

USING VIRTUAL REALITY TO EASE THE BURDEN ON INFORMAL CAREGIVERS

Jana Horová, Sylva Bártlová, Hana Hajduchová, Lenka Motlová, Marie Trešlová, Helena Zášková, Iva Brabcová *, Tomáš Hrdý, Ingrid Baloun, Věra Stasková

University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, Department of Nursing, Midwifery and Emergency Care, České Budějovice, Czech Republic

Submitted: 2022-02-15

Accepted: 2022-04-13

Published online: 2022-06-30

Abstract

Introduction: Today, support for caregivers through communication and information technology is increasingly being used. Virtual environments can to some extent satisfy the need for support and allow for an empathetic perception of the situation, which reduces the caregiver's burden. This review presents the findings of research studies, over a period of 4 years (2018–2021), that have looked at the use of virtual reality to alleviate the burden of informal caregivers.

Methods: By formulating a clinical question using the PICO method, keywords were identified, and search resources were retrieved from the full-text electronic databases Cinahl, ProQuest Central, and PubMed Central.

Results: Nine relevant research studies were included in the final review. Five studies focused on investigating the impact of virtual reality on informal caregivers of persons with dementia, and the other research focus was on caregivers of persons with psychiatric illness, the elderly with chronic illness, or those in the terminal stage of illness. Programs using virtual reality were included as research interventions. These were created in the locality, taking into account the cultural specificities of the participants.

Conclusions: Support for informal caregivers is generally perceived as inadequate. Virtual reality and simulation are areas that have great potential to support health and social care provision.

Keywords: Care burden; Caregiver; Home care; Virtual reality

INTRODUCTION

In connection with the increase in the absolute and relative number of seniors in recent decades (not only in the Czech Republic), where the number of people over 85 has increased significantly (Czech Statistical Office, 2021), efforts to deinstitutionalise health and social services are gaining importance. This situation leads to informal care. Informal care is provided by support, assistance and care of loved ones, relatives, or acquaintances. It

is often without specific professional education and performed after/before work with high emotional involvement. The term “informal caregiver” is not precisely defined in the Czech legislative; the caregiver is mentioned in Act No. 108/2006 Coll., on social services, only indirectly in connection with the definition of dependent persons. However, in the Czech Republic, up to two million adults are involved in caring for their loved ones (Geissler et al., 2019).

Despite emotional involvement, long-term care leads to a physical, mental, emotional, social, or financial burden (Přidalová, 2006), which is often referred to as a care burden.

With the development of communication technologies and the increasing digital literacy of the population, the interests of researchers worldwide are moving to support the introduction of information technology as an educational and supportive means for (not only) the general public. Support for caregivers through communication and information technologies and virtual reality is increasingly being used. The virtual environment can satisfy the need to share the experiences and feelings of caregivers, and allow users to interact and empathise with perception, which can be beneficial in reducing caregiving (Alvariza et al., 2020).

MATERIALS AND METHODS

The main goal of this review was to find out what approaches in virtual reality are used to alleviate the care burden of informal caregivers and enable a view of health and social work. In search of relevant scientific evidence, it is appropriate to use the modified structure of the PICO tool to formulate a specific research question (foreground type), namely the acronym PICO: P (participant, care user, population), I (research phenomenon) and Co (context, circumstances) (Marečková et al., 2015).

Based on this method, we identified a “foreground” clinical question: What approaches/strategies of virtual reality (I – intervention) are used to alleviate the care burden (Co – context) of informal caregivers (P – population)?

We used the method of content analysis of the retrieved documents. For this study, the term “informal caregiver” was defined as “an individual providing care to a close person in the home environment”. Concerning the currentness of the topic, the period for the searched published documents was set to 2018–2021. The conditions for inclusion in the analysis were a publication in a peer-reviewed journal, the possibility of displaying the full text, the focus of the research on humankind (the object of the research were peo-

ple), and the publication being in the English language. We considered the source (conference collections, journals, other sources, reports, professional journals and working documents) and document type (articles).

We used an advanced search strategy for keywords. We included several Boolean operators (nesting) (Jarošová and Zeleníková, 2014). We used Boolean operators such as “and” (looking for where the terms are together) and “or” (looking for both terms independently) (Marečková et al., 2015). We did not use wildcards, truncation, or proximity operators (*near*, *within*, *adjacent*). We selected the following keywords: virtual reality (*and/or*) informal care (*and/or*) caregiver (*and/or*) home care (*and/or*) care burden. We searched for relevant sources in full-text electronic databases focused on nursing and other medical disciplines, such as Cinahl, ProQuest Central, and PubMed Central.

