607/9789241564250_eng.pdf?sequence=1
32. Roy A, Sarchiopone M, Carli V. Gene-environment interaction and suicidal behavior. J Psychiatr Pract. [Internet]. 2009 [cited in 14 Nov 2021]; 15(4):282-8. DOI: 10.1097/01.pra.0000358314.88931.b5

Associated Publisher: Vânia Del'Arco Paschoal.

Conflict of Interests: the authors declared there is no conflict of interests.

Financing: none.

CONTRIBUTIONS
Bruna Caroline Voltarelli and **Karin Aparecida Casarini** contributed to the writing and revision. **Heloisa Cristina Figueiredo Frizzo** participated in the conception of the study and its project, writing and revision. **Ricardo Augusto dos Santos** collaborated in the conception of the study and its project, collection and analysis of data, writing and revision.

How to cite this article (Vancouver)
Santos RA, Frizzo HCF, Casarini KA, Voltarelli BC. Self-destructive behavior and information and communication technology. Rev Fam, Ciclos Vida Saúde Contexto Soc. [Internet]. 2023 [cited in *insert day, month and year of access*]; 11(1):e6439. Available from: *insert access link*. DOI: *insert DOI link*

How to cite this article (ABNT)
SANTOS, R. A.; FRIZZO, H. C. F.; CASARINI, K. A.; VOLTARELLI, B. C. Self-destructive behavior and information and communication technology. **Rev. Fam., Ciclos Vida Saúde Contexto Soc.**, Uberaba, MG, v. 11, n. 1, p. e6439, 2023. DOI: *insert DOI link*. Available from: *insert access link*. Access in: *insert day, month and year of access*.

How to cite this article (APA)
Santos, R.A., Frizzo, H.C.F., Casarini, K.A., & Voltarelli, B.C. (2023). Self-destructive behavior and information and communication technology. *Rev. Fam., Ciclos Vida Saúde Contexto Soc.*, 11(1). Retrieved in *insert day, month and year of access* from *insert access link*. DOI: *insert DOI link.*