



ISSBD Bulletin

Number 2 Serial No. 80

Supplement to International Journal of Behavioral Development Volume 45 Issue 6 November, 2021

Contents

SPECIAL ISSUE: Digital Interventions

Page

SPECIAL SECTION

- 1 Introduction to the Special Issue: Digital Interventions
Karina Weichold and Deepali Sharma

FEATURE ARTICLES

- 2 Digital Physical Activity Interventions to Improve Health and Wellbeing
Tiara Ratz
- 7 Digital Tools in the Treatment of Depression
Caroline Oehler
- 11 Digital Single-Session Interventions: Promoting Resilience Across the Lifespan
Atina Manvelian and Jessica Schleider
- 14 Considerations in the Development and Use of e-and-m- Mental Health in Latin American Contexts: Case Analysis of an m-Health Intervention to Prevent Postnatal Depression and Anxiety in Chilean Mothers
J. Carola Pérez, Soledad Coo, Daniela Aldoney, and María Ignacia García

COUNTRY REPORT

- 22 Knowledge Survey about Early Child Development in a Low Resource Community Setting in Pakistan
Maham Rasheed, Muhammad Suleman Shakoor, Tayyeba Kiran, Mina Husain, Shehla Naeem, and Nasim Chaudhry

SOCIETY

- 27 News from the Early Career Scholars' Representative
Cinzia Di Dio
- 28 News from the Organizers of the 26th Biennial Meeting of ISSBD
Frosso Motti-Stefanidi

Main Editor
Karina Weichold

ISSBD Bulletin
Department of Youth Research, Institute of Psychology
University of Jena
Am Steiger 3 / Haus I
D-07743 Jena, Germany
Email: karina.weichold@uni-jena.de

Co-Editor
Deepali Sharma

ISSBD Bulletin
Mental Health Services Oldham
Pennine Care NHS Foundation Trust
United Kingdom
Email: deepali.sharma3@nhs.net



Introduction to the Special Section: Digital Interventions

The world is still in an extraordinary condition. The COVID-19 pandemic continues to create an ongoing threat to life and health and the associated changes in private, public, work and family life impact the physical and mental health of humans around the globe. In line with that, studies are showing that prevalence rates for many disorders in children, adolescents, and adults increased during the lockdowns implemented to combat the spread of the virus. As a consequence, the need for quickly accessible intervention measures increased tremendously across all age groups during the past year. Given the fact that, under the pandemic situation, with social distancing guidelines, personal face-to-face interactions—on which most preventive and therapeutic interventions are grounded—are only possible to a limited extent. Providing digital interventions via the internet, or via Apps becomes more and more interesting as a possibility to reach out to individuals in need of treatment or as a method to deliver preventive interventions. Based on that, the current special section of the ISSBD Bulletin aims at presenting new and fascinating international research, with its opportunities and challenges, on various kinds of digital interventions.

We are introducing in this special section, first, options for digital interventions that aim at the promotion of physical activity at a universal level (Ratz). This feature of lifestyle is related to many facets of health and wellbeing of humans and was particularly challenged during lockdowns. Second, Oehler discusses the suitability of digital tools to deliver treatment and psychiatric therapy for depressive patients. Because depressive symptoms increased in many adolescents and adults during the pandemic but access to face-to-face therapy was very limited with long waiting times, a focus on this group is important. The third paper of the special section (Manvelian & Schleider) applies a strength-based

approach to foster resiliency skills in adolescents, and across the lifespan, to promote their capacity to positively deal with challenges of their everyday lives in order to stimulate a positive future development despite facing stressful events, such as the consequences associated with the pandemic. Finally, the fourth paper by Perez et al., stresses the importance of considering possible problems, such as access to and integrality of digital tools and/or internet, or limited use and issues of non-compliance, which may be still challenging for studies in the field and may hinder a broad distribution of digital interventions in all population groups. Possibilities for overcoming these problems are discussed.

With this collection of papers, we hope to draw the attention to digital interventions, which are crucial, particularly during these times. The special section is accompanied by a country report focussing on research activities in Pakistan (Rasheed et al.). Furthermore, reports from the Early Career Scholars' Representative and organizers of the 26th Biennial Meeting of ISSBD report on the activities of the Society. With the outlook to have a Meeting of all members of ISSBD next summer in Rhodes, Greece, in person and face-to-face, we hope that until then you stay healthy and optimistic, and that the COVID-19 pandemic will have ended.

With the Special Section we hope to stimulate more research on the interface between science and practice, and also more engagement of developmental science to contribute, in particular during the current crisis, to the training of professionals to improve mental health around the world.

We wish that you and your families all stay healthy and safe!

Karina Weichold & Deepali Sharma
Email: karina.weichold@uni-jena.de

Digital Physical Activity Interventions to Improve Health and Wellbeing

Ratz Tiara¹

¹Jacobs University Bremen, Bremen, Germany

Email: t.ratz@jacobs-university.de

Introduction

Health and wellbeing are strongly associated with healthy lifestyle. This includes regular engagement in health-promoting behaviors, such as physical activity (Moholdt, Skarpsno, Moe, & Nilson, 2021; Sperlich, Beller, Epping, Tetzlaff, & Geyer, 2020) following a healthy diet (Angelino et al., 2019; Tosti, Bertozzi, & Fontana, 2018), and abstaining from health-risk behaviors, such as smoking (Jha & Peto, 2014) or excessive alcohol consumption (Griswold et al., 2018). Fostering sustainable health behavior change is a complex endeavor, with research in disciplines like health psychology and behavioral medicine continuously contributing to the evidence base of what makes health behavior change interventions successful. The aim of this paper is to discuss the possibilities and challenges, and future directions of a subset of health behavior change intervention research: digital physical activity interventions. A special focus will be on the potential of academic-industry collaborations and implications for health care.

Digital Physical Activity Interventions – the Possibilities

Within the last twenty years (2000 to 2020), the number of publications in mobile Health (mHealth) literature has followed an exponential growth rate, according to a bibliometric analysis (Cao, Lim, Sengokus, Guo, & Kodama, 2021). The term “physical activity” was the second most frequently occurring keyword, with only the keyword “mental health” having occurred more often. A bibliometric analysis of publications on digital health behavior change technology, including the years 2000 to 2018, also observed a strong increase of publications, especially in the last decade (Taj et al., 2019). They found the term “mHealth” to occur most frequently, followed by keywords such as “eHealth”, “physical activity” and “behavior change”. Moreover, physical activity was the health-related behavior that was targeted most often by the interventions (Taj, Klein, & van Halteren, 2019).

Internet-supported interventions for health behavior change have been around and regarded as effective for several years now, with a review from over a decade ago having reported that internet-based interventions could

significantly improve health-related behavior, especially when they were theory-based and incorporated behavior change techniques (Webb, Joseph, Yardley, & Michie, 2010). As of now, numerous systematic reviews and meta-analyses exist, which cover the effects of specific types of digital physical activity interventions, on several indicators of physical activity, in a variety of population groups. For example, eHealth physical activity interventions seem to lead to positive and significant improvements in steps per day, total minutes of physical activity, and minutes spent engaging in moderate-to-vigorous intensity physical activity in young adults (McIntosh, Jay, Hadden, & Whittaker, 2017) as well as adults aged over 50 years (Núñez de Arenas-Arroyo et al., 2021; Stockwell et al., 2019). mHealth physical activity interventions such as smartphone applications (apps) or activity trackers – which are defined as a subset of the broader term “eHealth interventions” – have been reported to improve physical activity measures in adults (Brickwood, Watson, O’Brien, & Williams, 2019; Laranjo et al., 2020., 2019) and to potentially decrease sitting time, and increase physical activity and fitness in older adults (Yerrakalva, Hajna, & Griffin, 2019).

Internet-based and mobile interventions have the potential to improve health and wellbeing, as they have been found to not only yield positive effects on physical activity, but also improve diet, and reduce adiposity, smoking, and alcohol consumption (Afshin et al., 2016). Yet, the evidence only suggested improvements in health-related behaviors for up to one year, which is why the authors called for interventions that are capable of fostering sustainable health behavior change. A recent meta-analysis of randomized controlled trials found mHealth physical activity intervention effects to be maintained over time, but with decreasing effect sizes (Mönninghoff et al., 2021). Moreover, the authors concluded that their meta-analysis was one of the first to report that mHealth interventions were superior to nonmobile interventions for increasing physical activity levels – as opposed to being equivalent.

One of the advantages of digital interventions is that they can relatively easily allow for individualization of content and frequency of intervention components. For example, a recently published secondary analysis of an Australian study found that the number of preferred text messages regarding physical activity and diet goals varied across individuals, showing that the “one size fits all” assumption does not apply (Fjeldsoe et al., 2021). In that study, a higher dose of text messages was associated with greater weight loss, yet the authors noted that the self-selection of the doses could point towards participants who lost more weight being more motivated in general (Fjeldsoe et al., 2021). Motivation is an important keyword in digital physical activity interventions, as tools such as step trackers



have been found to motivate individuals and increase their physical activity levels by raising awareness for the current behavior (McCormack, McFadden, McHugh, Spence, & Mummery, 2019). Thus, digital tools are suitable for providing opportunities for individualized feedback, self-monitoring, goal-setting, and motivation (DeSmet et al., 2019), which also is reflected by these behavior change techniques being the most frequently adopted in digital health behavior change interventions (Taj et al., 2019).

Challenges on the Way to Evidence-based Digital Health Applications

It has been shown that engagement in physical activity apps (i.e., intervention exposure) is associated with increases in physical activity levels (i.e., intervention efficacy; Edney et al., 2019), but one of the challenges accompanying digital physical activity interventions is that compliance and satisfaction with the technology components is so essential to intervention success. The user-centered design of digital physical activity interventions is therefore of utmost importance, and oftentimes, the success and quality of digital physical activity interventions relies on the user's input of health-related data. Only recently, a multi-country collaborative has identified ethical considerations impacting the use of technology in tailored physical activity delivery as one of two overarching research opportunities for improvement of tailored physical activity behavior change interventions (Ma et al., 2021). The willingness to share self-collected health-related data and how intervention providers can use these data is a sensitive topic. A recent paper pointed towards the need for models providing a framework for relationships between data providers and institutions that take dealing with data ownership, security and privacy, as well as informed consent, into account (Seifert & Vandelanotte, 2021).

The research area of digital health applications has a large overlap with industry, as developing user-centered technology can go beyond the scope of what can typically be achieved in research projects with limited resources with regards to time, budget, and personnel (e.g., see Kolt et al., 2020; Sezgin, 2021). The know-how for app development on the developer's side, on the other hand, may not suffice to realize the technology's full potential for improving health-related lifestyle and thus health and wellbeing. Effective internet-delivered health interventions are often characterized by being evidence-based and grounded in psychological theory (Rogers, Lemmen, Kramer, Mann, & Chopra, 2017). Despite these findings indicating that theory-based interventions are beneficial, researchers face the challenge that current behavior change theory still is not able to explain how exactly mHealth interventions for physical activity behavior change work (Aromatario et al., 2019; Romeo et al., 2021). Digital interventions for health care should meet strict regulatory and scientific guidelines, such as following principles of good clinical and good scientific practice. These requirements on both research and development call for industry-academia collaborations. These collaborations, although desirable, can, however, pose challenges in themselves. For example, a recently published article discussed a key factor for why a digital health trial, that had been set up as a collaboration with a technological

start-up company, had failed (Olivier et al., 2021). Among the influencing factors identified, using root cause analysis, were issues in enrollment, participant support, and the choice of a technological partner who was inexperienced in health care (Olivier et al., 2021). Thus, a strong focus for future directions lies in ensuring that app development is guided and regulated, so that, for example, the development of secure mHealth applications can be supported (Aljedaani & Babar, 2021), and research-industry collaborations can follow established frameworks.

Digital Physical Activity Interventions in Chronic Disease and Health Care

Both attrition and poor maintenance of intervention benefits are common issues in health behavior change research (Kolt et al., 2020; Mönninghoff et al., 2021). This is where consumer-based wearable activity trackers could support research in long-term monitoring, as Brickwood et al. (2019) suggested. For example, it may be viable to identify the types of individuals who benefit from digital tools for lasting improvements of physical activity levels, and to evaluate how such tools can be made more attractive for those who experience more difficulties with adopting a physically active lifestyle using digital tools. As wearable activity trackers and their ability to synchronize with physical activity smartphone applications gain more popularity in the general population, it is evident that digital physical activity tools and interventions deserve a closer look for their potential to inspire long-term physical activity participation on a larger scale.

The widespread use of wearables and health apps is not as prevalent among older adults, with a recent study reporting that 23% of a sample consisting of Swiss older adults used a health-related app. However, 40% indicated that they were interested in using one and almost 70% used a smartphone (Seifert & Vandelanotte, 2021). According to a rapid review of apps and websites available in regular app stores as digital approaches to supporting physical activity engagement in older adults, some of the identified commercially available tools are in fact suitable for improving strength and balance training and preventing falls in older adults (McGarrigle, Bolton, & Todd, 2020). Yet, they concluded that none of the identified apps or websites had been scientifically evaluated in a randomized controlled trial. There is a variety of health and wellbeing apps for behavior change out there, but most available physical activity apps include only a low number of behavior change techniques that would help to foster long-term physical activity level increases (McKay, Wright, Shill, Stephens & Uccellini, 2019).

Potential application fields of digital physical activity interventions to improve health and wellbeing are primary and secondary prevention of cardiovascular disease. One of the cornerstones of cardiac rehabilitation and cardiovascular disease care is the promotion of physical activity, and digital modes of delivery can provide valuable and cost-effective remote opportunities for treatment of cardiovascular disease patients (Su, Yu, & Paguio, 2020; Vasankari et al., 2021). Recently, researchers have proposed a conceptual framework of utilizing micro-randomized trial design to analyze just-in-time adaptive interventions in the field of

activity mHealth interventions for cardiovascular disease (Golbus, Dempsey, Jackson, Nallamotheu, & Klasnj, 2021). Digital physical activity interventions have also been tested in primary care by targeting them at patients at risk of cardiovascular disease, but results are mixed with some interventions showing the hypothesized positive effects (Roberts et al., 2019), and some interventions reporting non-significant effects (e.g., see Peacock et al., 2020).

Discussion and Outlook

The digital advances experienced in technology development can be utilized in research on physical activity promotion and there are potentials to apply study and intervention designs that exceed the traditional randomized controlled trials – such as micro-randomized trials (Golbus et al., 2021) and just-in-time adaptive interventions (Hardeman, Houghton, Lane, Jones, & Naughton, 2019). In a recently published opinion paper, Sezgin (2021) distinguished between commercial mobile apps and research mobile apps, and discussed how commercial mobile apps could be used in health care research. They concluded that it may be beneficial to integrate future longitudinal research of digital behavior change interventions into commercially available platforms. This could be a low-cost alternative to utilizing research mobile apps that are only created for research purposes and may turn into digital waste after the research project is finalized (Sezgin, 2021). However, it was also mentioned that such arrangements will require applicable, comprehensive and feasible data privacy and data use policies, preferably defined within a roadmap for academia-industry collaborations. Results of a survey covering adults aged 18 to 83 years suggest that usage of commercial physical activity apps is positively associated with physical activity engagement (Petersen, Kempes, Lewis, & Prichard, 2020). Particularly, the researchers were interested in the psychological mechanisms behind this relationship, and they found that it could be explained by constructs such as social support, self-efficacy and autonomous motivations. This concludes the discussion of digital physical activity interventions to improve health and wellbeing in this paper, which highlights the interconnection between health behavior change theory, commercial use of digital tools for physical activity engagement, and the potential of collaborations between academia and industry to leverage interdisciplinary know-how and resources to make the most out of digital physical activity interventions in health care.

