EMPOWERING CHILDREN TO BEHAVE SAFELY ONLINE:

AN INTEGRATED DEVELOPMENTAL-BEHAVIORAL APPROACH TO DIGITAL MEDIA LITERACY

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Scientific relevance and challenges

Today's children are growing up in an always-on, interactive digital media society.[1] Research has demonstrated that digital media equally create opportunities for children, in terms of entertainment, education, and communication, as well as posing risks for their well-being and safety.[2-3] One of the most pressing issues in the current societal debate on digital media is its growing threat for children's privacy and security.[4-8] This threat not only includes the safety risks involved in sharing personal information online, but also commercial data collection and profiling practices. These practices raise serious concerns about digital dossiers that could follow children into adulthood, affecting their access to education and employment.[5,6] To ensure that children can participate fully in the digital media culture but at the same time use online media safely, there is a growing call to invest in children's digital and media literacy.[9-19]

Media literacy education generally focuses on developing the knowledge (including technical skills and understanding of how digital media messages are constructed) needed to become critical consumers and creators of media messages in a variety of forms.[19,20] As such, it aims to promote more reflective ways of using media, and hence to stimulate safe (online) media behavior. However, the earlier work of myself[21-24] and others[19,20,25-31] has revealed that even if children have acquired the necessary media-related knowledge, this does not ensure they also use and respond to media in a reflective manner. This implies that enhancing children's knowledge of media will not automatically result in safe online behavior. Existing theories on digital and media literacy[31-33] fall short in explaining how to overcome this knowledge-behavior gap. To do so, these theories need to be expanded with insights from theories on behavior change and, because the cognitive capacities needed to translate knowledge into behavior are still maturing in children, theories on cognitive development. In light of this need, **the proposed project seeks to validate a novel theoretical framework, the Digital Media Empowerment model, using an integrated theoretical approach (combining theories on media literacy, behavior change, and cognitive development) to explain how children can be empowered to behave safely online.**

By adopting an integrated developmental-behavioral approach to digital media literacy, the DME model will not only focus on the knowledge children need to safely consume and create digital media content, but will also take into account the mechanisms that increase children's agency to actually act on that knowledge. On top of the framework being able to explain the mechanisms that drive children's safe online behavior, it will serve as a practical tool for the easy identification of the factors that should be targeted by interventions to empower children to use media safely. Such insights are imperative because only when interventions are effective in helping children to make the crucial transition from having the necessary knowledge to actually applying that knowledge in order to act safely, can they fully benefit from the opportunities digital media have to offer.

Key objectives and focus of the project

To validate the DME model, the project has two key objectives:

1) to empirically test the theorized relationships between the model's mechanisms (i.e., knowledge, ability, motivation) and children's online safety behavior through observation (Subproject I) and manipulation of the model's mechanisms (Subproject II); and

2) to develop an innovative research tool for data collection and intervention involving an advanced game-based research methodology that can be used to test the model's theorized relationships (Subproject I & II).

By addressing these key objectives, the project provides evidence for the validity of the theoretical assumptions of the DME model. As the model's working might vary in natural and experimental settings, the theorized relationships are tested both through observation and manipulation of the model's mechanisms. The model will be tested for different types of online safety behaviors (e.g., limiting self-disclosure, adopting privacy protective measures), which allows more general conclusions on the validity of the DME model to be drawn.

The research project focuses on young adolescents (10- to 14 year olds), because children in this age range rapidly gain autonomy in their online behaviors and activities[1-3,5] implying that safe digital media habit formation is crucial. Children in this age range also still have difficulty regulating their online behavior autonomously[21] but do possess the cognitive capacities that are necessary to boost their behavior-regulation skills.[36]

Theoretical famework: The Digital Media Empowerment Model

Figure 1 depicts the DME mode, which is the conceptual framework that serves as the starting point of this project. The model extends existing digital and media literacy theories by extending them with insights from theories on children's cognitive development, and behavior change. The following section describes how these theories together form the basis of the model.

Starting at the left-hand side of Figure 1, the figure first depicts the foundation of the model: **knowledge.** The DME model shares the assumption of classic media literacy theories that knowledge (including technical skills and understanding of how digital media messages are constructed) is fundamental to the acquisition of media literacy, as it provides the context within which individuals can access, create and make sense of (digital) media content.[19,31-33]

However, the earlier work of myself[21-24] and others[19,20,25-31] has shown that having knowledge of media does not automatically result in changes in their media behavior. Theories of children's cognitive development suggest that this is especially true for children, because the cognitive skills they need to translate knowledge into action are not yet fully developed.[21,36] Moreover, insights on how children use and create media have shown that children's experiences with media are largely driven by pleasure, instant gratification, and emotional action ("How appealing is this to me?").[1,21,28,34] Together, these insights suggest that, due to children's immature cognitive abilities—combined with the impulsive and affective nature of their experiences with media—children's ability and motivation to act on their knowledge and behave safely online are low. This is problematic because theories of behavior change suggest that abilty and motivation are important behavioral determinants.[36] The DME therefore posits that, for knowledge to lead to behavior, both **ability** and

motivation to perform the behavior are crucial mechanisms that should be taken into account when explaining how children can be empowered to behave safely online.