RESULTS

After entering the set criteria, we found 469 relevant records (Table 1). We used the “hand search” method to find three other sources. Subsequently, we filtered the sources by studying the abstracts and removing duplicate articles. The final number was 57 publications. We searched for their full texts to perform content analysis.

In the second result evaluation phase, the exclusionary factors were inconsistencies with PICO, duplicate publications, and focus on professional care and the environment of residential facilities. After a critical evaluation of the full texts, we included nine studies in the final review (Table 2).

Five studies used the quantitative research design, one used the qualitative, and one used the mixed method. One study was cross-sectional, and one was a systematic review. The presented surveys were conducted in the USA (3 studies), the Netherlands (2 studies), China (2 studies), South Korea (1 study), and Spain (1 study). Five studies focused on the impact of virtual reality on informal caregivers of people with dementia. Another research focused on caregivers of people with psychiatric illnesses, seniors with chronic diseases, or the terminal stage of the disease.

Table 1 – Search strategies

Clinical question		Results	Limitations
What approaches/strategies are used using virtual reality (I – intervention) to alleviate the care burden (Co – context) of informal caregivers (P – population)?			
1	caregiver OR informal care OR informal caregiver OR primary care provider	P	language: EN; publishing period: 2018–2021; document type: non-reviewed articles
2	virtual reality OR simulation	I	
3	care burden OR burden of caregivers OR burden on caregivers	Co	
4	home care OR long-term care		
5	(1) AND (2) AND (3) AND (4)	PICO	
		10.673	
		92.097	
		11.202 + 13.962	
		469	

Source: According to Marečková et al. (2015).

Various programmes using virtual reality were used as research interventions. They were created in a specific locality and considered cultural specificities. The following were used: 360° simulation tool with accompanying e-learning course Through the D'mentia Lens – TDL (Wijma et al., 2018); the simulation tool Into D'mentia (Jütten et al., 2018); web soap opera Mirela/online soap opera with psychoeducational effect (Kajiyama et al., 2018); mHealth application (mobile application for sharing health information) (Phongtankuel et al., 2018); video education programme Aging Service Technology AST (Tam and Schmitter-Edgecombe, 2019); We-Chat virtual community programme (Han et al., 2022; Zang et al., 2021); a virtual reality programme for the improvement of caregivers' practical competences (Kim, 2021), and an analysis of the technical and functional characteristics of mobile health applications for caregivers of people with chronic conditions (Lorca-Cabrera et al., 2021).

Research conclusions

All included research studies concluded that applied virtual reality interventions had an effective and positive impact. Significant effects have been reported regarding stress reduction, exercise resistance, empathy, depressive symptoms, knowledge, and practical competences (Han et al., 2022; Kajiyama et al., 2018; Wijma et al., 2018). The programme's low cost was also evaluated positively (Kajiyama et al., 2018). One study noted an increased risk of dizziness in programme par-

ticipants and recommended conducting virtual reality interventions while sitting (Kim, 2021). A review by Lorca-Cabrera et al. (2021) noted that digital applications lacked scientific evaluation, and most of them were not approved by official agencies. It is, therefore, necessary to always support efficiency with scientific evidence. The presented conclusions also resulted in a fundamental requirement that the participants had at least a partial level of digital literacy.

DISCUSSION

The goal of this article was to find out the possibilities of supporting informal caregivers who use virtual reality. Current research presents such possibilities and provides clear information in health and social work.

The need to provide support to caregivers of their close relatives has been confirmed in most of the research studies included. Providing long-term care in a family is a dynamic and complex process that requires considerable effort and responsibility (Kuručová, 2016). The current so-called “sandwich generation”, a phenomenon in which people of working age with children take care of ageing parents at the same time (Vidović et al., 2003), is a generation born in the 1960s–1980s. This population is significantly endangered by the increased burden of caring for their close relatives, which includes a higher level of mental and physical exhaustion (stress, fatigue, depression, workload perception). At the same