References

- Afshin, A., Babalola, D., Mclean, M., Yu, Z., Ma, W., Chen, C., Arabi, M., & Mozaffarian, D. (2016). Information Technology and Lifestyle: A Systematic Evaluation of Internet and Mobile Interventions for Improving Diet, Physical Activity, Obesity, Tobacco, and Alcohol Use. *Journal of the American Heart Association*, 5(9). <https://doi.org/10.1161/JAHA.115.003058>
- Aljedaani, B., & Babar, M. A. (2021). Challenges With Developing Secure Mobile Health Applications: Systematic Review. *JMIR MHealth and UHealth*, 9(6), e15654. <https://doi.org/10.2196/15654>
- Angelino, D., Godos, J., Ghelfi, F., Tieri, M., Titta, L., Lafranconi, A., Marventano, S., Alonzo, E., Gambera, A., Sciacca, S., Buscemi, S., Ray, S., Galvano, F., Del Rio, D., & Grosso, G. (2019). Fruit and vegetable consumption and health outcomes: An umbrella review of observational studies. *International Journal of Food Sciences and Nutrition*, 70(6), 652–667. <https://doi.org/10.1080/09637486.2019.1571021>
- Aromatario, O., Van Hove, A., Vuillemin, A., Foucaut, A. M., Crozet, C., Pommier, J., & Cambon, L. (2019). How do mobile health applications support behaviour changes? A scoping review of mobile health applications relating to physical activity and eating behaviours. *Public Health*, 175, 8–18. <https://doi.org/10.1016/j.puhe.2019.06.011>
- Brickwood, K.-J., Watson, G., O'Brien, J., & Williams, A. D. (2019). Consumer-Based Wearable Activity Trackers Increase Physical Activity Participation: Systematic Review and Meta-Analysis. *JMIR MHealth and UHealth*, 7(4), e11819. <https://doi.org/10.2196/11819>
- Cao, J., Lim, Y., Sengoku, S., Guo, X., & Kodama, K. (2021). Exploring the Shift in International Trends in Mobile Health Research From 2000 to 2020: Bibliometric Analysis. *JMIR MHealth and UHealth*, 9(9), e31097. <https://doi.org/10.2196/31097>
- DeSmet, A., De Bourdeaudhuij, I., Chastin, S., Crombez, G., Maddison, R., & Cardon, G. (2019). Adults' preferences for behavior change techniques and engagement features in a mobile app to promote 24-hour movement behaviors: Cross-sectional survey study. *Journal of Medical Internet Research*, 21(12). <https://doi.org/10.2196/15707>
- Edney, S., Ryan, J. C., Olds, T., Monroe, C., Fraysse, F., Vandelanotte, C., Plotnikoff, R., Curtis, R., & Maher, C. (2019). User Engagement and Attrition in an App-Based Physical Activity Intervention: Secondary Analysis of a Randomized Controlled Trial. *Journal of Medical Internet Research*, 21(11), e14645. <https://doi.org/10.2196/14645>
- Fjeldsoe, B. S., Goode, A. D., Job, J., Eakin, E. G., Spilsbury, K. L., & Winkler, E. (2021). Dose and engagement during an extended contact physical activity and dietary behavior change intervention delivered via tailored text messaging: exploring relationships with behavioral outcomes. *International Journal of Behavioral Nutrition and Physical Activity*, 18(1), 119. <https://doi.org/10.1186/s12966-021-01179-8>
- Golbus, J. R., Dempsey, W., Jackson, E. A., Nallamotheu, B. K., & Klasnja, P. (2021). Microrandomized Trial Design for Evaluating Just-in-Time Adaptive Interventions Through Mobile Health Technologies for Cardiovascular Disease. *Circulation. Cardiovascular Quality and Outcomes*, 14(2), e006760. <https://doi.org/10.1161/CIRCOUTCOMES.120.006760>
- Griswold, M. G., Fullman, N., Hawley, C., Arian, N., Zimsen, S. R. M., Tymeson, H. D., Venkateswaran, V., Tapp, A. D., Forouzanfar, M. H., Salama, J. S., Abate, K. H., Abate, D., Abay, S. M., Abbafati, C., Abdulkader, R. S., Abebe, Z., Aboyans, V., Abrar, M. M., & Acharya, P., ... Gakidou, E. (2018). Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 392(10152), 1015–1035. [https://doi.org/10.1016/S0140-6736\(18\)31310-2](https://doi.org/10.1016/S0140-6736(18)31310-2)



- Hardeman, W., Houghton, J., Lane, K., Jones, A., & Naughton, F. (2019). A systematic review of just-in-time adaptive interventions (JITAs) to promote physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), 31. <https://doi.org/10.1186/s12966-019-0792-7>
- Jha, P., & Peto, R. (2014). Global Effects of Smoking, of Quitting, and of Taxing Tobacco. *New England Journal of Medicine*, 370(1), 60–68. <https://doi.org/10.1056/NEJMra1308383>
- Kolt, G. S., Duncan, M. J., Vandelanotte, C., Rosenkranz, R. R., Maeder, A. J., Savage, T. N., Tague, R., Van Itallie, A., Mummery, W. K., & Caperchione, C. M. (2020). Successes and Challenges of an IT- Based Health Behaviour Change Program to Increase Physical Activity. *Studies in Health Technology and Informatics*, 268(March), 31–43. <https://doi.org/10.3233/SHTI200004>
- Laranjo, L., Ding, D., Heleno, B., Kocaballi, B., Quiroz, J. C., Tong, H. L., Chahwan, B., Neves, A. L., Gabarron, E., Dao, K. P., Rodrigues, D., Neves, G. C., Antunes, M. L., Coiera, E., & Bates, D. W. (2020). Do smartphone applications and activity trackers increase physical activity in adults? Systematic review, meta-analysis and metaregression. *British Journal of Sports Medicine*, 55(8), 422–432. <https://doi.org/10.1136/bjsports-2020-102892>
- Ma, J. K., Floegel, T. A., Li, L. C., Leese, J., De Vera, M. A., Beauchamp, M. R., Taunton, J., Liu-Ambrose, T., & Allen, K. D. (2021). Tailored physical activity behavior change interventions: challenges and opportunities. *Translational Behavioral Medicine*. <https://doi.org/10.1093/tbm/ibab106>
- McCormack, G. R., McFadden, K., McHugh, T.-L. F., Spence, J. C., & Mummery, K. (2019). Barriers and facilitators impacting the experiences of adults participating in an internet-facilitated pedometer intervention. *Psychology of Sport and Exercise*, 45, 101549. <https://doi.org/10.1016/j.psychsport.2019.101549>
- McGarrigle, L., Boulton, E., & Todd, C. (2020). Map the apps: a rapid review of digital approaches to support the engagement of older adults in strength and balance exercises. *BMC Geriatrics*, 20(1), 483. <https://doi.org/10.1186/s12877-020-01880-6>
- McIntosh, J. R. D., Jay, S., Hadden, N., & Whittaker, P. J. (2017). Do E-health interventions improve physical activity in young people: a systematic review. *Public Health*, 148, 140–148. <https://doi.org/10.1016/j.puhe.2017.04.001>
- McKay, F. H., Wright, A., Shill, J., Stephens, H., & Uccellini, M. (2019). Using health and well-being apps for behavior change: A systematic search and rating of apps. *JMIR MHealth and UHealth*, 7(7). <https://doi.org/10.2196/11926>
- Moholdt, T., Skarpsno, E. S., Moe, B., & Nilsen, T. I. L. (2021). It is never too late to start: adherence to physical activity recommendations for 11–22 years and risk of all-cause and cardiovascular disease mortality. The HUNT Study. *British Journal of Sports Medicine*, 55(13), 743–750. <https://doi.org/10.1136/bjsports-2020-102350>
- Mönninghoff, A., Kramer, J. N., Hess, A. J., Ismailova, K., Teepe, G. W., Tudor Car, L., Müller-Riemenschneider, F., & Kowatsch, T. (2021). Long-term Effectiveness of mHealth Physical Activity Interventions: Systematic Review and Meta-analysis of Randomized Controlled Trials. *Journal of Medical Internet Research*, 23(4), e26699. <https://doi.org/10.2196/26699>
- Núñez de Arenas-Arroyo, S., Caveno-Redondo, I., Alvarez-Bueno, C., Sequí-Domínguez, I., Reina-Gutiérrez, S., & Martínez-Vizcaíno, V. (2021). Effect of eHealth to increase physical activity in healthy adults over 55 years: A systematic review and meta-analysis. *Scandinavian Journal of Medicine & Science in Sports*, 31(4), 776–789. <https://doi.org/10.1111/sms.13903>
- Olivier, C. B., Middleton, S. K., Purington, N., Shashidhar, S., Hereford, J., Mahaffey, K. W., & Turakhia, M. P. (2021). Why digital health trials can fail: Lessons learned from a randomized trial of health coaching and virtual cardiac rehabilitation. *Cardiovascular Digital Health Journal*, 2(2), 101–108. <https://doi.org/10.1016/j.cvdhj.2021.01.003>
- Peacock, O. J., Western, M. J., Batterham, A. M., Chowdhury, E. A., Stathi, A., Standage, M., Tapp, A., Bennett, P., & Thompson, D. (2020). Effect of novel technology-enabled multidimensional physical activity feedback in primary care patients at risk of chronic disease – the MIPACT study: a randomised controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 99. <https://doi.org/10.1186/s12966-020-00998-5>
- Petersen, J. M., Kemps, E., Lewis, L. K., & Prichard, I. (2020). Psychological mechanisms underlying the relationship between commercial physical activity app use and physical activity engagement. *Psychology of Sport and Exercise*, 51, 101719. <https://doi.org/10.1016/j.psychsport.2020.101719>
- Roberts, L. M., Jaeger, B. C., Baptista, L. C., Harper, S. A., Gardner, A. K., Jackson, E. A., Pekmezi, D., Sandesara, B., Manini, T. M., Anton, S. D., & Buford, T. W. (2019). Wearable technology to reduce sedentary behavior and cvd risk in older adults: A pilot randomized clinical trial. *Clinical Interventions in Aging*, 14, 1817–1828. <https://doi.org/10.2147/CIA.S222655>
- Rogers, M. A. M., Lemmen, K., Kramer, R., Mann, J., & Chopra, V. (2017). Internet-delivered health interventions that work: Systematic review of meta-analyses and evaluation of website availability. *Journal of Medical Internet Research*, 19(3), 1–28. <https://doi.org/10.2196/jmir.7111>
- Romeo, A. V., Edney, S. M., Plotnikoff, R. C., Olds, T., Vandelanotte, C., Ryan, J., Curtis, R., & Maher, C. A. (2021). Examining social-cognitive theory constructs as mediators of behaviour change in the active team smartphone physical activity program: a mediation analysis. *BMC Public Health*, 21(1), 88. <https://doi.org/10.1186/s12889-020-10100-0>
- Seifert, A., & Vandelanotte, C. (2021). The use of wearables and health apps and the willingness to share self-collected data among older adults. *Aging and Health Research*, 1(3), 100032. <https://doi.org/10.1016/J.AHR.2021.100032>
- Sezgin, E. (2021). Can We Use Commercial Mobile Apps Instead of Research Mobile Apps in Healthcare Research? *Frontiers in Public Health*, 9, 1073. <https://doi.org/10.3389/fpubh.2021.685439>
- Sperlich, S., Beller, J., Epping, J., Tetzlaff, J., & Geyer, S. (2020). Trends in self-rated health among the elderly population in Germany from 1995 to 2015 – the influence

- of temporal change in leisure time physical activity. *BMC Public Health*, 20(1), 113. <https://doi.org/10.1186/s12889-020-8218-7>
- Stockwell, S., Schofield, P., Fisher, A., Firth, J., Jackson, S. E., Stubbs, B., & Smith, L. (2019). Digital behavior change interventions to promote physical activity and/or reduce sedentary behavior in older adults: A systematic review and meta-analysis. *Experimental Gerontology*, 120, 68–87. <https://doi.org/10.1016/j.exger.2019.02.020>
- Taj, F., Klein, M. C. A., & van Halteren, A. (2019). Digital Health Behavior Change Technology: Bibliometric and Scoping Review of Two Decades of Research. *JMIR MHealth and UHealth*, 7(12), e13311. <https://doi.org/10.2196/13311>
- Tosti, V., Bertozzi, B., & Fontana, L. (2018). Health Benefits of the Mediterranean Diet: Metabolic and Molecular Mechanisms. *The Journals of Gerontology: Series A*, 73(3), 318–326. <https://doi.org/10.1093/gerona/glx227>
- Su, J. J., Yu, D. S. F., & Paguio, J. T. (2020). Effect of eHealth cardiac rehabilitation on health outcomes of coronary heart disease patients: A systematic review and meta-analysis. *Journal of Advanced Nursing*, 76(3), 754–772. <https://doi.org/10.1111/jan.14272>
- Vasankari, V., Halonen, J., Vasankari, T., Anttila, V., Airaksinen, J., Sievänen, H., & Hartikainen, J. (2021). Physical activity and sedentary behaviour in secondary prevention of coronary artery disease: A review. *American Journal of Preventive Cardiology*, 5, 100146. <https://doi.org/10.1016/j.ajpc.2021.100146>
- Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research*, 12(1), 1–18. <https://doi.org/10.2196/jmir.1376>
- Yerrakalva, D., Hajna, S., & Griffin, S. (2019). Effects of Mobile Health App Interventions on Sedentary Time, Physical Activity, and Fitness in Older Adults: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, 21(11), e14343. <https://doi.org/10.2196/14343>



Digital tools in the treatment of depression

Oehler, Caroline¹

¹Depression Research Centre, German Depression Foundation, Leipzig, Germany

E-mail: caroline.oehler@deutsche-depressionshilfe.de,
<https://orcid.org/0000-0001-8329-147X>

The use of digital tools and computers in psychiatry is often presented as a recent development and sometimes even termed “the future of psychiatry” by enthusiasts, but its development can look back on a long history. First publications can be found from the 1960s where computers are used in the care of psychiatric patients, e.g. for the automated aggregation of data that can be visualized to inform clinical decision making (Rosenberg et al., 1967) or to enhance the reliability of psychiatric diagnosis through the use of “computer programs” (mainly resembling decision trees; Spitzer, 1968). While computers’ processing speed developed exponentially, the complexity of such interventions increased. Computerized versions of diagnostic interviews first appeared in the 1980s (Murphy, Neff, Sobol, Rice, & Oliver, 1985), in the form of counseling services as well as cognitive behavioral therapy (Wagman & Kerber, 1984). One example of early digital therapy, the program “Morton”, used a chat-like interface. Patients could read the question and answer it using one of several multiple-choice options, a form of presentation still used by some digital interventions today. Morton provided psychoeducation and exercises to discover the connection of (negative) thoughts and feelings in depression and was set up for use in a treatment facility, supported by the staff (Selmi, Klein, Greist, Johnson, & Harris, 1982). From today’s perspective, it is noteworthy that also 40 years ago, wider and easier access to therapeutic support was urgently needed and innovators were developing technological solutions to ameliorate the problem. But until recently, it was difficult to provide this technology on a large scale; computers and software were comparatively expensive and were only available to a limited group of people.

Today, more than 60% of the world’s population have access to the internet and the numbers are rising rapidly (Kemp, n.d.) and the digital divide, while it still exists, has diminished. For people all over the world, information technology in the form of computers and more specifically smartphones have become part of their everyday life (Kemp, n.d.) and are used as an important source of health information (Kalckreuth, Trefflich, & Rummel-Kluge., 2014). Therefore, the dissemination of digital interventions moved from locally placed computers, that were accessible e.g. in psychiatric clinics, to browser- or mobile-app-based interventions, and upscaling became more feasible.

With depression being highly prevalent (Wittchen et al., 2011), one leading cause of nonfatal disease burden worldwide (Vos et al., 2020), and associated with an elevated mortality risk (Walker, McGee, & Druss., 2015), improvements in its treatment have a great potential impact. This is all the more true given that treatment rates are appallingly low worldwide, especially in low- and middle-income countries (Mekonen, Chan, Connor, Hides, & Leung, 2021). Consequently, many researchers focused on digital interventions to ameliorate symptoms of depression and support treatment in an easily scalable manner.

Today’s programs typically rely on principles of cognitive behavioral therapy (CBT) and are accessible through an internet browser. They provide psychoeducation in text, audio or video form and introduce techniques and exercises similar to those therapists might use with their patients. Mood ratings to self-monitor symptom development are a common feature and the interventions content is usually organized in modules or workshops, each targeting a specific topic. In this respect, they are not so different from the early versions described above, but as CBT has evolved, so has its digital counterpart, sometimes referred to as iCBT; mindfulness, acceptance and commitment-related aspects are gradually being incorporated into digital interventions.

Still, more than 40 years after the first successful trials, using a digital intervention is not yet a common option offered to patients with depression. The reasons for this are manifold. While there are many factors inhibiting their widespread use, such as lack of knowledge about such interventions or data protection issues, one important barrier is hesitancy on the side of healthcare professionals. Worries such as a lack of safety and efficacy due to the missing human contact have been raised and might keep psychotherapists, general practitioners and other specialists from taking up digital interventions as an additional option in the treatment of depression. The next paragraph will shed light on whether, based on the current state of research, these fears are justified.