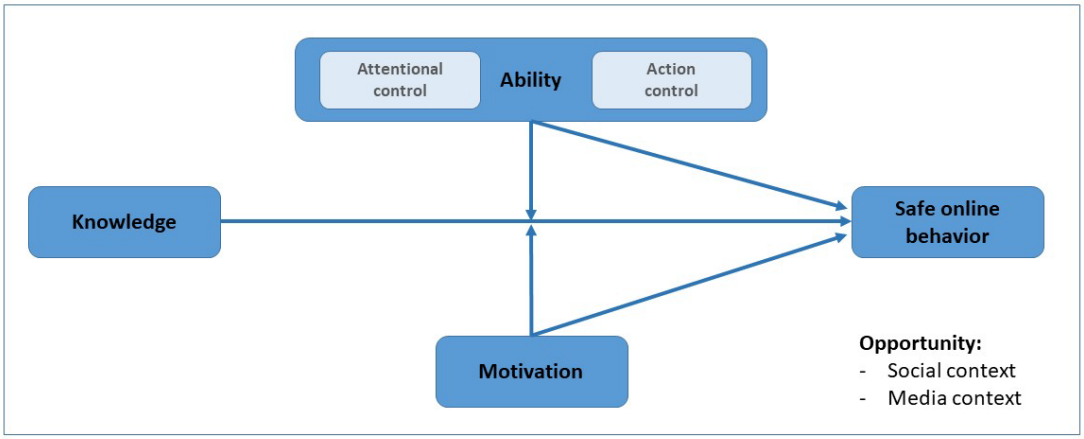

Figure 1. Conceptual framework, the DME model

Insights from developmental theories suggest that children's ability to act safely online depends largely on their cognitive skills.[36] To behave safely online, children should be able to control their impulsive responses to what they see in and do with digital media and instead respond in a different way. I refer to this process as the "stop-and-think reaction,"[21] because it requires that children control their impulsive reactions ("stop") and then come up with a strategy to deal with the situation ("think"). The stop-and-think reaction is closely linked to children's executive functions, which are a set of mental processes that aid in the monitoring and control of emotion, thought, and action,[36] and do not reach adult levels until late adolescence.[38]

The upper half of Figure 1 depicts the two aspects of executive functioning that are assumed by the model to play a key role in children's ability to stop and think while interacting with digital media: attentional and action control. *Attentional control* enables the inhibition of irrelevant information and efficient retrieval and integration of relevant information.[39] For children to behave safely online, attentional control is required to process the media content and pro-actively respond by shifting the attention away or efficiently retrieving relevant knowledge (e.g., how to change privacy settings) from memory. *Action control* is required to overcome impulsive behavioral tendencies in response to the enticing appeal of the media. Children with higher levels of action control generally behave in a more self-directed and independent fashion, and show more perseverance.[40-42] Children with less developed attentional and action control, will be more likely to respond to the emotionally pleasing aspects of the media they are using immediately and are therefore less likely to enact a stop-and-think response and engage in safe online behavior.[22]

The lower half of Figure 1 depicts motivation. Theories of behavior change suggest that, without motivation or intention to do so, a person is unlikely to put effort in regulating their behavior.[43-48] In line with these theories and earlier research,[49-55] the model assumes that children who are less motivated to act on their media-related knowledge with regard to safe online behavior, are less likely to actually do so while engaging with digital media.

Based on the insights presented above, the DME model hypothesizes that higher levels of ability and motivation lead to a stronger knowledge-behavior relationship. Following theories of behavior change, the model also assumes that children's online safety behavior does not occur in a vacuum. The DME model posits that the extent to which individual levels of ability and motivation moderate the knowledge-behavior relationship is dependent on several contextual factors that determine children's **opportunity** to perform the behavior.[37] Children's opportunity to perform safe online behavior, represented in Figure 1 by the square around the model, is determined by both the social context (e.g., the influence of others) and the physical media context (e.g., technological affordance, that is the extent to which a media platform allows certain safe behavior to be carried out) in which the children's online media use takes place.

Methods and techniques

In addressing the overall aim, the proposed project adopts an innovative methodological approach by using an advanced game-based strategy for data collection and intervention. Specifically, an innovative research tool, called the Digital Media Empowerment (DME) Lab, will be developed that encompasses a range of game-based research technologies. Gaming technology is pre-eminently suitable for the purposes of this project for three reasons:

1. Gaming technology enables children to experience digital media in a real-life environment, which makes it possible to observe and measure unobtrusively their online decision-making and safety behavior in real-life situations through in-game metrics. Children's online behavior is commonly measured through self-report. However, self-reported measures of behavior have several disadvantages that decrease their validity (e.g., social desirability, inaccurate recall, measurement of intentions instead of actual behavior).[35] Gamified data collection methods are less subject to these types of response bias than traditional methods.[56,58]
2. Gaming technology enables experimental manipulation of the underlying mechanisms of the DME model by integrating evidence-based intervention techniques into the mechanics of the game.[59]
3. Games, at least when professionally designed, are engaging and intrinsically motivating, which is crucial to keep children involved in the research and to improve data quality.[59-61]