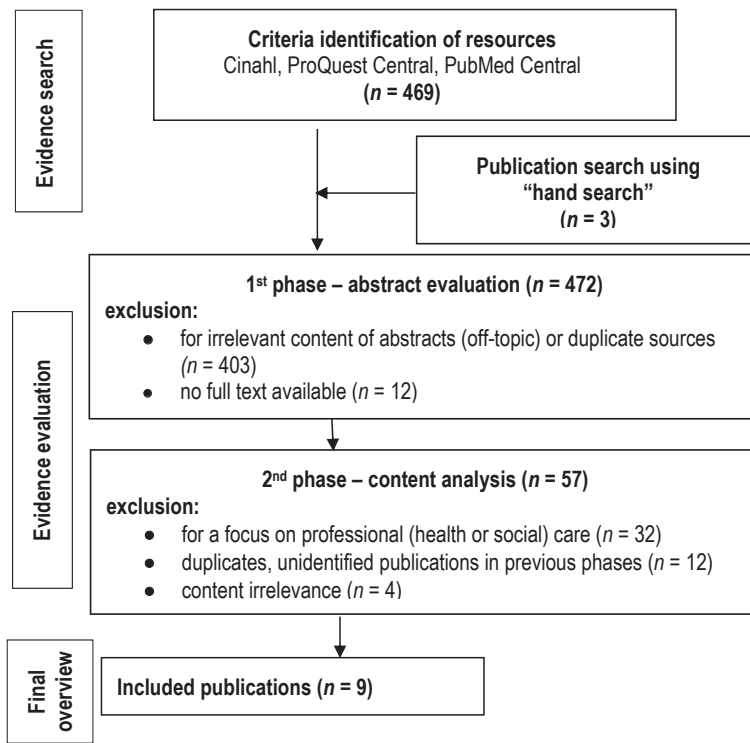


Chart 1 – Relevant sources search strategies (Prisma flow diagram)

time, this generation is influenced by the development of communication and information technologies (Sak and Kolesárová, 2012).

Simulation of a stressful situation or feelings of a sick person (e.g., a person with mobility or cognitive impairment) allows the user to interact and perceive the patient’s situation with greater empathy (Baños et al., 2011). Virtual reality, which achieves significant results in treating selected disorders and diseases, has become a common strategy used in medical or psychological fields (Šmahaj and Procházka, 2014). Research teams have used these benefits to support informal caregivers, who often care for their close relatives without support (nursing and psychological care and social assistance). The importance of the simulation strategies and virtual reality for informal care provision has been highlighted by the Dutch research team Wijma et al. (2018). Their pilot study focused on the impact of a 360° simulation tool with an accompanying e-learning course, Through the D’mentia Lens (TDL), for caregivers of patients with de-

mentia. The course simulated the feelings of people with dementia. This intervention had a positive effect on caregivers’ level of empathy ($p = 0.006$), feeling of higher competence ($p = 0.007$), feeling of higher resistance to burden ($p = 0.005$), increased activity ($p = 0.043$), and more positive interaction with a person with dementia ($p = 0.000$). Similar results were presented by another Dutch research team, Jütten et al. (2018). The authors assumed that applying the intervention – training in the simulation unit (apartment imitation – dementia simulator-Into D’mentia) would increase caregivers’ level of empathy and understanding of the disease and reduce the care burden. The respondents stated that they were more patient and focused mainly on the positive aspects of care.

The stigma associated with mental illness and psychiatry leads to the discrimination of mentally ill people. It becomes a significant obstacle to timely and successful treatment. In the care of a patient with a psychiatric diagnosis, public prejudice and stigma can create