Does technology keep its promise?

The scientific community is now in a position, where the efficacy of digital interventions in the treatment of depression can be considered proven. Meta-analyses that aggregate a large number of trials provide sufficient evidence that digital interventions are more effective than waitlist controls (a rather small hurdle) but also more effective than treatment as usual (TAU) (Karyotaki et al., 2021; Wright et al., 2019) and in some trials were even equivalent to active control interventions (Glozier et al., 2013; Johansson et al., 2012; Oehler, Görge, Rogalla, Rummel-Kluge, & Hegerl, 2020). This is especially true, when the intervention is provided with some form of guidance. A healthcare professional providing guidance in face-to-face settings led to

the largest effect sizes in a meta-analysis, followed by telephone contact and asynchronous guidance via chat or email messages (Wright et al., 2019).

The strongest evidence to date comes from comparing digital interventions for the treatment of depression with face-to-face treatment. In these, either no statistically significant difference (Andersson, Topooco, Havik, & Nordgreen, 2016) or less reduction in depression symptoms but comparable improvements in quality of life and equal patient satisfaction (Luo et al., 2020) were found. Although non-inferiority studies need large sample sizes to claim definite results, these outcomes seem very promising.

Just as other treatment options like psychotherapy or pharmacotherapy, digital intervention can have unwanted side effects that need to be considered. In the case of digital interventions, unwanted or negative effects seem to appear with a similar frequency as in classical psychotherapy. Typical negative effects encompass the (temporary) worsening of symptoms or the feeling of not being taken seriously (Oehler, Görge, Hegerl & Rummel-Kluge, 2021). Frustration about technical problems and feeling pressured by the interventions schedule are negative effects that can occur specifically in digital interventions (Rozental, Boettcher, Andersson, Schmidt & Carlbring, 2015) and should be addressed in the continued development of digital interventions. The intensity of the negative effects are usually low and they are often temporary (Oehler et al., 2021). Taken together, the current evidence indicates that digital interventions are both helpful and safe to use under study conditions with the current challenge being the translation into routine care.

In contrast to most randomized controlled trials, studies on digital interventions for depression in routine care have produced conflicting results. While some investigators report medium-to-large effect sizes (Williams & Andrews, 2013), others could not find an additional benefit in adding digital interventions to treatment-as-usual (Gilbody et al., 2015; Kivi et al., 2014). An important reason for these results might actually lie in a lack of adherence. Many digital interventions suffer from low or very low adherence; e.g. in the study of Gilbody et al. (2015) less than 20% of the participants completed the interventions and around 20% did not even begin to use the intervention. This limits the effectiveness (usefulness under real world conditions as opposed to potential helpfulness under controlled trial conditions) of digital interventions, since adherence is positively associated with symptom change (Donkin et al., 2011).

It is well established by now that guidance boosts both symptom reduction and adherence to digital interventions (Baumeister, Reichler, Munzinger, & Lin, 2014). Besides this, especially persuasive system design elements seem to be an important factor to facilitate adherence (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012), and specifically the regular sending of reminders impacts user behavior (Whitton et al., 2015). Interestingly, the results on age as a predictor for the use of digital interventions are quite mixed, so the easy-to-make assumption that digital tools are for the younger generations is not empirically supported (Beatty & Binnion, 2016).

To go forward, the design as well as the guidance of interventions need to be further improved to enable long term use. Strikingly, most studies so far were conducted on browser-based interventions, and a switch in modality

to app-based interventions could facilitate access in everyday life, as no stationary computer has to be switched on. Initial meta-analysis indicates that app-based approaches can reduce symptoms of depression (Linardon, Cuijpers, Carlbring, Messer & Fuller-Tyszkiewicz, 2019). But the gap between empirically tested applications and the app-marketplaces is wide: most healthcare apps that can currently be found on the usual download platforms have not been tested for efficacy or safety (Torous et al., 2021). Also, the problem of low adherence seems to be present for app-based interventions as well. An evaluation of objective usage data for mental health apps showed that after 15 days, less than 5% of the users were still active (Baumel, Muench, Edan, & Kane, 2019).

The future of digital interventions for depression

As described above, today's digital interventions often resemble the earliest forms of digital therapy and deliver psychoeducation and "worksheet"-like exercises. With this robust evidence base behind us, the goal should be to expand both the usability and application areas of digital interventions. One way to go forward could be the selective use of treatment resources. Targeted interventions that are delivered to patients currently in need could play a decisive role in eliminating the care gaps in depression, and the spread of the smartphone in particular is opening up new possibilities.

Devices like smartphones and wearables are equipped with a wide variety of sensors. They can collect information not only on physiological measures like heart rate variability but also on behavioral measures such as frequency of texting/calling or steps walked. This wide range of information that is potentially available gives researchers the opportunity to look for so-called "digital biomarkers" to detect or even predict depression. Passively collecting these data can potentially allow patients to better understand their own condition while reducing the burden of data collection. At the same time, clinical decision-making by practitioners could be informed and supported.

The high complexity and sheer volume of these passively collected data requires new methods of analysis. But the application of machine learning and artificial intelligence allows a reduction to relevant markers; at the time of writing, numerous related research projects are underway, some already yielding promising results. For example, in a non-clinical sample of college students, a machine learning approach was used to detect symptoms of depression as well as individual symptom changes via longitudinal smartphone and fitness tracker data. Also, post-semester depressive symptoms can be predicted 11-15 weeks in advance, allowing ample time for intervention (Chikersal et al., 2021). In addition to the great potential benefits of these applications, they also bring new risks. Data protection in particular should be at the forefront of the development and testing of these systems, as has been discussed in depth elsewhere (Lustgarten, Garrison, Sinnard, & Flynn, 2020).

But advances in digital technology are not only relevant in diagnostics and prediction of symptomatology, they also broaden the options for treatment. One exciting example is



Virtual Reality (VR) interventions, most often used in the form of exposure therapy. Wearing a headset, the patient experiences a three-dimensional world, and can not only move around in it and, but in some cases can interact with the environment. In the treatment of anxiety disorders, this allows realistic exposure experiences to be conducted in the safety of a familiar environment. But other interventions are possible, such as sports exercises in virtual nature or experiencing and reflecting stressful situations in VR during CBT. First studies confirm that VR approaches can successfully complement the treatment of depression, and further developments in this field are to be expected (Baghaei et al., 2021; Dellazizzo, Potvin, Luigi, & Dumais, 2020).

Conclusion

The effectiveness of digital interventions in supporting the treatment of depression can be considered well established. In particular, browser—or app based, guided interventions that convey CBT content have been studied in a large number of high-quality papers and their use in routine care of depressed patients is slowly increasing. Still, a major problem with these approaches is low adherence, which reduces their potential effectiveness.

However, the full potential of digital approaches is currently far from being utilized. With the rapid development of technology, new opportunities are emerging for its use in depression treatment. Initial studies complement classical psychotherapy with VR elements; the association of depressive symptoms with “digital biomarkers” as well as their predictive value has already been successfully demonstrated and opens the way to more targeted, personalized treatment.

References

- Andersson, G., Topocoo, N., Havik, O., & Nordgreen, T. (2016). Internet-supported versus face-to-face cognitive behavior therapy for depression. *Expert Review of Neurotherapeutics*, 16(1), 55–60. <https://doi.org/10.1586/14737175.2015.1125783>
- Baghaei, N., Chitale, V., Hlasnik, A., Stemmet, L., Liang, H.-N., & Porter, R. (2021). Virtual Reality for Supporting the Treatment of Depression and Anxiety: Scoping Review. *JMIR Ment Health*, 8(9), e29681. <https://doi.org/10.2196/29681>
- Baumeister, H., Reichler, L., Munzinger, M., & Lin, J. (2014). The impact of guidance on Internet-based mental health interventions — A systematic review. *Internet Interventions*, 1(4), 205–215. <https://doi.org/10.1016/j.invent.2014.08.003>
- Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective User Engagement With Mental Health Apps: Systematic Search and Panel-Based Usage Analysis. *J Med Internet Res*, 21(9), e14567. <https://doi.org/10.2196/14567>
- Beatty, L., & Binnion, C. (2016). A Systematic Review of Predictors of, and Reasons for, Adherence to Online Psychological Interventions. *International Journal of Behavioral Medicine*, 23(6), 776–794. <https://doi.org/10.1007/s12529-016-9556-9>
- Chikersal, P., Doryab, A., Tumminia, M., Villalba, D. K., Dutcher, J. M., & Liu, X., ... Dey, A. K. (2021). Detecting depression and predicting its onset using longitudinal symptoms captured by passive sensing: A machine learning approach with robust feature selection. *ACM Transactions on Computer-Human Interaction*, 28(1), 1–41. <https://doi.org/10.1145/3422821>
- Dellazizzo, L., Potvin, S., Luigi, M., & Dumais, A. (2020). Evidence on Virtual Reality–Based Therapies for Psychiatric Disorders: Meta-Review of Meta-Analyses. *J Med Internet Res*, 22(8), e20889. <https://doi.org/10.2196/20889>
- Donkin, L., Christensen, H., Naismith, S. L., Neal, B., Hickie, I. B., & Glozier, N. (2011). A Systematic Review of the Impact of Adherence on the Effectiveness of e-Therapies. *Journal of Medical Internet Research*, 13(3), e52. <https://doi.org/10.2196/jmir.1772>
- Gilbody, S., Littlewood, E., Hewitt, C., Brierley, G., Tharmanathan, P., & Araya, R., ... Shepherd, C., ... White, D. (2015). Computerised cognitive behaviour therapy (cCBT) as treatment for depression in primary care (REEACT trial): large scale pragmatic randomised controlled trial. *BMJ*, h5627. <https://doi.org/10.1136/bmj.h5627>
- Glozier, N., Christensen, H., Naismith, S., Cockayne, N., Donkin, L., Neal, B., Mackinnon, A., & Hickie, I. (2013). Internet-Delivered Cognitive Behavioural Therapy for Adults with Mild to Moderate Depression and High Cardiovascular Disease Risks: A Randomised Attention-Controlled Trial. *PLOS ONE*, 8(3), e59139. <https://doi.org/10.1371/journal.pone.0059139>
- Johansson, R., Sjöberg, E., Sjögren, M., Johnsson, E., Carlbring, P., Andersson, T., Rousseau, A., & Andersson, G. (2012). Tailored vs. Standardized Internet-Based Cognitive Behavior Therapy for Depression and Comorbid Symptoms: A Randomized Controlled Trial. *PLOS ONE*, 7(5), e36905. <https://doi.org/10.1371/journal.pone.0036905>
- Kalkreuth, S., Trefflich, F., & Rummel-Kluge, C. (2014). Mental health related Internet use among psychiatric patients: a cross-sectional analysis. *BMC Psychiatry*, 14(1), 368. <https://doi.org/10.1186/s12888-014-0368-7>
- Karyotaki, E., Efthimiou, O., Miguel, C., BERPohl, F. M., Genannt Furukawa, T. A., & Cuijpers, P., & Collaboration, I. P. D. M.-A. for D. (IPDMA-D. (2021). Internet-Based Cognitive Behavioral Therapy for Depression: A Systematic Review and Individual Patient Data Network Meta-analysis. *JAMA Psychiatry*, 78(4), 361–371. <https://doi.org/10.1001/jamapsychiatry.2020.4364>
- Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. (2012). Persuasive System Design Does Matter: a Systematic Review of Adherence to Web-based Interventions. *Journal of Medical Internet Research*, 14(6), e152. <https://doi.org/10.2196/jmir.2104>
- Kemp, S. (n.d.). Digital 2021 July Global Statshot Report. Retrieved 09-28, 2021, from <https://datareportal.com/reports/digital-2021-july-global-statshot>
- Kivi, M., Eriksson, M. C. M., Hange, D., Petersson, E. L., Vernmark, K., Johansson, B., & Björkelund, C. (2014). Internet-Based Therapy for Mild to Moderate Depression in Swedish Primary Care: Short Term Results from the PRIM-NET Randomized Controlled Trial. *Cognitive Behaviour Therapy*, 43(4), 289–298. <https://doi.org/10.1080/16506073.2014.921834>

- Linardon, J., Cuijpers, P., Carlbring, P., Messer, M., & Fuller-Tyszkiewicz, M. (2019). The efficacy of app-supported smartphone interventions for mental health problems: a meta-analysis of randomized controlled trials. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, 18(3), 325–336. <https://doi.org/10.1002/wps.20673>
- Luo, C., Sanger, N., Singhal, N., Pattrick, K., Shams, I., & Shahid, H., . . . Haber, S. (2020). A comparison of electronically-delivered and face to face cognitive behavioural therapies in depressive disorders: A systematic review and meta-analysis. *EclinicalMedicine*, 24, 100442.
- Lustgarten, S. D., Garrison, Y. L., Sinnard, M. T., & Flynn, A. W. (2020). Digital privacy in mental healthcare: current issues and recommendations for technology use. *Current Opinion in Psychology*, 36, 25–31. <https://doi.org/10.1016/j.copsyc.2020.03.012>
- Mekonen, T., Chan, G. C. K., Connor, J. P., Hides, L., & Leung, J. (2021). Estimating the global treatment rates for depression: A systematic review and meta-analysis. *Journal of Affective Disorders*, 295, 1234–1242. <https://doi.org/https://doi.org/10.1016/j.jad.2021.09.038>
- Murphy, J. M., Neff, R. K., Sobol, A. M., Rice, J. X., & Olivier, D. C. (1985). Computer diagnosis of depression and anxiety: the Stirling County Study. *Psychological Medicine*, 15(1), 99–112. <https://doi.org/10.1017/S0033291700020961>
- Oehler, C., Görge, F., Hegerl, U., & Rummel-Kluge, C. (2021). A closer look at negative effects in a guided web-based intervention for mild to moderate depression. *Clinical Psychology: Science and Practice*, 28(2), 131–141. <https://doi.org/10.1037/cps0000004>
- Oehler, C., Görge, F., Rogalla, M., Rummel-Kluge, C., & Hegerl, U. (2020). Efficacy of a Guided Web-Based Self-Management Intervention for Depression or Dysthymia: Randomized Controlled Trial With a 12-Month Follow-Up Using an Active Control Condition. *Journal of Medical Internet Research*, 22(7), e15361. <https://doi.org/10.2196/15361>
- Rosenbert, M., Glueck, B. C., & Stroebel, C. F. (1967). The Computer and the Clinical Decision Process. *American Journal of Psychiatry*, 124(5), 595–599. <https://doi.org/10.1176/ajp.124.5.595>
- Rozental, A., Boettcher, J., Andersson, G., Schmidt, B., & Carlbring, P. (2015). Negative Effects of Internet Interventions: A Qualitative Content Analysis of Patients' Experiences with Treatments Delivered Online. *Cognitive Behaviour Therapy*, 44(3), 223–236. <https://doi.org/10.1080/16506073.2015.1008033>
- Selmi, P. M., Klein, M. H., Greist, J. H., Johnson, J. H., & Harris, W. G. (1982). An investigation of computer-assisted cognitive-behavior therapy in the treatment of depression. *Behavior Research Methods & Instrumentation*, 14(2), 181–185. <https://doi.org/10.3758/BF03202150>
- Spitzer, R. L. (1968). DIAGNO. *Archives of General Psychiatry*, 18(6), 746. <https://doi.org/10.1001/archpsyc.1968.01740060106013>
- Torous, J., Bucci, S., Bell, I. H., Kessing, L. V., & Faurholt-Jepsen, M., . . . Firth, J. (2021). The growing field of digital psychiatry: current evidence and the future of apps, social media, chatbots, and virtual reality. *World Psychiatry*, 20(3), 318–335. <https://doi.org/https://doi.org/10.1002/wps.20883>
- Vos, T., Lim, S. S., Abbafati, C., Abbas, K. M., Abbasi, M., Abbasifard, M., & Abbasi-Kangevari, M., . . . Murray, C. J. L. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, 396(10258), 1204–1222. [https://doi.org/10.1016/S0140-6736\(20\)30925-9](https://doi.org/10.1016/S0140-6736(20)30925-9)
- Wagman, M., & Kerber, K. W. (1984). Computer-Assisted Counseling: Problems and Prospects. *Counselor Education and Supervision*, 24(2), 142–154. <https://doi.org/10.1002/j.1556-6978.1984.tb00644.x>
- Walker, E. R., McGee, R. E., & Druss, B. G. (2015). Mortality in Mental Disorders and Global Disease Burden Implications: A Systematic Review and Meta-analysis. *JAMA Psychiatry*, 72(4), 334–341. <https://doi.org/10.1001/jamapsychiatry.2014.2502>
- Whitton, A. E., Proudfoot, J., Clarke, J., Birch, M.-R., Parker, G., Manicavasagar, V., & Hadzi-Pavlovic, D. (2015). Breaking Open the Black Box: Isolating the Most Potent Features of a Web and Mobile Phone-Based Intervention for Depression, Anxiety, and Stress. *JMIR Mental Health*, 2(1), e3. <https://doi.org/10.2196/mental.3573>
- Williams, A. D., & Andrews, G. (2013). The Effectiveness of Internet Cognitive Behavioural Therapy (iCBT) for Depression in Primary Care: A Quality Assurance Study. *PLoS ONE*, 8(2). <https://doi.org/10.1371/journal.pone.0057447>
- Wittchen, H. U., Jacobi, F., Rehm, J., Gustavsson, A., Svensson, M., & Jönsson, B., . . . Steinhausen, H.-C. (2011). The size and burden of mental disorders and other disorders of the brain in Europe 2010. *European Neuropsychopharmacology*, 21(9), 655–679. <https://doi.org/10.1016/j.euroneuro.2011.07.018>
- Wright, J. H., Owen, J. J., Richards, D., Eells, T. D., Richardson, T., Brown, G. K., & . . . Thase, M. E. (2019). Computer-Assisted Cognitive-Behavior Therapy for Depression. *The Journal of Clinical Psychiatry*, 80(2). <https://doi.org/10.4088/JCP.18r12188>



Digital Single-Session Interventions: Promoting Resilience Across the Lifespan

Marvelian, Atina Ph.D.¹ and Schleider, Jessica L. Ph.D.¹

¹Department of Psychology, Stony Brook University

Online interventions offer a promising path for enhancing the accessibility of mental healthcare. Single-session interventions use evidence-based principles to deliver key messages, teaching important mental health skills in one brief session. Digital single-session interventions can be widely disseminated, easily accessed, and tailored for delivery across a wide variety of settings. Below, we discuss the promise of online single-session interventions and explore how they might be adapted to promote resilience across different developmental milestones.

A Global Mental Health Crisis

There is a growing need to expand how evidence-based mental health interventions are designed and accessed (Kazdin, 2019). Traditional psychological treatment has historically involved face-to-face psychotherapy, which can be expensive and difficult to access due to longstanding provider shortages. The COVID-19 pandemic has magnified mental health disparities, highlighting the increased demand for psychological support, the inaccessibility of in-person treatment options, and the barriers to care faced by under-resourced communities (Moreno et al., 2020). Moreover, those who do have access to mental health services often receive treatments that are not evidence-based, leaving millions of children, adolescents, and adults without effective, science-based psychological support.

The Promise of Digital Interventions

Online mental health programs are increasing in popularity (Powell, Firth, & Kaufman, 2020). Able to meet users in the comfort of their own homes, digital interventions can remove the barriers associated with psychological care in brick-and-mortar clinics. However, as digital mental health supports become more popular, there needs to be careful thinking around *how* to provide online interventions that are evidence-based, easy to access, and easy to complete, and *when* to provide these interventions, tailoring them to in-the-moment needs to maximize their impact.

Single-Session Interventions

Creating brief, timely interventions, such as single-session interventions (SSI), may be one effective way to expand rapid access to high-quality mental health support.

Single-session interventions (SSIs) typically entail the delivery of a core component of longer (multi-session) evidence-based interventions through a single, brief, and targeted clinical encounter (Schleider et al., 2020a). SSIs can be delivered online, through a provider or self-guided program, allowing for widespread dissemination and easy access. Because of their brevity, SSIs can also be adapted and implemented in a variety of settings, such as institutions of higher learning, hospitals, and non-profit centers.

SSIs diversify mental health treatment options, expanding access to mental health services, complementing more traditional forms of psychological care. Overall, SSIs have slightly smaller effects than more traditional, long-lasting interventions (Schleider & Weisz, 2018); however, they are often free and deliverable online, providing populations with little to no access to therapy the opportunity to learn new skills and improve their mental health.

SSIs may also be useful during times of global distress and social isolation such as during the COVID-19 pandemic. In a large randomized controlled trial conducted during the COVID-19 pandemic, a large sample of adolescents (N = 2,452) with elevated symptoms of depression were recruited from every state in the United States and randomized to 1 of 3 SSIs: a supportive control, an SSI promoting behavioral activation, and an SSI teaching that personal traits are malleable. Compared to the control condition, both active SSIs improved depressive symptoms, hopelessness, and restrictive eating at the 3-month assessment, demonstrating the utility of online SSIs even during times of global unrest.

Designing Single-Session Interventions for Developmental Transitions

Digital SSIs can be optimized to promote resilience during the psychosocial difficulties associated with time-sensitive developmental transitions including, for instance, the transition to adolescence, college, or parenthood.

Learning from Single-Session Interventions Designed for Youth

A number of digital SSIs have been created for youth and adolescent populations. SSIs can be attuned to be developmentally appropriate for youth to mitigate mental health problems early on and promote positive life trajectories.

B.E.S.T. Elements

When thinking about how to develop new SSIs for different developmental transitions, we can learn a great deal from

the B.E.S.T. principles, a theory-guided approach that pulls from the literature on social and clinical psychology to design effective digital SSIs in youth (Schleider et al., 2020a).

B.E.S.T. principles stand for:

B: “Brain science” to normalize and improve buy-in from youth

E: “Empowerment,” to uplift adolescents by prescribing an expert role

S: “Saying-is-believing” to reinforce learning by teaching others

T: “Testimonials” to incorporate persuasive narratives and peer influence

The B.E.S.T. elements for guiding SSI design are uniquely attuned for adolescence, a period of time marked by acute socioemotional and physical growth. First, adolescents have an increasing need for autonomy and independence. Thus, *brain science* is used to encourage believability and normalize the challenges they face (e.g., “all brains function in this way”), reducing shame or negative emotions associated with psychosocial difficulties. Second, SSIs focus on *empowerment*, encouraging teens to participate as “the experts,” by asking for their advice (e.g., “we need your help!”). This tactic purposefully helps teens feel more autonomous and in control, promoting their willingness to participate. Third, *saying-is-believing* techniques can reinforce core SSI principles. For example, writing activities that ask teens to teach their peers how they might navigate roadblocks using SSI principles can help teens internalize core messages. Finally, adolescents are often profoundly influenced by the beliefs and actions of their peers. Thus, SSIs can capitalize on this by using *testimonials*, persuasive stories from other peers, to illustrate the program’s core message and provide examples of how the target skill is helpful in daily life.

A recent example of a developmentally-attuned, youth-directed, digital SSI that incorporates B.E.S.T. elements is the “ABC Project” – Action Brings Change (Jessica L. Schleider et al., 2021). The ABC project targets depression by teaching behavioral activation, inspiring youth to engage in valued activities as a way to improve their mood. After agreeing to participate, participants are immediately asked for “help from scientists at Stony Brook University,” *empowering* youth into an expert role. *Brain science* is then used to normalize the role that avoidance plays in everyone’s life (i.e., helping us stay safe but also potentially keeping us stuck). By introducing different *testimonials* from peers, youth are taught that connecting with others, conquering a goal, or engaging in an enjoyable activity can ultimately improve their mood. To drive home these skills, ABC Project helps youth create an achievable action plan and plan for setbacks. What is notable here is that youth aren’t just learning from the stories of their peers; they are asked to provide advice to peers who happen to experience similar roadblocks as them. By providing advice, youth practice the *saying-is-believing* strategy and have the opportunity to internalize this message, helping themselves remember that they, too, can engage in valued activities to improve their mood.

Multiple digital SSIs, including the ABC Project, have been designed for youth, demonstrating high acceptability and small but significant effects in alleviating

psychopathology (e.g., depression and anxiety symptoms) across 3 to 9 months (Schleider et al., 2021; Schleider et al., 2020b; Schleider & Weisz, 2018). Nevertheless, the full promise of digital SSIs remains unmet—particularly in addressing time-sensitive mental health needs amid other developmental transitions across the lifespan.

The Transition to College

The majority of college counseling clinics are struggling to meet the increasing mental health needs of their students (Watkins et al., 2012), presenting an excellent window of opportunity for SSI delivery. College life is ripe with multiple challenges that students must navigate, such as finding a new support system, taking on more responsibility, and enrolling in rigorous academic courses. Leaving one’s home to create a new life and network can feel insurmountable for specific groups of youth, particularly if they have experienced race-based rejection in the past and question their belonging (Mendoza-Denton et al., 2002).

Wise interventions are brief, social-psychological interventions that promote adaptive meaning making and are often used to treat collective social problems (Schleider et al., 2020c). One example of a wise intervention designed for the transition to college is the brief social-belonging intervention by Walton & Cohen (2011), found to be particularly beneficial for African-American students who may question their belonging due to race-based discrimination, longstanding institutional barriers, and lack of representation at predominantly white institutions.

This brief, online intervention is now used at a number of college campuses and is easy to implement. Providing participants with multiple *testimonials* from a diversity of college students, this social-belonging intervention normalizes college-adjustment as a stage that everyone goes through regardless of race or gender. Using the “*saying-is-believing*” technique, it *empowers* participants to write and record a speech, to help ease the transition to college for future students. As students engage in these activities, they begin internalizing these messages—learning that feelings of not belonging are normal, transient emotions that will pass. African-American students particularly benefited from this intervention, demonstrating improvements in self-rated health and GPA years later (Walton & Cohen, 2011).

Using similar techniques, B.E.S.T. principles can guide the development of other SSIs for college students by using *brain science* to normalize the difficulties they experience, *testimonials* to increase hope by modeling how peers have coped with these difficulties, and *saying-is-believing* activities to *empower* students to give advice to others in similar situations.

The Transition to Parenthood

Another critical and challenging period of developmental change is the transition to parenthood, marked by new routines, sleepless nights, and changes in one’s primary role. Mothers may be particularly impacted by this transition, with 10-15% percent of new mothers reporting post-partum depressive symptoms (Gaynes et al., 2005). Unfortunately, untreated post-partum depressive symptoms can lead to serious consequences for the healthy development and



attachment of their children (Patel, Bailey, Jabeen, & Barker, 2021). In these critical moments, immediately accessible digital SSI may have great potential to help while reducing the stigma associated with accessing mental healthcare. For instance, an SSI designed to support mothers at-risk for post-partum depression might teach mood management skills and strategies for cultivating a support system, mitigating psychological issues and intergenerational consequences down the line.

B.E.S.T. principles might inform a developmentally-attuned SSI for the transition to motherhood to prevent post-partum depression. Such an SSI might borrow evidence-based principles from Cognitive Behavioral Therapy for postpartum depressive symptoms (Sockol, 2015), teaching mothers how to challenge their thoughts, normalizing common developmental changes, and encouraging mothers to ask for support. *Brain science* can be used to explain the changes that mothers might be experiencing during and after their pregnancy, increasing buy-in and normalizing their symptoms. *Testimonials* from other mothers might normalize the transition to motherhood and encourage mothers to stay connected to a community of people undergoing similar challenges and symptoms. *Testimonials* might also model ways in which other mothers successfully challenged negative self-directed thoughts or reached out to their communities for support. To solidify the learning of new skills and strategies, mothers might be guided through an activity wherein they identify and challenge unhelpful thoughts during the digital SSI; then, they might be asked to give advice to other women, through writing activities, who share in their struggles, *empowering* them into the expert role. An action plan can be created, inviting mothers to write a letter to their future selves to help them overcome roadblocks when they feel stuck. By using simple elements such as *saying-is-believing* techniques, we can build easily accessible SSIs that are developmentally attuned, designed specifically for the transition to motherhood.

Conclusion

Digital single-session interventions (SSIs)—which can help fill need-to-access gaps that traditional, face-to-face therapy cannot—have shown promise for reducing and preventing mental health problems among youth. However, their potential benefits and applications across the lifespan remain largely unexplored. We suggest that brief, self-guided interventions might be attuned and rapidly, broadly delivered during critical developmental transitions can maximize impact by targeting specific, time-sensitive needs. To diversify mental healthcare options, future researchers might work with community partners to design and pilot test SSIs for different developmental transitions, targeting underprivileged students during the transition to college or mothers at-risk for post-partum depression during the transition to parenthood.

References

- Gaynes, B. N., Gavin, N., Meltzer-Brody, S., Lohr, K. N., Swinson, T., Gartlehner, G., Brody, S., & Miller, W. C. (2005). Perinatal depression: prevalence, screening accuracy, and screening outcomes. *Evidence Report/Technology Assessment (Summary)*, 119, 1–8. <https://doi.org/10.1037/e439372005-001>.
- Kazdin, A. E. (2019). Annual research review: Expanding mental health services through novel models of intervention delivery. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 60(4), 455–472.
- Mendoza-Denton, R., Downey, G., Purdie, V. J., Davis, A., & Pietrzak, J. (2002). Sensitivity to status-based rejection: implications for African American students' college experience. *Journal of personality and social psychology*, 83(4), 896.
- Moreno, C., Wykes, T., Galderisi, S., Nordentoft, M., Crossley, N., Jones, N., Cannon, M., Correll, C. U., Byrne, L., Carr, S., Chen, E. Y. H., Gorwood, P., Johnson, S., K, ärkkäinen, H., Krystal, J. H., Lee, J., Lieberman, J., López-Jaramillo, C., M, ännikkö, M., ... Arango, C. (2020). How mental health care should change as a consequence of the COVID-19 pandemic. *The Lancet Psychiatry*, 7(9), 813–824. [https://doi.org/10.1016/S2215-0366\(20\)30307-2](https://doi.org/10.1016/S2215-0366(20)30307-2).
- Patel, M., Bailey, R. K., Jabeen, S., Ali, S., & Barker, N. C. (2021). *Postpartum Depression: A Review*. 23(2), 534–542.
- Powell, A. C., Torous, J. B., Firth, J., & Kaufman, K. R. (2020). Generating value with mental health apps. *BJPsych Open*, 6(2), 1–5. <https://doi.org/10.1192/bjo.2019.98>.
- Schleider Jessica, M. C. M., Fox, K. R., Dobias, M. L., Shroff, A., Hart, E. A., & Roulston, C. A. (2021). A Nationwide RCT of Single Session Interventions for Adolescent Depression during COVID-19. *Nature Human Behaviour*.
- Schleider, Jessica L., & Weisz, J. R. (2017). Little Treatments, Promising Effects? Meta-Analysis of Single-Session Interventions for Youth Psychiatric Problems. 2(2), 107–115.
- Schleider, J. L., Dobias, M. L., Sung, J. Y., & Mullarkey, M. C. (2020a). Future Directions in Single-Session Youth Mental Health Interventions. *Journal of Clinical Child and Adolescent Psychology*, 49(2), 264–278. <https://doi.org/10.1080/15374416.2019.1683852>.
- Schleider, J. L., Dobias, M., Sung, J., Mumper, E., & Mullarkey, M. C. (2020b). Acceptability and utility of an open-access, online single-session intervention platform for adolescent mental health. *JMIR mental health*, 7(6), e20513.
- Schleider, J. L., Mullarkey, M. C., & Chacko, A. (2020c). Harnessing wise interventions to advance the potency and reach of youth mental health services. *Clinical child and family psychology review*, 23(1), 70–101.
- Schleider, J., & Weisz, J. (2018). A single-session growth mindset intervention for adolescent anxiety and depression: 9-month outcomes of a randomized trial. *Journal of Child Psychology and Psychiatry*, 59(2), 160–170.
- Sockol, L. E. (2015). A systematic review of the efficacy of cognitive behavioral therapy for treating and preventing perinatal depression. *Journal of Affective Disorders*, 177, 7–21.
- Walton, G. M., & Cohen, G. L. (2011). A brief social-belonging intervention improves academic and health outcomes of minority students. *Science*, 331(6023), 1447–1451.
- Watkins, D. C., Hunt, J. B., & Eisenberg, D. (2012). Increased demand for mental health services on college campuses: Perspectives from administrators. *Qualitative Social Work*, 11(3), 319–337.