Table 2 – Final overview of included studies

Author (publication year)	Place	Research type / research focus	Research object/subject	Conclusion
Wijma et al. (2018)	The Netherlands	Quantitative Influence of emotion simulation of people with dementia (360° simulation tool accompanied by e-learning course Through the D'mentia Lens – TDL) on informal caregivers (empathy, burden, competence...).	Informal caregivers of their relatives with diagnosed dementia (n = 42); IT literacy required.	<ul style="list-style-type: none"> ↑ positive mental interaction with a person with dementia ($p = 0.000$) ↑ empathy ($p = 0.006$) ↑ competence ($p = 0.007$) ↑ resistance to burden ($p = 0.005$) ↑ activities ($p = 0.043$) <p>The use of a simulation tool supports caregivers in their role. Pilot version of the programme.</p>
Jütten et al. (2018)	The Netherlands	Quantitative Influence of dementia simulation (Into D'mentia) on caregivers. Evaluation of empathy, care burden, social reliability, anxiety, depression, and subjective and objective health of caregivers.	Informal caregivers of people with dementia. Intervention group (IG) n = 145 and control group (CG) n = 56 (absent from simulation intervention).	<p>There were no significant differences between IG and CG ($p > 0.05$). 85% of IG participants considered the intervention useful; 76% changed their approach to caring; 61% increased their understanding of dementia. No significant differences between IG and CG in sense of competence, quality of the relationship with care receiver, care burden, depression, and anxiety.</p>
Kajiyama et al. (2018)	USA	Qualitative Investigation of the use and impact of mHealth applications (mobile applications for sharing health information) on the sensitivity of caregivers and their concerns in the provision of home hospice care.	80 informal caregivers supported by a non-profit hospice organisation. Semi-structured telephone conversations.	Younger caregivers (<65 years) had better knowledge and were more open to AST than older caregivers (>65 years). There is a significant interaction between fewer functional limitations of the dependent person and a positive change in attitudes towards AST.
Phongtankuel et al. (2018)	USA	Qualitative Investigation of the use and impact of mHealth applications (mobile applications for sharing health information) on the sensitivity of caregivers and their concerns in the provision of home hospice care.	80 informal caregivers supported by a non-profit hospice organisation. Semi-structured telephone conversations.	The need for communication, care information, education, updates from professional staff and care planning as essential areas in the mHealth application.
Tam and Schmitter-Edgecombe (2019)	USA	Qualitative Aging Service Technology (AST) → video-educational programme focused on increasing awareness of caregivers of seniors.	43 informal caregivers of seniors.	Younger caregivers (<65 years) had better knowledge and were more open to AST than older caregivers (>65 years). There is a significant interaction between fewer functional limitations of the dependent person and a positive change in attitudes towards AST.

Table 2 (continued)

Author (publication year)	Place	Research type / research focus	Research object/subject	Conclusion
Han et al. (2022)	China	Quantitative Virtual reality effect (community in the WeChat virtual community programme) Note: WeChat is a Chinese multifunctional mobile application. Allows users to communicate via free text and multimedia messages or video calls. Other features include educational videos and contributions.	Caregivers of their relatives with diagnosed dementia in virtual community (n = 159; 136 – 85.5% active participants).	The effect of intervention on the incidence of depression (p < 0.05), perceived stress (p < 0.05), helplessness (p < 0.001), total score of total effectiveness (p < 0.05) and two information gathering domains and gaining support (p < 0.05). After the intervention, there was no decrease in the perception of stress caused by care burden of a caregiver (p > 0.05).
Kim (2021)	South Korea	Mixed Development of a virtual reality programme to improve the practical competences of caring for patients with dementia.	Caregivers who have participated in an educational programme to care for people with dementia (n = 77).	Improving concentration, increasing self-confidence in the care of patients with dementia, perception of the patient in a realistic way... Risks of virtual reality → dizziness
Zang et al. (2021)	China	Cross-sectional Evaluation of the WeChat programme's impact on selected areas of caregivers (perception of stress, stigmatisation, coping, social support, family functioning and the feeling of reward for care).	Caregivers of close relatives with psychiatric diagnosis (taking antipsychotics) (n = 449; 229 did not participate in the WeChat programme and 220 did not participate at all → control group).	Programme users reported lower scores regarding stress (p = 0.017) and stigmatisation (p = 0.009); higher score in situation management (p = 0.003), social support (p < 0.001), family functioning (p < 0.001) and feeling rewarded for the given care (p < 0.001). Significant influence of age and education on programme involvement.
Lorca-Cabrera et al. (2021)	Spain	Systematic review To analyse the technical and functional properties of mobile health applications designed for caregivers of people with chronic conditions and/or diseases.	A systematic search for smartphone mobile health apps in App Store and Google Play (5–6/2018). The second search – PubMed and Google Scholar databases to determine if the applications were evaluated and presented in scientific journals. Third search – Spanish catalogues of medical applications – evaluation of quality and safety of selected applications.	43 applications were included in the overview; 67% (n = 29) of the applications focused exclusively on informal caregivers, 51% (n = 22) were dedicated to their support, and only 21% (n = 9) provided social or emotional support. The analysed applications lack scientific publication, and most applications (84%; n = 36) have not been officially approved by official agencies. The evaluated applications focus on improving the care of individuals with chronic diseases. Efficiency needs to be supported by scientific evidence.

a barrier to achieving and enjoying life goals (Corrigan et al., 2002). A study by Zang et al. (2021) presented findings on reduced levels of the perception of stigma ($p = 0.009$) and stress ($p = 0.017$) regarding informal caregivers who care for patients with mental illness. However, the education and age of the participants had a significant effect, which is probably related to the level of digital literacy.