Considerations in the development and use of e- and m- mental health in Latin American contexts: case analysis of an m-health intervention to prevent postnatal depression and anxiety in Chilean mothers

J. Carola Pérez^{1,2*}, Soledad Coo¹, Daniela Aldoney¹
and María Ignacia García¹

¹Facultad de Psicología. Universidad del Desarrollo (UDD),
Santiago, Chile

²Millennium Institute for Research on Depression and
Personality (MIDAP)

*J. Carola Pérez; Centro de Apego y Regulación
Emocional, Universidad del Desarrollo, Av. Las Condes
12.461, Edificio Plaza San Francisco de Asís, oficina 306,
Las Condes, Santiago, Chile. Email: janetperez@udd.cl

Introduction

The daily use of and increasing access to digital technologies is having a transforming effect in the treatment of mental health problems (Batterham & Calear, 2017). Digital interventions offer low-cost and easily accessible treatment alternatives, that protect users' privacy (Taylor, Graham, Flatt, Waldherr, & Fitzsimmons-Craft, 2021). This has become especially relevant after the COVID-19 outbreak, due to its negative impact on mental health (Brooks et al., 2020; Zhou et al., 2020) and its associated increased need for interventions that do not require face-to-face contact, and thus offer a safe alternative in infection prevention (Rauschenberg et al., 2021).

Also, increasing evidence exists on the effectiveness of e- and m- mental health interventions (e-/m- MHIs) in the treatment of depression, especially guided or moderated programs (Wright et al., 2019). E-/m-MHIs have been proven effective in the treatment of anxiety disorders compared to non-treatment groups, and have been shown to be as effective as face-to-face treatment (Peñate & Fumero, 2016). To a smaller degree, e-/m-MHIs are also effective for the treatment of substance abuse and eating disorders (Taylor et al., 2021). Latin America's high prevalence rates of mental health problems and limited resources dedicated to their treatment, make e-/m- MHOs promising (Vigo, Kestel, Pendakur, Thornicroft, & Atun, 2019). Despite this

potential, research on e-/m- MHIs in Latin American Countries is scarce and heterogeneous in its aims and designs. Most initiatives focus on the feasibility and acceptability of pilot studies (Jiménez-Molina et al., 2019; Martínez, P., Rojas, Martínez, V., Lara, & Pérez, 2018; Rojas, Martínez, V., Martínez, P., Franco, & Jiménez-Milina, 2019).

When considering the potential and need for this type of intervention, there are four critical issues that must be addressed in the development and implementation of e-/m-MHIs in Latin American Countries for them to effectively and positively impact the users' well-being.

1. Limited use by the patient

One of the challenges involved in e-/m- MHIs is the limited use by patients, either due to treatment drop-out or low adherence problems (Christensen, Griffiths, & Farrer, 2009; Dunn, Casey, Sheffield, Newcombe, & Chang, 2012; Kelders, Kok, Osssebaard, & Van Gemert-Pijnen, 2012; Melville, Casey, & Kavanagh, 2010; Postel et al., 2011; Stockings, 2017; Van Ballegooijen et al., 2014). Also, a significant number of participants do not use the interventions as the developers intend them to (Kelders et al., 2012; Sieverink, Kelders, & Gemert-Pijnen, 2017). This is a common issue in both international and Latin-Americans' studies (Espinoza et al., 2016; Farfallini, Cortada, Marcaccio, Batageli, & Claudio y Moreno, 2016; Jaramillo et al., 2021; Lara, Tiburcio, Aguilar Abrego, & Sanchez-Solis, 2014; Monezi et al., 2016; Pérez et al., in press; Salamanca-Sanabria et al., 2020).

Barriers that limit patients' use and adherence to e-/m-MHIs include the lack or limited contact with a therapist or real facilitator (Bendelin et al., 2011; Gerhards et al., 2011) particularly in times of crisis (Darvell, Kavanagh, & Connolly, 2015) and program contents that are perceived as difficult to translate and apply to patients' daily life (Gerhards et al., 2011) or that are perceived as not being sufficiently aligned with the users' emotional state or needs (Darvell et al., 2015; Donkin & Glozier, 2012; Johansson, Michel, Andersson, & Paxling, 2015; Vis et al., 2018). Additionally, it has been proposed that the lack of previous experiences in the use of these type of interventions, either on a personal



level or in the potential users' close social network, impacts the patients' expectations and credibility towards them (Pérez et al., in press) interfering with its use (Constantino et al., 2011, 2019).

According to this evidence, in recent years the importance of tailor-made contents, that recognize the needs, apprehensions and expectations of the segment of patients to whom e-/m- MHIs are addressed, has been emphasized. A useful concept that encompasses this perspective is "usability", for example, extent to which a product or intervention can be used effectively by specified users to achieve specified goals in a specified context of use (International Organization for Standardization, 1998). Usability principles that have been proposed to be considered in the design of psychosocial interventions include learnability (rapid understanding can be built), memorability (easy to remember), efficiency (minimal time, effort, and cost), low cognitive load (minimal thinking is required), error reduction (users can prevent or rapidly recover from misapplication), satisfaction (viewed as acceptable and valuable), and capitalizing on context (addresses the static properties of the destination context, for example, considers time available to be destined by users and privacy issues) (Lyon, Brewer, & Areán, 2020a). Incorporating these principles may maximize interventions (Lyon, Koerner, & Chung, 2020b) and may drive the use of persuasive, co-design and generative participatory designs and methodologies (Alpay, Doms, & Bijwaard, 2019; Hetrick et al., 2018; Kelders et al., 2012; Vandekerckhove, De Mul, Ma, Bramer, & De Bont, 2020). However, these approaches are still limited internationally (Kelders et al., 2012), in Latin America (Martínez et al., 2018) and particularly in the Chilean reality (Parada, Martínez, Espinosa, Bauer, & Moessner, 2020; Rojas et al., 2019). A remarkable exception is a recent study developed by Ospina-Pinillos et al. (2020), who used participatory design methodologies to culturally adapt a Web-based Mental Health eClinic (MHeC) for Colombian youth (18-22 years old), considering the perception of their close social support network and health professionals. Also, they report on the development of a skeletal framework and prototype for a Colombian version of the MHeC.

2. The additional demands that e-/m- MHIs entail for mental health care providers

Although a wide range of e-/m- MHIs have been designed to be fully automated (Burger, Neerinx, & Brinkman, 2020), when the interventions involve health care professionals, they become very relevant stakeholders that influence the intervention effectiveness (Feijt, De Kort, Bongers, & IJsselstein, 2018; Vis et al., 2018; WHO, 2019). This highlights the need for e-/m- MHIs developers to consider their perspective, acknowledging their expectations and assigned credibility to these types of intervention (Feijt et al., 2018; Perle et al., 2013), as well as recognizing how compatible their traditional work responsibilities and e-/m- MHIs usage are (Vis et al., 2018; WHO, 2019).

If health professionals do not consider these tools to be a contribution or to have a positive impact on their users, it is unlikely that they will recommend them to the patients, and might even disqualify or invalidate these tools, affecting the patients' credibility towards them. Another aspect to be

considered is whether the use of e-/m- MHIs involves changes in the usual way of caring for and/or relating to patients, which might generate resistance in the healthcare providers and affect their use (Osma, Sprenger, & Mettler, 2017; Sprenger, Mettler, & Osma, 2017). Finally, health professionals will seek to protect clients' confidential information when using digital interventions, particularly when this information concerns a stigmatized diagnosis (Perle et al., 2013; WHO, 2019), an issue that must be considered in e-/m- MHIs development and needs to be clearly communicated to healthcare providers and patients.

3. The need to ensure the "integrality" of the technological components used

For an intervention to have the expected effectiveness, it is necessary for the user to be able to access it completely in the format, timing and quality it was designed to be offered. From this perspective any situation or event that interrupts or reduces the access to part of the components becomes a threat (Vis et al., 2018; WHO, 2019). For example, if interventions require internet service, it is necessary to consider the dissemination of internet connectivity among the target users, as well as insuring the stability of the signal. Also relevant is the degree of continuity and security of the servers on which the e-/m- MHIs are hosted. And finally, in the case of users, it is necessary to consider the availability of devices, including access to PCs, mobiles or smartphones, etc.—as well as the continuity of the internet service, which is often conditioned on the availability of economic resources to support it. Having internet coverage does not necessarily ensure quality access for all potential users. Chile is recognized for having one of the best internet services in Latin America (Pew Research Center, 2016) with 87% of homes having access (SUBTEL, 2017), and there are almost more mobile phones in use than people in the country (SUBTEL, 2020). However, this scenario is not as promising in the lower income sectors (Pew Research Center, 2016; SUBTEL, 2017), the cost of the services being the main reason for no use (SUBTEL, 2017). So, due to social inequalities, potential users may be excluded because of limited access to internet services (low quality and discontinued connection) which hinders the engagement with the intervention's content or renders timely access impossible.

4. The greater the complexity and interdependence of e-/m- MHIs components, the greater the number of potential problems in the stability and continuity of the intervention

When e-/m- MH interventions are developed, different components are included to achieve specific goals. Thus, for example, it might include a series of sequential modules containing psychoeducational information with suggested activities to be developed by the user, such as homework, relaxation exercises, etc. (i.e. Arjadi et al., 2016; Lara et al., 2014; Monezi et al., 2016; Salamanca-Sanabria et al., 2020; Tiburcio et al., 2016). It could also include symptom self-ratings and feedback (Arjadi et al., 2016; Espinosa et al., 2016; Pérez et al., in press), and different degrees of guided

mental health professional support (Salamanca-Sanabria et al., 2020), for example, in response to suicidal risk indicators (Arjadi et al., 2016; Pérez et al., in press). The e-/m-MHIs vary in objectives, and accordingly they will also vary in their complexity and level of interrelation with face-to-face care. For example, one way in which adherence problems have been addressed in e-/m-MHIs has been to incorporate some degree of personal contact or therapeutic guidance, either delivered online or face-to-face (Barak, Klein, & Proudfoot, 2009; Wentzel, Van der Vaart, Bohlmeijer, & Van Gemert-Pijnen, 2016). This combination of online care and therapeutic guidance is called “blended care”, allowing the delivery at the same time of the personal attention of a professional and the accessibility of online tools (Kelders et al., 2012; van der Vaart et al., 2014). Although this combination has been seen as an element that enhances the results (Murillo et al., 2020), studies to date have shown inconsistent results in patients with chronic somatic conditions (Kloek, Bossen, Bakker, Veenhof, & Dekker 2017) and depression (Pérez et al., in press). Therefore, it will be necessary to consider which and how many components are required for the interventions to be effective and efficient, and how these components are interrelated to each other. Also, if one component of the intervention is conditioned on the functioning of a previous one, there will be a greater chance of problems emerging if one of these components fails (Alcayaga et al., 2014). For example, if educational information is sent to patients via SMS or Instant Messaging, after the user responds through an Interactive Voice Response (IVR), the delivery of the intervention could be suspended if the user does not give confirmation to that IVR call, or because the IVR system does not work properly on all technological devices.

In addition, it must be established whether the e-/m-MHIs will function as a unit or will be a complementary intervention to the usual care, or could be integrated with it. Integrated e-/m-MHIs could be especially challenging to achieve in establishing continuity of the intervention, due to the difficulty of articulated automated phenomena with the changing demands or unexpected events that can modify the day-to-day functioning of health care centers (Alcayaga et al., 2014).

To offer a more practical approach to how these principles can guide the development and implementation of e-/m-MHIs, a case revision analysis is described below.

Case revision of m-health “What Were We Thinking” (m-WWWT), intervention to promote maternal postpartum mental health

The m-health version of “What Were We Thinking” is a complementary m-health intervention, which includes: a) Psychoeducational information for understanding and managing infant behavior, parenting in general, and changes in the couple’s relationship during the transition to parenthood. This information is structured in 13 modules delivered through instant messaging service for mobile phones (i.e., WhatsApp) 3-4 times a week for a four-week period. Each module includes a very brief video offering information regarding a specific topic; a proposed personal exercise; and the invitation to assess the perceived usefulness of the information received. Some modules include

links to external, complementary information from the Chilean Infancy Policy. b) Contact with the trained program facilitator. This allows mothers to ask questions that arise from the topics addressed in the psychoeducational videos and share their personal experiences. The answers seek to promote the understanding and elaboration of the contents, and operate by providing expert support. This is also done through an instant messaging service for mobile phones. In the present study, the facilitator will be a mental health professional of the research team who has been trained on the intervention model; c) A virtual group meeting will take place with mothers and their partners (or significant others) and the program facilitator. The group meeting offers an instance where new mothers and fathers can share their experiences regarding their parenthood and the changes it has induced in their daily lives, as well as providing the opportunity for developing support networks among them (Coo & Pérez, NCT04847076)

I. Limited use by the patient:

The transition to motherhood is a demanding time; women are usually busy with infant care, and scheduling activities at specific times may be challenging due to frequent changes in infant routine. Considering this reality, psychoeducational modules (videos) were designed to be minimally time-consuming (3 min. on average), available to be viewed by the mother at any moment they find suitable (even months after the intervention is finished) and, as many times as they want. Additionally, the module distribution (3 weekly videos) is not conditioned on the woman’s behavior (i.e., they do not have to give feedback on a module to receive the next one). This format allows women to “catch up” on the intervention if they have had limited time to view the modules they have received, and offers continuity in the provision of the information.

One of the strengths of m-WWWT is its usability. The intervention’s content and delivery were inspired by the human design usability principles for psychosocial interventions (Lyon & Koerner, 2016). The interventions contents were adapted using a cross-cultural adaptation model (Bernal, Jiménez-Chafey, & Domenech Rodríguez, 2009) and piloted to be used in Chilean populations (Coo, García, Awad, Rowe, & Fisher, 2021). This process informed the creation of video with meaningful and real-life examples (principles of learnability and memorability). Videos are sent to a mother’s personal WhatsApp. This app was selected due to its low or null associated cost, and high use rates (SUBTEL, 2020, Cadem-Jelly, 2019); In addition, it requires very simple user skills and little effort (principle of efficiency). These factors, together with the use of animation and the inclusion of only one topic in each video contribute to its ease of use, placing minimal cognitive demand on the mothers (principle of low cognitive load). The intervention contents also provide practical guidance in issues related to infant care that are positively valued by the women (Coo et al., 2021), making m-WWWT acceptable and valuable for the participant especially compared with alternate products in the health services realm (principle of satisfaction).

Also, the possibility of using instant text messaging to share personal experiences and ask for information or



clarification on the issues addressed in the intervention, constitutes an efficient (efficiency principle), valued (satisfaction principle) and adapted to the user context (capitalizing on context principle) health promotion strategy.

Finally, with regard to the online group session considered by the m-WWWT, Chilean health users traditionally have very low rates of attendance to health promotion and prevention interventions (CEDEP, 2013; Henriquez et al., 2014). An example is the parenting program “Nadie es Perfecto” (no one is perfect) which is delivered by trained local public health workers in 6-8 weekly group sessions. A nationwide randomized control trial reported that the overall participation rate was 24.9% among eligible individuals and the average number of sessions attended by compliers was 5.68 sessions (Carneiro, Galasso, Lopez Garcia, Bedregal, & Cordero, 2019). In this context, we expect that some mothers will not join the group session, but others will participate because it is a one-time activity, does not require the mother to leave her home or child, is relatively short (1 hour max.) and takes place at a time of day most women can attend (Hirmas et al., 2013). Lack of participation in the group session may limit the opportunities of new mothers to develop a support network beyond their family and current friends. Whether this limitation has an effect on the intervention impacts it is an open question.

2. The additional demands that e-lm- MHIs entail for mental health care providers

In its current form as a pilot study, the intervention is not delivered by the health professionals of the involved health centers, but by members of the research team. The facilitator activities include coordination and mental health referral of mothers with positive depression screening results; video distribution, offering information and feedback on participant questions; and shared information, all of which promote efficient use of available public health resources for new mothers and their children (by sharing educational material, information on lactation clinics, and following up on attendance to mental health appointments, among others).

In the future, if the intervention is incorporated as a regular service of the health services, the hours needed to deliver it could be added to those dedicated to preventive activities. Health centers in Chile usually structure their activities according to particular health-related goals and key performance indicators (KPI). Screening for maternal depression and referral for treatment is included in the current KPIs of primary healthcare professionals (MINSAL, 2010). Delivering preventive interventions, such as m-WWWT, could be included in these KPIs as a strategy to promote maternal health.

Despite involving some additional workload for the facilitator of the intervention, m-WWWT is an efficient and relatively low time-consuming alternative and does not require sophisticated technological skills. This simplicity allows the facilitator to focus on the communication with the users via instant text message (by WhatsApp or similar) and referral of at-risk women. The latter requires sufficient awareness and knowledge about referral protocols and the services available at the health center, which is expected to be fulfilled by the health care center workers. Also,

facilitators should have knowledge and experience in perinatal mental health, to appropriately handle the communication with the users and address their questions and needs.

The number of health professionals trained to deliver the m-WWWT intervention in a health center should relate to the population of perinatal women who receive healthcare at each center. The training should also be adjusted to meet the requirements and characteristics (i.e., in terms of hours and schedule) of the health care centers’ activities, training agenda and KPIs related to professional development.

Finally, if the intervention will be part of the regular services offered by health care centers, participants’ adherence could be promoted by health professionals during regular contacts with the mothers, for instance, at monthly infant health check-ups (face-to-face contact with the facilitators).

3. The need to ensure the “integrality” of the technological components used

Chile has overall high-quality internet connectivity, especially in urban areas, and the use of mobile phones is extended (SUBTEL 2017, 2020), thus facilitating users’ access to the m-WWWT intervention. The videos which are part of the intervention are short and do not consume much Internet data. Further, the access to WhatsApp to establish contact with the facilitator is usually unlimited for mobile phone users who have regular plans with Internet and mobile phone services providers. Even those mothers who have very low-cost prepaid telephone services have unlimited access to WhatsApp. These characteristics promote the mothers’ access to the different m-WWWT components.

4. The greater the complexity and interdependence of e-lm- MHIs components, the greater the number of potential problems in the stability and continuity of the intervention

The low complexity of the m-WWWT intervention components (videos, contact with the facilitator via WhatsApp and one group online session) contributes to the continuous accessibility of the interventions as a whole to the users. In this case, the components are related to each other in such a way that they reinforce the psychoeducational contents; thus they are related but not fully interdependent. Also, m-WWWT provides human guidance through remote contact with the facilitator. This practice could increase participant involvement (Barak et al., 2009; Wentzel et al., 2016) promoting stability and continuity of the intervention.

As can be observed in this case analysis, the development, pilot implementation and potential escalation to a public health level of e- / m-MHIs, require a systemic, dynamic and interdisciplinary perspective. It is necessary to consider—at a minimum—the recipient of the intervention, the health actors involved, and the availability and operability of technologies in the macro and micro territory (access and use of technologies at the recipient level). Also, the dynamism of the psychological processes of the subjects and their relationship with technology must be recognized.

And finally, it requires creativity and the capacity to work and interact effectively between different disciplines. The psychological clinical perspective is insufficient; it is also necessary to integrate the view of engineers, designers, and programmers, among others.

Acknowledgments

The project described in this article has received funding from ANID Millennium Science Initiative/Millennium Institute for Research on Depression and Personality-MIDAP ICS13_005.

References

- Alcayaga, C., Pérez, J. C., Bustamante, C., Campos, S., Lange, I., & Zuñiga, F. (2014). Pilot plan for a mobile health communication and monitoring system for people with diabetes. *Revista Panamericana de Salud Publica*, 35(5–6), 458–464. <http://www.ncbi.nlm.nih.gov/pubmed/25211577>
- Alpay, L., Doms, R., & Bijwaard, H. (2019). Embedding persuasive design for self-health management systems in Dutch healthcare informatics education: Application of a theory-based method. *Health Informatics Journal*, 25(4), 1631–1646. <https://doi.org/10.1177/1460458218796642>
- Arjadi, R., Nauta, M. H., Scholte, W. F., Hollon, S. D., Chowdhary, N., Suryani, A. O., & Bockting, C. L. H. (2016). Guided Act and Feel Indonesia (GAF-ID) - Internet-based behavioral activation intervention for depression in Indonesia: Study protocol for a randomized controlled trial. *Trials*, 17(1), 1–10. <https://doi.org/10.1186/s13063-016-1577-9>
- Barak, A., Klein, B., & Proudfoot, J. G. (2009). Defining internet-supported therapeutic interventions. *Annals of Behavioral Medicine*, 38(1), 4–17. <https://doi.org/10.1007/s12160-009-9130-7>
- Batterham, P. J., & Calear, A. L. (2017). Preferences for Internet-Based mental health interventions in an adult online sample: Findings from an online community survey. *JMIR Mental Health*, 4(2), Article e26. <https://doi.org/10.2196/mental.7722>
- Bendelin, N., Hesser, H., Dahl, J., Carlbring, P., Nelson, K. Z., & Andersson, G. (2011). Experiences of guided Internet-based cognitive-behavioural treatment for depression: A qualitative study. *BMC Psychiatry*, 11, Article 107. <https://doi.org/10.1186/1471-244X-11-107>
- Bernal, G., Jiménez-Chafey, M. I., & Domenech Rodríguez, M. M. (2009). Cultural adaptation of treatments: A resource for considering culture in evidence-based practice. *Professional Psychology: Research and Practice*, 40(4), 361. <https://doi.org/10.1037/a0016401>
- Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet*, 395(10227), 912–920. [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8)
- Burger, F., Neerinx, M. A., & Brinkman, W. P. (2020). Technological state of the art of electronic mental health interventions for major depressive disorder: Systematic literature review. *Journal of Medical Internet Research*, 22(1), 1–22. <https://doi.org/10.2196/12599>
- Cadem-Jelly. (2019, March). *El Chile que viene: uso de redes sociales* [The Chile to be coming: Use of social networks]. <https://www.jelly.cl/wp-content/themes/jellydigital/assets/Estudio-jelly-cadem-elchilequeviene.pdf>
- Carneiro, P. M., Galasso, E., Lopez Garcia, I. X., Bedregal, P., & Cordero, M. (2019). *Parental beliefs, investments, and child development: Evidence from a large-scale experiment*. World Bank Policy Research Working Paper N°8743. <https://ssrn.com/abstract=3335616>
- Centro de Estudios de Desarrollo y Estimulación Psicosocial [CEDEP] (2013). Estudio cualitativo sobre la implementación del taller grupal de competencias parentales “Nadie es Perfecto” [Qualitative study on the implementation of the group workshop on parenting competences “Nobody is Perfect”]. <https://www.crececontigo.gob.cl/wp-content/uploads/2015/11/7-Informe-final-Estudio-cualitativo-implementacion-Nadie-es-perfecto.pdf>
- Chile, Ministerio de Salud [MINSAL]. (2010). Estrategia nacional de salud para el cumplimiento de los objetivos sanitarios de la década 2011-2020 [National health strategy to meet the health objectives for the 2011-2020 decade]. Available in <https://www.minsal.cl/portal/url/item/c4034eddb96ca6de0400101640159b8.pdf>
- Chile, Subsecretaría de Telecomunicaciones [SUBTEL]. (2017). *Informe final. IX Encuesta de acceso y usos de internet*. <https://www.subtel.gob.cl/estudios/internet-y-sociedad-de-la-informacion/>
- Chile, Subsecretaría de Telecomunicaciones [SUBTEL]. (2020). *Informe Anual del Sector Telecomunicaciones*. <https://www.subtel.gob.cl/estudios/internet-y-sociedad-de-la-informacion/>
- Christensen, H., Griffiths, K. M., & Farrer, L. (2009). Adherence in internet interventions for anxiety and depression. *Journal of Medical Internet Research*, 11(2), 1–16. <https://doi.org/10.2196/jmir.1194>
- Constantino, M. J., Arnkoff, D. B., Glass, C. R., Ametrano, R. M., & Smith, J. A. Z. (2011). Expectations. *Journal of Clinical Psychology*, 67(2), 184–192. <https://doi.org/10.1002/jclp.20754>
- Constantino, M. J., Coyne, A. E., Boswell, J. F., Iles, B. R., & Vislä, A. (2019). Promoting treatment credibility. In J. C. Norcross & M. J. Lambert (Eds.), *Psychotherapy relationships that work: Evidence-based therapist contributions* (pp. 495–521). Oxford University Press.
- Coo, S., García, M. I., Awad, N., Rowe, H., & Fisher, J. (2021). Cultural adaptation of an intervention to prevent postnatal depression and anxiety in Chilean new mothers. *Journal of reproductive and infant psychology*, 39(3), 276–287. <https://doi.org/10.1080/02646838.2019.1705264>
- Coo, S., & Pérez, C. (2021, April 15). Feasibility of m-health version of “What Were We Thinking” intervention to promote maternal postpartum mental health. Identifier NCT04847076. <https://clinicaltrials.gov/ct2/show/NCT04847076>
- Darvell, M. J., Kavanagh, D. J., & Connolly, J. M. (2015). A qualitative exploration of Internet-based treatment for comorbid depression and alcohol misuse. *Internet Interventions*, 2(2), 174–182. <https://doi.org/10.1016/j.invent.2015.03.003>
- Donkin, L., & Glozier, N. (2012). Motivators and motivations to persist with online psychological interventions: A qualitative study of treatment completers. *Journal of*



- Medical Internet Research*, 14(3), Article e91. <https://doi.org/10.2196/jmir.2100>
- Dunn, T. L., Casey, L. M., Sheffield, J., Newcombe, P., & Chang, A. B. (2012). Dropout from Computer-based interventions for children and adolescents with chronic health conditions. *Journal of Health Psychology*, 17(3), 429–442. <https://doi.org/10.1177/1359105311415558>
- Espinosa, H. D., Carrasco, Á., Moessner, M., Cáceres, C., Gloger, S., Rojas, G., Perez, J. C., Vanegas, J., Bauer, S., & Krause, M. (2016). Acceptability Study of “ascenso”: An Online Program for Monitoring and Supporting Patients with Depression in Chile. *Telemedicine and E-Health*, 22(7), 577–583. <https://doi.org/10.1089/tmj.2015.0124>
- Farfallini, L., Cortada, K., Marcaccio, A., Batageli, A., & Claudio y Moreno, J. E. (2016). *Adaptación cultural de una intervención online para los trastornos emocionales* [Cultural adaptation of an online intervention for emotional disorders]. [Poster]. VIII Congreso Internacional de Investigación y Práctica Profesional En Psicología XXIII Jornadas de Investigación XII Encuentro de Investigadores En Psicología Del MERCOSUR. Buenos Aires, Argentina.
- Feijt, M. A., De Kort, Y. A. W., Bongers, I. M. B., & IJsselstein, W. A. (2018). Perceived drivers and barriers to the adoption of eMental health by psychologists: The construction of the levels of adoption of eMental health model. *Journal of Medical Internet Research*, 20(4). <https://doi.org/10.2196/jmir.9485>
- Gerhards, S. A. H., Abma, T. A., Arntz, A., De Graaf, L. E., Evers, S. M. A. A., Huibers, M. J. H., & Widdershoven, G. A. M. (2011). Improving adherence and effectiveness of computerised cognitive behavioural therapy without support for depression: A qualitative study on patient experiences. *Journal of Affective Disorders*, 129(1–3), 117–125. <https://doi.org/10.1016/j.jad.2010.09.012>
- Henríquez, S., Barrera, G., Hirsch, S., de la Maza, M. P., Jara, N., Leiva, L., & Bunot, D. (2014). Evaluación de un programa ministerial para manejo del síndrome metabólico en adultos con sobrepeso y obesidad [Evaluation of a ministerial program for the management of metabolic syndrome in overweight and obese adults]. *Revista Médica de Chile*, 142(7), 817–825. <http://dx.doi.org/10.4067/S0034-98872014000700001>
- Hetrick, S. E., Robinson, J., Burge, E., Blandon, R., Mobilio, B., Rice, S. M., Simmons, M. B., Alvarez-Jimenez, M., Goodrich, S., & Davey, C. G. (2018). Youth codesign of a mobile phone app to facilitate self-monitoring and management of mood symptoms in young people with major depression, suicidal ideation, and self-harm. *JMIR Mental Health*, 5(1), Article e9. <https://doi.org/10.2196/mental.9041>
- Hirmas, M., Poffald, L., Jasmen, A. M., Aguilera, X., Delgado, I., & Vega, J. (2013). Barreras y facilitadores de acceso a la atención de salud: Una revisión sistemática cualitativa [Health care access barriers and facilitators: A qualitative systematic review]. *Revista Panamericana de Salud Publica* 33(3), 223–229. <https://doi.org/10.1590/s1020-49892013000300009>
- International Organization for Standardization (1998). *Ergonomic requirements for office work with visual display terminals (VDTs) - Part 11: Guidance on usability* (p. 9241). Geneva, Switzerland: International Organization for Standardization
- Jaramillo, J. C., Espinosa Duque, D., Fernández Arcila, M., & Ruiz Osorio, M. P. (2021). Experiencia de uso de una intervención basada en internet en instituciones educativas de la ciudad de Medellín-Colombia. *Tempus Psicológico*, 4(1), 137–155. <https://doi.org/10.30554/tempuspsi.4.1.3984.2021>
- Jiménez-Molina, Á., Franco, P., Martínez, V., Martínez, P., Rojas, G., & Araya, R. (2019). Internet-based interventions for the prevention and treatment of mental disorders in Latin America: A Scoping Review. *Frontiers in Psychiatry*, 10, Article 664. <https://doi.org/10.3389/fpsyt.2019.00664>
- Johansson, O., Michel, T., Andersson, G., & Paxling, B. (2015). Experiences of non-adherence to Internet-delivered cognitive behavior therapy: A qualitative study. *Internet Interventions*, 2(2), 137–142. <https://doi.org/10.1016/j.invent.2015.02.006>
- Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. W. C. (2012). Persuasive system design does matter: A systematic review of adherence to web-based interventions. *Journal of Medical Internet Research*, 14(6), Article e152. <https://doi.org/10.2196/jmir.2104>
- Kloek, C., Bossen, D., Bakker, D. H. D., Veenhof, C., & Dekker, J. (2017). Blended interventions to change behavior in patients with Chronic somatic disorders: Systematic review. *Journal of Medical Internet Research*, 19(12), Article e418. <https://doi.org/10.2196/jmir.8108>
- Lara, M. A., Tiburcio, M., Aguilar Abrego, A., & Sánchez-Solís, A. (2014). A four-year experience with a Web-based self-help intervention for depressive symptoms in Mexico. *Revista Panamericana de Salud Publica*, 35(5–6), 399–406. <http://www.ncbi.nlm.nih.gov/pubmed/25211568>
- Lyon, A. R., Brewer, S. K., & Areán, P. A. (2020a). Leveraging human-centered design to implement modern psychological science: Return on an early investment. *American Psychologist*, 75(8), 1067–1079. <https://doi.org/10.1037/amp0000652>
- Lyon, A. R., & Koerner, K. (2016). User-centered design for psychosocial intervention development and implementation. *Clinical Psychology: Science and Practice*, 23(2), 180–200. <https://doi.org/10.1111/cpsp.12154>
- Lyon, A. R., Koerner, K., & Chung, J. (2020b). Usability evaluation for evidence-based psychosocial interventions (USE-EBPI): A methodology for assessing complex intervention implementability. *Implementation Research and Practice*. <https://doi.org/10.1177/2633489520932924>
- Martínez, P., Rojas, G., Martínez, V., Lara, M. A., & Pérez, J. C. (2018). Internet-based interventions for the prevention and treatment of depression in people living in developing countries: A systematic review. *Journal of Affective Disorders*, 234, 193–200. <https://doi.org/10.1016/j.jad.2018.02.079>
- Melville, K. M., Casey, L. M., & Kavanagh, D. J. (2010). Dropout from internet-based treatment for psychological disorders. *British Journal of Clinical Psychology*, 49(4), 455–471. <https://doi.org/10.1348/014466509X472138>
- Monezi, A. L., Boerngen de Lacerda, R., Pinto, H., Mota, T., Andreoli, L. M., Fernandes, L., Bedendo, A., & Oliveira, M. L. (2016). Web-based self-help intervention