Lorca-Cabrera et al.'s (2021) assertion that – a scientific guarantee and the presentation of the results are insufficient – seems important. It is, therefore, necessary to always support the effectiveness of research findings with scientific evidence.

There is no research conclusion in the Czech Republic that shows the effect of providing support to people caring for their close relatives using virtual reality or simulation. However, courses for informal (and formal) caregivers are offered, which will enable the participants to experience a person dependent on care through virtual reality and simulation (e.g., Virtual Reality courses of the APSS CR Institute for Education – client care and Virtual Reality – dementia). Research that focuses on emotional involvement, and the mental and (often) physical demands of caring for a close relative is usually designed using qualitative or mixed research methods and fewer respondents. Thus, the resulting statements of the research teams cannot be generalised but can be used to support the introduction of an individualised approach in informal care. The virtual environment can also satisfy the need to share the experiences and feelings of caregivers, and this activity and form of support should correspond to the evaluation of their real needs and options.

CONCLUSIONS

In recent years, the research focus has been on verifying the impact of information technology on health and social care. This review presents current foreign research aimed at supporting informal caregivers through simulation and virtual information platforms. The virtual environment supports the caregivers' complementarity, self-confidence, and perception of their health and nursing care competence.

The presented article offers inspiration for further research in health and social work. Comparing the possibilities of supporting informal care in different countries can help this neglected area of health and social care. An amendment to Act No. 108/2006 Coll., on social services, is currently being prepared. An informal caregiver should appear in the draft amendment as an official target group. The interconnectedness of health and social care is indisputable in informal care. Therefore, the implication of the presented topic is expected to be beneficial not only for social work but also for the field of nursing.

Ethical aspects and conflict of interests

The authors have no conflict of interests to declare.

Limitations

The article is restricted to sources listed in English only, which may have prevented the inclusion of some studies published in other world languages.

Funding

This study was conducted with the state support of the Technology Agency of the Czech Republic within the ETA programme, and as part of project No. TL03000518 "Support of informal caregivers in South Bohemia through audio-visual means, including virtual reality".