- reduces alcohol consumption in both heavy-drinking and dependent alcohol users: A pilot study. *Addictive Behaviors*, 63, 63–71. <https://doi.org/10.1016/j.addbeh.2016.06.027>
- Murillo, R., Ordóñez-Reyes, C., Caicedo-Martínez, M., Vargas, S. P., Ariza, E., Schüz, J., & Espina, C. (2020). Coverage and acceptability of mobile phone messages for cancer prevention: a population-based study in a Latin American country. *Journal of Cancer Education* (Advance online publication) <https://doi.org/10.1007/s13187-020-01912-0>
- Osma, J., Sprenger, M., & Mettler, T. (2017). Introduction of e-mental health in national health systems – A health professionals' perspective. *Health Policy and Technology*, 6(4), 436–445. <https://doi.org/10.1016/j.hlpt.2017.07.001>
- Ospina-Pinillos, L., Davenport, T. A., Navarro-Mancilla, A. A., Cheng, V. W. S., Alarcón, A. C. C., Rangel, A. M., Rueda-Jaimes, G. E., Gomez-Restrepo, C., & Hickie, I. B. (2020). Involving end users in adapting a Spanish version of a web-based mental health clinic for young people in Colombia: Exploratory study using participatory design methodologies. *JMIR Mental Health*, 7(2), Article e15914. <https://doi.org/10.2196/15914>
- Parada, F., Martínez, V., Espinosa, H. D., Bauer, S., & Moessner, M. (2020). Using persuasive systems design model to evaluate “Cuida tu Anímo”: An Internet-based pilot program for prevention and early intervention of adolescent depression. *Telemedicine and E-Health*, 26(2), 251–254. <https://doi.org/10.1089/tmj.2018.0272>
- Peñate, W., & Fumero, A. (2016). A meta-review of Internet computer-based psychological treatments for anxiety disorders. *Journal of Telemedicine and Telecare*, 22(1), 3–11. <https://doi.org/10.1177/1357633X15586491>
- Pérez, J., Fernández, O., Cáceres, C., Carrasco, A., Moessner, M., Bauer, S., Espinosa, D., Gloger, S., & Krause, M. Effectiveness of an adjunctive Internet-based intervention to enhance treatment for depression in adults: A randomized controlled trial. *JMIR Mental Health*, in press.
- Perle, J. G., Langsam, L. C., Randel, A., Lutchman, S., Levine, A. B., Odland, A. P., Nierenberg, B., & Marker, C. D. (2013). Attitudes toward psychological telehealth: Current and future clinical psychologists' opinions of internet-based interventions. *Journal of Clinical Psychology*, 69(1), 100–113. <https://doi.org/10.1002/jclp.21912>
- Pew Research Center. (2016). *Smartphone ownership and internet usage continues to climb in emerging economies. Global report*. <https://www.pewresearch.org/global/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/>
- Postel, M. G., De Haan, H. A., Ter Huurne, E. D., Van Der Palen, J., Becker, E. S., & De Jong, C. A. J. (2011). Attrition in web-based treatment for problem drinkers. *Journal of Medical Internet Research*, 13(4), Article e117. <https://doi.org/10.2196/jmir.1811>
- Rauschenberg, C., Schick, A., Hirjak, D., Seidler, A., Paetzold, I., Apfelbacher, C., Riedel-Heller, S. G., & Reininghaus, U. (2021). Evidence synthesis of digital interventions to mitigate the negative impact of the COVID-19 pandemic on public mental health: Rapid meta-review. *Journal of Medical Internet Research*, 23(3), 1–14. <https://doi.org/10.2196/23365>
- Rojas, G., Martínez, V., Martínez, P., Franco, P., & Jiménez-Molina, Á. (2019). Improving mental health care in developing countries through digital technologies: a mini narrative review of the Chilean case. *Frontiers in Public Health*, 7, Article 391. <https://doi.org/10.3389/fpubh.2019.00391>
- Salamanca-Sanabria, A., Richards, D., Timulak, L., Connell, S., Perilla, M. M., Parra-Villa, Y., & Castro-Camacho, L. (2020). A culturally adapted cognitive behavioral internet-delivered intervention for depressive symptoms: Randomized controlled trial. *JMIR Mental Health*, 7(1), Article e13392. <https://doi.org/10.2196/13392>
- Sieverink, F., Kelders, S. M., & Gemert-Pijnen, V. (2017). Clarifying the concept of adherence to ehealth technology: Systematic review on when usage becomes adherence. *Journal of Medical Internet Research*, 19(12), 1–16. <https://doi.org/10.2196/jmir.8578>
- Sprenger, M., Mettler, T., & Osma, J. (2017). Health professionals' perspective on the promotion of e-mental health apps in the context of maternal depression. *PLoS ONE*, 12(7), e0180867. <https://doi.org/10.1371/journal.pone.0180867>
- Stockings, E. A. (2017). Commentary on Boumparis et al. (2017): It works, but only if they use it—addressing treatment adherence and attrition in internet interventions for illicit substance use. *Addiction*, 112(9), 1533–1534. <https://doi.org/10.1111/add.13862>
- Taylor, C. B., Graham, A. K., Flatt, R. E., Waldherr, K., & Fitzsimmons-Craft, E. E. (2021). Current state of scientific evidence on Internet-based interventions for the treatment of depression, anxiety, eating disorders and substance abuse: an overview of systematic reviews and meta-analyses. *European Journal of Public Health*, 31(1), i3–i10. <https://doi.org/10.1093/eurpub/ckz208>
- Tiburcio, M., Lara, M. A., Abrego, A. A., Fernández, M., Vélez, N. M., & Sánchez, A. (2016). Web-based intervention to reduce substance abuse and depressive symptoms in Mexico: Development and usability test. *JMIR Mental Health*, 3(3), Article e47. <https://doi.org/10.2196/mental.6001>
- Van Ballegooijen, W., Cuijpers, P., Van Straten, A., Karyotaki, E., Andersson, G., Smit, J. H., & Riper, H. (2014). Adherence to internet-based and face-to-face cognitive behavioural therapy for depression: A meta-analysis. *PLoS ONE*, 9(7), Article e100674. <https://doi.org/10.1371/journal.pone.0100674>
- van der Vaart, R., Witting, M., Riper, H., Kooistra, L., Bohlmeijer, E. T., & van Gemert-Pijnen, L. J. E. W. C. (2014). Blending online therapy into regular face-to-face therapy for depression: Content, ratio and preconditions according to patients and therapists using a Delphi study. *BMC Psychiatry*, 14(1), Article 355. <https://doi.org/10.1186/s12888-014-0355-z>
- Vandekerckhove, P., De Mul, M., Bramer, W. M., & De Bont, A. A. (2020). Generative participatory design methodology to develop electronic health interventions: Systematic literature review. *Journal of Medical Internet Research*, 22(4), 1–18. <https://doi.org/10.2196/13780>
- Vigo, D. V., Kestel, D., Pendakur, K., Thornicroft, G., & Atun, R. (2019). Disease burden and government spending on mental, neurological, and substance use



- disorders, and self-harm: cross-sectional, ecological study of health system response in the Americas. *The Lancet Public Health*, 4(2), e89–e96. [https://doi.org/10.1016/S2468-2667\(18\)30203-2](https://doi.org/10.1016/S2468-2667(18)30203-2)
- Vis, C., Mol, M., Kleiboer, A., Bührmann, L., Finch, T., Smit, J., & Riper, H. (2018). Improving implementation of e-mental health for mood disorders in routine practice: Systematic review of barriers and facilitating factors. *JMIR Mental Health*, 5(1), Article e20. <https://doi.org/10.2196/mental.9769>
- Wentzel, J., Van der Vaart, R., Bohlmeijer, E. T., & Van Gemert-Pijnen, J. E. W. C. (2016). Mixing online and face-to-face therapy: How to benefit from blended care in mental health care. *JMIR Mental Health*, 3(1), Article e9. <https://doi.org/10.2196/mental.4534>
- World Health Organization [WHO]. (2019). *WHO guideline: Recommendations on digital interventions for health system strengthening*. <http://apps.who.int/iris/bitstream/handle/10665/311941/9789241550505-eng.pdf?ua=1>
- Wright, J. H., Owen, J. J., Richards, D., Eells, T. D., Richardson, T., Brown, G. K., Barrett, M., Rasku, M. A., Polser, G., & Thase, M. E. (2019). Computer-assisted cognitive-behavior therapy for depression: A systematic review and meta-analysis. *Journal of Clinical Psychiatry*, 80(2), Article 18r12188. <https://doi.org/10.4088/JCP.18r12188>
- Zhou, X., Snoswell, C. L., Harding, L. E., Bambling, M., Edirippulige, S., Bai, X., & Smith, A. C. (2020). The role of telehealth in reducing the mental health burden from COVID-19. *Telemedicine and E-Health*, 26(4), 377–379. <https://doi.org/10.1089/tmj.2020.0068>

Knowledge survey about Early Child Development in a Low Resource Community Setting in Pakistan

Rasheed, Maham¹, Shakoor, Muhammad Suleman²,
Kiran, Tayyeba³, Husain, Mina⁴, Naeem, Shehla⁵ and
Chaudhry, Nasim⁶

¹Clinical Psychologist, Research Associate at Pakistan
Institute of Living & Learning (PILL)

²Bio-Statistician at Pakistan Institute of Living & Learning
(PILL)

³Assistant Director Research & Development at Pakistan
Institute of Living & Learning (PILL)

⁴Higher Trainee Psychiatry, South London and Maudsley
NHS Foundation Trust

⁵Principal, Iqra University Nursing College

⁶Professor of Psychiatry, Dow University of Health Sciences,
Chief Executive Officer (CEO), Pakistan Institute of Living
& Learning (PILL)

The Nurturing Care Framework for early childhood development set out by the World Health Organization (2018) builds on the premise that young children need nurturing care to develop to their full potential (WHO, 2018). Right nutrition, secure attachment, and optimal stimulation by parents and caregivers during the crucial first three years of life can shape the developmental trajectories of children and lay a strong foundation for their health and well-being. However, a large number of children are at risk of poor developmental outcomes, especially in the low and middle income countries (LMIC). The numbers are huge, with an estimated 250 million children under the age of five at risk of sub-optimal development and stunted growth in LMICs. This calls for immediate concerted action and timely interventions if we are to achieve the United Nations' 2030 agenda for sustainable development (World Bank, 2018).

According to the most recent UNICEF (2018) report, Pakistan has the worst neonatal (46 deaths per 1,000 live births) and under-five mortality (78.8/1000 live births) in the world along with high maternal mortality rates (178 per 100,000). According to the Pakistan Demographic and Health Survey (2017-2018), 23% of the children below five years of age were underweight, 37% were stunted and 7% were wasted. All of these risk factors are associated with poor child growth and development outcomes (NIPS, 2018). Despite this huge burden of maternal and child morbidity and mortality, there is little evidence of parents knowledge about early child development in Pakistan. A study conducted in Pakistan (Rehman, Kazmi & Munir, 2016) reported that the majority of mothers' knowledge about child development was via television, radio,

magazines and discussions with a pediatrician. The study also reported that mothers' knowledge about sensory and motor development of children was better than their knowledge about language and cognitive development. Recommendations were made related to enhancing mothers knowledge about child development (Rehman, et al., 2016).

The Sustainable Development Goals (SDGs), adopted by United Nations Member States in 2015, are a universal call to action to end poverty, protect people and ensure the world for peace and prosperity by 2030 (World Assembly, 2015). The SDG-3 is tasked to "ensure healthy lives and promote well-being for all at all ages" and directly address in one of the sections the need to reduce the global maternal mortality ratio to less than 70 per 100,000 live births. Meanwhile, Goal 4, which is the "educational goal", addresses inclusive and equitable quality education and promotion of lifelong opportunities for all. Caregivers or parents and family make significant contributions to child development outcomes by early identification of delays and disturbances as well as by providing accurate information to health professionals (IIDS, 2017; Van Belkum & Meintjes, 2013). It is important for parents to be well-equipped in terms of awareness and knowledge about milestones, caregiving skills, processes of child development and availability of child-care skills (Gadsden, Ford, & Breiner, 2016). To accomplish the above-mentioned goals, we need to understand the gap in knowledge so we can develop locally relevant training to enhance health literacy. Therefore, the aim of this study was to address this gap and assess knowledge about early child development in a low resource community setting in Karachi, Pakistan.

Methodology

Study setting: A cross sectional survey was conducted in a low resource community setting in Gadap town, Karachi. Karachi is the largest metropolitan city of Pakistan with a population of 14.9 million and *Gadap* town is one of the most densely populated towns in Karachi. In *Gadap*, there are 8 Union Councils (UC) with over 400 villages. Our already established network of Community Health Workers (CHWs) helped us to identify and short list 120 villages that could be included in the survey. The remaining villages were excluded because of uncertainty about the prevailing law and order situation. This survey was part of a large cluster Randomized Controlled Trial that aimed at evaluating the clinical and cost effectiveness of an integrated parenting intervention (Husain et al., 2021).

Sampling and population: Community members (both male and female) aged 16 years and above and willing to

participate a in health survey were recruited through a convenient sampling method. Participants were invited by trained CHWs (residents of the same community) and researchers (Master level psychologists). A total of 1,344 individuals were invited to participate in the survey. Among these individuals, 53 refused to participate and did not share any reason for refusal, 68 individuals mentioned that they wanted to participate but could not give time to complete the survey questionnaire at that specific time, and 23 were physically too unwell to participate. N=1,200 participants completed the survey questionnaires.

Demographic form: A brief demographic form was administered to collect demographic information such as age, gender, marital status, education, and family status.

Knowledge Questionnaire: The knowledge aspect of the Knowledge Attitude Practice (KAP) questionnaire was selected to assess the knowledge of the targeted community which comprised 25 items to assess knowledge and expectations of child development in the first three years. The questionnaire assessed knowledge of the parents in different developmental domains including social, language, emotional and cognitive development (See Table 3). This questionnaire is based on information from Learning through Play (LTP), a parenting intervention (Husain et al., 2017). The LTP intervention is comprised of a calendar that includes information about child development and is divided into different age stages.

Procedure

Ethics approval for the study was obtained from the ethics committee of Karachi Medical and Dental College (KMDC) (Ref #0019/13). Before the initiation of the survey, the field workers, including the psychologists and CHWs, were

trained in Good Clinical Practices (GCP) and the Knowledge questionnaire by the project manager (TK). The training was comprised of discussion on each item of the questionnaire and role play sessions on how to ask each question. Pre and post training assessments were also carried out. The project manager also observed the administration of questionnaires by field workers and ongoing feedback was given to them. Participants were approached by fieldworkers and provided with a detailed Participant Information Leaflet (PIL) about the survey in their local language. Written informed consent was obtained from all the participants and a thumb impression was taken in case of low literacy in the presence of a trustworthy literate community person identified by the participants themselves. The fieldworker read out each item from the questionnaire to the participants in their local language and waited for their responses before moving on to the next item. The administration of the questionnaire took between 15 to 20 minutes.

Statistical analysis

Demographic characteristics of the data is reported using descriptive statistics: means, standard deviation, frequencies and percentages along with corresponding measures of variability. Categorical variables were summarized by the number and percentage in each category. Statistical comparisons of the two groups (male and female) were also made and continuous variables were compared using the unpaired t-test if normally distributed. The Mann-Whitney test was used to compare ordinal measures between the two settings. The Chi-square test was used for categorical variables, except for variables with uncommon categories, where Fisher's exact test was preferred.



Table 1. Socio-demographic characteristics of the participants (n = 1200).

Gender	Frequency	%age
Male	241	20.08
Female	959	79.92
Marital Status		
Single	184	15.33
Married / Separation / Divorced / Widow	1016	84.66
Education of Participants		
No formal education	604	50.33
Formal education of any level	596	49.67
Family Status		
Nuclear	628	52.33
Joint	572	47.67
Status of house		
Self	1041	86.75
Rent	159	13.25
Do you clean your drinking water every day?		
No	965	80.42
Yes	235	19.58
If yes to above question, How?		
Boil	157	13.08
Chlorine	2	0.17
Use Filter	25	2.08
Any Other	50	4.2
	Mean, Median	SD
Age of participant	30.64	9.590
Total number of family member	8	6
Total Monthly Income (PK Rs – Rs 135 = 1\$)	10,000	11,000
Total Number of children	3	3

Table 2. Comparison of knowledge scores between subjects

Mean (SD)	Knowledge	Mean Difference	P-value
Gender			
Female	13.79 (3.03)	.265 (-.204 to .734)	.135
Male	13.46 (2.75)		
Marital Status			
Single	13.95 (3.20)	.252 (-.204 to .761)	.294
Married / Widow Separation	13.68 (2.94)		
Education			
No formal education	12.99 (2.94)	-1.52 (-1.86 to -1.19)	.000
Formal education	14.51 (2.83)		
Age group			
18 to 25 years	13.81 (3.09)	.147 (-.201 to .495)	.414
26 to 50 years	13.67 (2.92)		

Results

Table 1 presents the socio-demographic characteristics of the participants.