REFERENCES

1. Act No. 108/2006 Sb., o sociálních službách, v platném znění. In: Sbírka zákonů České republiky, částka 37, pp. 1257–1289 (Czech).
2. Alvariza A, Häger-Tibell L, Holm M, Steineck G, Kreicbergs U (2020). Increasing Preparedness for Caregiving and Death in Family Caregivers of Patients with Severe Illness Who are Cared for at Home – Study Protocol for a Web-Based Intervention. *BMC Palliat Care* 19(33). DOI: 10.1186/s12904-020-0530-6.
3. Baños RM, Guillen A, Quero S, García-Palacios A, Alcaniz M, Botella C (2011). A Virtual Reality System for the Treatment of Stress-Related Disorders: A Preliminary Analysis of Efficacy Compared to a Standard Cognitive Behavioral Program. *Int J Hum Comput Stud* 69(9): 602–613. DOI: 10.1016/j.ijhcs.2011.06.002.
4. Corrigan PW, Rowan D, Green A, Lundin R, River P, Uphoff-Wasowski K, et al. (2002). Challenging two mental illness stigmas: personal responsibility and dangerousness. *Schizophr Bull* 28(2): 293–309. DOI: 10.1093/oxfordjournals.schbul.a006939.
5. Czech Statistical Office (2021). Aktuální populační vývoj v kostce [Current population development in a nutshell]. [online] [cit. 2021-11-02]. Available from: <https://www.czso.cz/csu/czso/aktualni-populacni-vyvoj-v-kostce> (Czech).
6. Geissler H, Fischerová A, Holeňová E, Solnářová D, Staňková N (2019). Jak podporovat pečující na regionální a lokální úrovni? Příklady dobré praxe. Projekt „Podpora neformálních pečujících II“ [How to support caregivers at the regional and local level? Examples of good practice. Project “Support for informal caregivers II”]. Praha: Fond dalšího vzdělávání. CZ.03.2.63/0.0/0.0/15_017/0006922 (Czech).
7. Han J, Guo G, Hong L (2022). Impact of professionally facilitated peer support for family caregivers of people with dementia in a WeChat virtual community. *J Telemed Telecare* 28(1): 68–76. DOI: 10.1177/1357633X20910830.
8. Jarošová D, Zeleníková R (2014). Ošetrovatelství založené na důkazech [Evidence-based nursing]. Evidence Based Nursing. Praha: Grada, 136 p. (Czech).
9. Jütten LH, Mark RE, Sitskoorn MM (2018). Can the Mixed Virtual Reality Simulator Into Dementia Enhance Empathy and Understanding and Decrease Burden in Informal Dementia Caregivers? *Dement Geriatr Cogn Dis Extra* 8(3): 453–466. DOI: 10.1159/000494660.
10. Kajiyama B, Fernandez G, Carter EA, Humber MB, Thompson LW (2018). Helping Hispanic Dementia Caregivers Cope with Stress Using Technology-based Resources. *Clin Gerontol* 41(3): 209–216. DOI: 10.1080/07317115.2017.1377797.
11. Kim D (2021). Development and Effect of Virtual Reality Practice Program for Improving Practical Competency of Caregivers Specializing in Dementia. *Healthcare* 9: 1390. DOI: 10.3390/healthcare9101390.
12. Kurucová R. (2016). Zátěž pečovatele – posuzování, diagnostika, intervence a prevence v péči o nevléčitelně nemocné [The caregivers’ burden – assessment, diagnostics, intervention, and prevention in caring for the terminally ill]. Praha: Grada, 112 p. (Czech).
13. Lorca-Cabrera J, Martí-Arques R, Albarca-Riobóo N, Raigal-Aran L, Roldan-Merino J, Ferré-Grau C (2021). Mobile Applications for Caregivers of Individuals with Chronic Conditions and/or Diseases: Quantitative Content Analysis. *Int J Med Inform* 145: 104310. DOI: 10.1016/j.ijmedinf.2020.104310.
14. Marečková J, Klugarová J, et al. (2015). Evidence-Based Health Care. Zdravotnictví založené na vědeckých důkazech [Evidence-based health care]. Olomouc: Univerzita Palackého Olomouc, 96 p. (Czech).
15. Phongtankuel V, Shalev A, Adelman RD, Dewald R, Dognam R, Baughn R, et al. (2018). Mobile Health technology is here—but are hospice informal caregivers receptive? *Am J Hosp Palliat Med* 35(12): 1547–1552. DOI: 10.1177/1049909118779018.
16. Přidalová M (2006). Péče o staré rodiče – nový úděl mladších seniorů? [Caring for elderly parents – a new fate for younger seniors?] *Sociální práce/Sociální práce 2006(2): 68–81*. [online] [cit. 2021-11-03]. Available from: <https://socialnprace.cz/issue/2006-02/> (Czech).
17. Sak P, Kolesárová K (2012). Sociologie stáří a seniorů [Sociology of old age and seniors]. Praha: Grada, 232 p. (Czech).

18. Šmahaj J, Procházka R (2014). Virtuální realita jako možnost léčby úzkostných poruch [Virtual reality as an option to treat anxiety disorders]. *Cesk Psychol* 58(6): 571–579 (Czech).
19. Tam JW, Schmitter-Edgecombe M (2019). A caregiver educational program: a video program to promote aging services technologies awareness. *Geriatr Nurs* 40(1): 78–83. DOI: 10.1016/j.gerinurse.2018.06.015.
20. Vidovičová L, Rabušic L, Mazáčová M (2003). Senioři a sociální opatření v oblasti stárnutí v pohledu veřejnosti [The elderly and social measures in the eyes of public]. Zpráva z empirického výzkumu. Praha: Výzkumný ústav práce a sociálních věcí, 67 p. [online] [cit. 2021-11-03]. Available from: <http://praha.vupsv.cz/Fulltext/vidrab.pdf> (Czech).
21. Wijma EM, Veerbeek MA, Prins M, Pot AM, Willemse BM (2018). A Virtual Reality Intervention to Improve the Understanding and Empathy for People with Dementia in Informal Caregivers: Results of a Pilot Study. *Aging Ment Health* 22(9): 1121–1129. DOI: 10.1080/13607863.2017.1348470.
22. Zang D, Zhang X, Li Y, Li T, Xiao S, Tebes JK, Yu Y (2021). WeChat use among family caregivers of people living with schizophrenia and its relationship to caregiving experiences. *Comput Hum Behav* 123(1): 106877. DOI: 10.1016/j.chb.2021.106877.

 **Contact:**

Iva Brabcová, University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences, Department of Nursing, Midwifery and Emergency Care, U Výstaviště 26, 370 05 České Budějovice, Czech Republic
Email: brabcova@zsf.jcu.cz