As can be seen from the Table 1, the mean age of the sample was 30.64 years (SD=5.45) and the majority of the participant were female (n=959; 79.92%) and married (n=991; 82.58%). Largely, the participants belonged to a nuclear family (n=628, 52.33%) but a large percentage also lived in joint family (n=572, 47.67%). Educational attainment of the sample was low with 50.33 having no formal education (n=604) and

49.67 having formal education (n=596). The majority of the participants did not drink clean water everyday (80.42%).

An independent sample t-test was used to compare mean differences between participants' knowledge score, indicating a significant difference of child development knowledge between those with and without formal education (See Table 2).

As can be seen from Table-3, responses of knowledge about child development indicated that there are some aspects where the participants had more than adequate knowledge such as the mother's mood directly affecting the



Table 3. Frequency of correct responses on Knowledge questionnaire (N = 1200).

KAP Questionnaire	N	%
1. The brain develops the fastest in first five years of life.	671	55.9
2. Children start to recognize the voice of their parents at the age 6 months.	161	13.4
3. Play is important because it makes a child strong, smart and able to get along well with others.	832	69.3
4. A baby who witnesses family violence, for example a father hitting a mother, will experience long term consequences.	787	65.6
5. A mother's mood (happy or sad) has an effect on her child's behavior.	1087	90.6
6. Babbling sounds (for example, "ba-ba" or "na-na") can be considered as a form of a child's communication.	1079	89.9
7. At the age of 6-9 months babies start showing some fear of strangers.	469	39.1
8. If you hold/carry babies too much, you will not spoil them.	271	22.6
9. A child with a close bond with the mother will grow up to be a secure and self-confident person.	490	40.8
10. If a child misbehaves, the best response from the parent would be to say "I don't like what you just did rather than saying "I don't like you".	681	56.8
11. Infants start to follow slow movements with their eyes (e.g. colorful objects, lights) during first month of their life.	395	32.9
12. Spanking children helps them develop a better sense of self-control.	751	62.6
13. A baby is dropping a toy on the floor again and again. She is doing this because she is interested in exploring what will happen with the toy rather than not being interested.	756	63.0
14. At the age of 5 years we should expect a child to be able to share a toy with another child.	285	23.8
15. Children learn through play and exploring the environment.	574	47.8
16. A 3-year-old cannot be expected to sit quietly for an hour or more, such as in a school or a place of worship.	919	76.6
17. What babies experience during early years of their life is important for their ability to learn when they go to the school.	826	68.8
18. Babies should not be kept off the floor before they are able to walk.	625	52.1
19. Parents can best help their child's language development by talking, singing and reading to them rather than children spending time in watching educational programs on television.	1173	97.8
20. A parent should not try to prevent a very young baby from putting his clean hand in his mouth.	288	24.0
21. Parents should start talking to their baby immediately after birth rather than waiting for the time when child start babbling or gets 1 year old.	477	39.8
22. A 1-year old who tries to climb on a chair after repeatedly being told not to do so, does not mean to misbehave but is rather exploring the world.	475	39.6
23. Children usually ask their parents to read the same story over and over again. They do so because they enjoy that story and they learn something new every time they listen to that story.	522	43.5
24. An 18-month-old child who has established a secure bond with his mother, still looks at his mother every time when a stranger approaches him.	1029	85.8
25. Having the mother follow her child's lead in a play, helps the child to learn and develop new experiences.	829	69.1

child's behavior (90.6%). Approximately 65% of the participants were aware that witnessing violence could affect children. A majority of the participants in our study reported that play is very important for a child's development and improves their engagement with others (69.3%). The respondents also knew that play time with the mother leads to the children having new experiences (69.1%). Most of the participants were aware of the fact that parents can best help their child's language development by talking, singing and reading to them rather than children spending time in watching educational programs on Television (97.8%). Furthermore, a majority of the participants were aware that the brain develops fast during the early years (55.9%) and that babbling is a type of child's communication (89.9%).

Only 13.4% participants had the knowledge that children start to recognize the voices of their parents at the age 6 months, and that parents should start talking to their child immediately after birth rather than waiting for the time when the child starts babbling or turns 1 year old (39.8%), that carrying the child would not spoil his habits (22.6%), that children should be expected to share toys at the age of 5 years with another child (23.8), and that a parent should not try to prevent the child from putting his clean hand in his mouth (24%). Few than half of the participants in the

present study knew why children demand to listen to the same stories over and over again (43.5%).

DISCUSSION

Caregivers' knowledge of child development is important in providing children with a healthy, enriched environment and is likely to boost the acquisition of development potential (Britto, Ponguta, Reyes, & Karnati, 2015; Gadsden et al., 2016). A higher educational background of the parents is likely to improve developmental outcomes for the children as well and this needs to be supported by concerted long term efforts to enhance literacy rates and improve knowledge about child rearing practices among parents.

In certain areas the participants had greater knowledge such as that the maternal mood directly affects the child's behavior. This is supported by existing evidence that children are extremely sensitive towards the mother's mood. Two thirds of the participants were aware that witnessing violence could affect children. Findings from a systematic review indicate that children living with domestic violence are at an increased risk of experiencing emotional, physical and sexual abuse, of developing emotional and behavioral

problems and of increased exposure to the presence of other adversities in their lives.

While the respondents had good knowledge about several aspects of the questionnaire, there were areas about they were not very well informed. A study conducted in Iran reported parents being reasonably well aware about the role of environment in language and cognitive development whereas a study conducted in Turkey reported that most mothers lack knowledge regarding normative ages for development of skills like vocalization, social smiling and overall brain development (Ertem et al., 2007). Earlier studies conducted in Pakistan reported that mothers had knowledge about few age norms of language and cognitive development like the earliest age at which a child can be taught but were unaware of other norms like the age at which brain development starts (Rehman et al., 2016).

Less than 50% of participants in the present study were aware why children may demand to listen to the same stories again and again. There is evidence that shared book reading by parents is associated with young children's acquisition of knowledge and skills that influence their later success in writing, reading, and other areas (Malin, Cabrera, Karberg, Aldoney, & Rowe, 2014). SDG 3 particularly focuses on ECD (ages 0–6 years), the period of brain development, cognitive skills acquisition, and vital health outcomes, all of which have significant lifetime implications.

Results from our study support the need to enhance the knowledge and awareness in communities, and particularly among parents, about child development since there is evidence that knowledgeable parents are more likely to provide a nurturing environment by having more interactions with their child, and show healthy parenting behaviors leading to improved social and cognitive development of their children (Morawska, Haslam, Milne & Sanders, 2011).

Limitations

- The sample was collected using convenient sampling method.
- The sample size of men was much smaller than women.
- The study was only limited to one of the 18 towns of Karachi.

CONCLUSION

Results from our survey highlight the need for action to increase early child development of literacy, which is likely to have long-term implications for parenting. Further longitudinal epidemiological and intervention studies are recommended for assessing knowledge within communities and establishing practical methods for knowledge promotion in the field of early child development in low resource and low literate populations.

References

Assembly, G. (2015). Sustainable development goals. *SDGs Transform Our World, 2030*.

- Breiner, H., Ford, M., & Gadsden, V. L., & National Academies of Sciences, Engineering, and Medicine. (2016). *Universal/Preventive and Widely Used Interventions. Parenting Matters: Supporting Parents of Children Ages 0-8*.
- Britto, P., Ponguta, L., Reyes, C., & Karnati, R. (2015). *A systematic review of parenting programmes for young children in low-and middle-income countries*. New York, NY: United Nations Children's Fund.
- Ertem, I., Atay, G., Dogan, D., Bayhan, A., Bingoler, B., & Gok, C., ... Isikli, S. (2007). Mothers' knowledge of young child development in a developing country. *Child: Care, Health, Development, 33(6)*, 728–737.
- Husain, Nusrat, Kiran, Tayyeba, Shah, Sadia, Rahman, Atif, Saeed, Qamar, Naeem, Shehla, & Bassett, Paul, et al. "Efficacy of learning through play plus intervention to reduce maternal depression in women with malnourished children: A randomized controlled trial from Pakistan☆." *Journal of Affective Disorders 278* (2021): 78–84.
- Husain, N., Zulqernain, F., Carter, L.-A., Chaudhry, I. B., Fatima, B., & Kiran, T., ... Lunat, F. (2017). Treatment of maternal depression in urban slums of Karachi, Pakistan: a randomized controlled trial (RCT) of an integrated maternal psychological and early child development intervention. *Asian Journal of Psychiatry, 29*, 63–70.
- IIIDS, I. f. I. D. S. (2017). A study of knowledge, attitude and practice (KAP) before and after implementation of parental education programme in 3 districts of Nepal.
- Malin, J. L., Cabrera, N. J., Karberg, E., Aldoney, D., & Rowe, M. L. (2014). Low-income, minority fathers' control strategies and their children's regulatory skills. *Infant Mental Health Journal, 35(5)*, 462–472.
- Meintjes, J. S., & Van Belkum, C. (2013). Caregivers' knowledge regarding early childhood development in Soshanguwe, South Africa. *Africa Journal of Nursing and Midwifery, 15(2)*, 187–186.
- Morawska, A., Haslam, D., Milne, D., & Sanders, M. R. (2011). Evaluation of a brief parenting discussion group for parents of young children. *Journal of Developmental Behavioral Pediatrics, 32(2)*, 136–145.
- NIPS, N. I. o. P. S. (2018). Pakistan Demographic and Health Survey 2017-18: Key Indicators Report.
- Rehman, A., Kazmi, S., & Munir, F. (2016). Mothers' Knowledge about Child Development. *Pakistan Pediatric Journal, 40*, 176–81.
- Unicef. (2018). *An Everyday Lesson: End Violence in Schools*. Unicef.
- World Health Organization. (2018). *WHO recommendations on intrapartum care for a positive childbirth experience*. World Health Organization.
- World Bank Education Overview: Early Childhood Development (English). *World Bank Education Overview* Washington, D.C.: World Bank Group (2018). <http://documents.worldbank.org/curated/en/690971541077990667/World-Bank-Education-Overview-Early-Childhood-Development>

News from the Early Career Scholars' Representative



Cinzia Di Dio, Università Cattolica del Sacro Cuore, Milan

The ISSBD Early Career Scholars Committee continues to work in line with the vision and goal of creating cohesion and strengthening the network of relationships among the Society's young members. In the second half of 2021, these intentions have been translated and concretized into several initiatives that have been welcomed by ECSs. In view of the results achieved, the Committee is determined to persevere and invest in these and additional initiatives for the coming year as well.

Accomplishments in 2021

As planned, the ECS Committee has implemented a database with ECS contacts and their respective research activities that has been shared among early scholars. This was to allow scholars to fasten communication and easily share projects thus creating synergies internationally.

Also, in line with ISSBD-promoted educational program related to research methodology, a mentoring online session has been organized and took place on 22 Apr 2021, where scholars were lectured about methodological issues associated with carrying out international projects. The online lecture was given by Qi Wang, Professor and Chair of Human Development at Cornell University, NY, USA. She directs the Culture & Cognition Lab. Her research examines the mechanisms underlying the development of a variety of cognitive and social-cognitive skills in the context of culture, focusing particularly on autobiographical memory.

The webinar was received with great enthusiasm by the many participants, so much so that it prompted the organization of a second event.

Following this initiative, in fact, a further a special lecture was organized specifically for ECs, but that met the general interest for the whole Community. The lecture took place online on 23rd September and was given by Prof. Semira Tagliabue, Associate Professor in Psychometrics at

the Università Cattolica del Sacro Cuore (Italy). She teaches Research Methods at bachelor, master and PhD level in both national and international courses. She is a member of MERITEA (Metodi di Ricerca e Tecniche di Analisi dei dati – Research Methods and Data Analyses) Research Unit, and of Family Studies and Research University Centre. The keynote topic was about “measurement invariance: different kinds of comparisons in complex research designs”. The concept of invariance of measure has now entered as a common research practice used in different areas of psychology, and the best-known procedures concern testing the equality of parameters by multigroup CFA applied to independent groups. The overall rationale is to test whether the way a quantitative instrument is measuring a construct is equal in different groups. The development of more complex research designs requires a reflection on how to apply the principles of measurement invariance in situations involving dyadic or relational designs, longitudinal or intensive designs, cross-cultural design mixed with other kind of designs, etc. The topic was selected in line with the idea of supporting a methodological training path that allows to deepen knowledge related to psychology and development, with an eye to international partnerships.

As anticipated, the Society is very committed to supporting initiatives to encourage the research of young people, as well as realities that may have difficulties in achieving objectives associated with promoting and publishing scientific research. In this spirit, the Society is actively reflecting on concrete possibilities to support the research and publication of young scholars' work internationally through opportunities offered also by the organization of the ISSBD meeting in Rhodes in 2022. It is our intention to be able to operationalize and share the current intervention hypotheses as soon as possible.

This and other general issues will be part of the topics that will be covered at the next ECS meeting to be organized by the ECS Committee before the end of the current year. This meeting will provide a further opportunity for informal sharing in which scholars will be able to express their thoughts and present issues related to creating and strengthening a community that shares research interests and needs on an international level.

Last, the ECS Committee together with the ISSBD Board Members are still actively working on the organization of a structure that enables a functional and effective networking between the ECS and ISSBD senior members, who can provide support to the ECS's research. In line with the general objectives of the Society and the interests of ECSs, the Committee will pursue this objective, which we are sure will add value to the quality of research and the educational process of our scholars.

The ECS Committee

News from the Organizers of the 26th Biennial Meeting of ISSBD

Frosso Motti-Stefanidi November 2021

The 26th Biennial Meeting of the International Society for the Study of Behavioral Development (ISSBD) will take place in person, June 19-23, 2022 at Rodos Palace Hotel, on the Island of Rhodes, in Greece.

We were very disappointed that we had to cancel the ISSBD 2020 conference due to the pandemic. We had a record number of submissions and we were expecting to have an outstanding meeting. The program was complete and it was of excellent quality.

We hope that you and your loved ones were able to safely navigate this challenging situation and that you are all healthy and well.

We invite colleagues and students who were planning to attend the 2020 conference as well as those who had not planned to attend that conference to submit their work for ISSBD 2022. As you will see in the instructions for abstract submission, work that was accepted for the 2020 conference and that has already gone through peer review, assuming it has not already been presented or published internationally, will be automatically accepted for ISSBD 2022.

Our goals are to promote at this Conference key principles of the ISSBD, namely diversity, equity and inclusion, both in terms of the presentations and with respect to the presenters, as well as its focus on human development throughout the life-span.

To achieve these goals, we invited colleagues from across the globe to present their work and to discuss with participants cutting edge conceptual and methodological issues. We have included invited keynote addresses and invited symposia organized and presented by colleagues from the USA, Europe, Africa, Asia and Australia. A number of the invited presentations address issues of ethnic, racial and sexual diversity, among others, and discrimination as they impact human development across the life-span. We have also invited colleagues to present and discuss issues related to Open Science, Big Data, the Translation of Developmental Science to Policy and the Internationalisation of Development Science.

ISSBD in a joint initiative with the International Consortium of Developmental Science Societies (ICDSS), will give emphasis at the conference on the effects of climate change

on human development across the life-span. We are planning a keynote address and an invited symposium on this topic. We also promoted collaborations with other Developmental Science learned societies. For example, we invited joint symposia between ISSBD and societies such as the European Association of Developmental Psychology (EADP), the European Association for Research on Adolescence (EARA), and the International Association of Gerontology and Geriatrics (IAGG).

Why the island of Rhodes in Greece? The Island of Rhodes is not only known for its endless beaches, wonderful weather, its medieval old town, beautiful landscape but also for its long experience in organizing large International Scientific Conferences. When the gods divided the world among themselves, so an ancient Greek legend goes, Helios (the Sun god) noticed an island emerging from the sea. He was so fascinated by its beauty that he immediately asked Zeus whether he might have this island as his share. Rhodes was that island. The island seems to glide like a dolphin, over the waves in the transparent seas of the south-eastern Aegean, where West meets East.

The Conference will offer numerous networking opportunities so that you will be able to meet and interact with leading scientists and researchers, friends and colleagues, as well as sponsors and exhibitors.

The social program will highlight our Greek cuisine, unique culture and arts, combined with the breathtaking natural beauty of the island. Pre- and post-congress tours will underscore the role of the Island of Rhodes as one of the world's most popular tourist destinations.

The proposed conference offers the occasion for a fertile dialogue and exchange of ideas, knowledge, and methods between scholars in a setting known for its beauty and history. We believe ISSBD 2022 promises to offer participants a memorable experience.

We hope you will join us for a symphony of outstanding science and to celebrate together our freedom from the pandemic.

Frosso Motti-Stefanidi
Chair of the Conference