References

1. Valkenburg, P. M., & Piotrowski, J. T. (2017). *Plugged in: How media attract and affect youth*. Yale University Press.
2. Chassiakos, Y. L. R., Radesky, J., Christakis, D., Moreno, M. A., & Cross, C. (2016). Children and adolescents and digital media. *Pediatrics*, *138*(5), e20162593.
3. Livingstone, S., Haddon, L., Görzig, A., and Ólafsson, K. (2011). *Risks and safety on the internet: The perspective of European children. Full Findings.* LSE, London: EU Kids Online.
4. Sharples, M., Graber, R., Harrison, C., & Logan, K. (2009). E-safety and Web 2.0 for children aged 11–16. *Journal of Computer Assisted Learning*, *25*(1), 70-84.
5. Stoilova, M., Livingstone, S. and Nandagiri, R. (2019) *Children's data and privacy online: Growing up in a digital age.* Research findings. London: London School of Economics and

Political Science. http://www.lse.ac.uk/my-privacy-uk/Assets/Documents/Childrens-data-and-privacy-online-report-for-web.pdf

6. Livingstone, S. Stoilova, M. and Nandagiri, R. (2019) Children's data and privacy online: Growing up in a digital age. An evidence review. London: London School of Economics and Political Science. http://www.lse.ac.uk/media-and-communications/assets/documents/research/projects/childrens-privacy-online/Evidence-review.pdf

7. Montgomery, K. C., Chester, J., & Milosevic, T. (2017). Children's privacy in the big data era: research opportunities. *Pediatrics*, *140*(Supplement 2), S117-S121.

8. Montgomery, K., Chester, J., & Milosevic, T. (2017). Ensuring young people's digital privacy as a fundamental right. *International handbook of media literacy*, 85-103.

9. Livingstone, S., & Third, A. (2017). Children and young people's rights in the digital age: An emerging agenda. *New Media & Society, 19*(5), 657-670.

10. Sauerteig, D. L., Gutierrez, M. F. C., Toven-Lindsey, B., & Dahl, I. H. (2019). Media Literacy for the 21st Century Teacher. *The International Encyclopedia of Media Literacy*, 1-11.

11. Greene, K., Yanovitzky, I., Carpenter, A., Banerjee, S. C., Magsamen-Conrad, K., Hecht, M. L., & Elek, E. (2015). A theory-grounded measure of adolescents' response to a media literacy intervention. *The journal of media literacy education*, *7*(2), 35-49.

12. Hobbs, R., & Jensen, A. (2009). The past, present, and future of media literacy education. *Journal of media literacy education*, *1*(1), 1-11.

13. Livingstone, S., & Van der Graaf, S. (2008). Media literacy. *The International Encyclopedia of Communication,* 1-5.

14. Turner, K. H., Jolls, T., Hagerman, M. S., O'Byrne, W., Hicks, T., Eisenstock, B., & Pytash, K. E. (2017). Developing digital and media literacies in children and adolescents. *Pediatrics*, *140*(Supplement 2), S122-S126.

15. Buckingham, D. (2013). *Media education: Literacy, learning and contemporary culture*. John Wiley & Sons.

16. Hobbs, R. (2019). Media Literacy Foundations. *The International Encyclopedia of Media Literacy*, 1-19.

17. Chen, D. T., Wu, J., & Wang, Y. M. (2011). Unpacking new media literacy. *Journal of Systemics, Cybernetics and Informatics, 9*(2), 84-88.

18. Davis, K., & James, C. (2013). Tweens' conceptions of privacy online: implications for educators. *Learning, Media and Technology*, *38*(1), 4-25.

19. Scharrer, E. (2002). Making a case for media literacy in the curriculum: Outcomes and assessment. *Journal of adolescent & adult literacy, 46*(4), 354-358.

20. Scharrer, E., Sekarasih, L., & Olson, C. (2016). What Are the Outcomes of Media Literacy Education? *The Routledge Handbook of Media Use and Well-Being: International Perspectives on Theory and Research on Positive Media Effects*, 250-261.

21. Rozendaal, E., Lapierre, M. A., Van Reijmersdal, E. A., & Buijzen, M. (2011). Reconsidering advertising literacy as a defense against advertising effects. *Media Psychology, 14,* 333-354.

22. Rozendaal, E., Buijzen, M., & Valkenburg, P. M. (2009). Do children's cognitive defenses reduce their desire for advertised products? *Communications: The European Journal of Communication Research, 34*, 287-303.

23. Rozendaal, E., Buijzen, M., & Valkenburg, P.M. (2012). Think-aloud method superior to thought-listing in increasing children's advertising defenses. *Human Communication Research, 38,* 198–220.

24. Rozendaal. E. & Figner, B. (2019). Development of a school-based intervention to empower children to cope with advertising. *Journal of Media Psychology,* 1-12.

25. Jeong, S. H., Cho, H., & Hwang, Y. (2012). Media literacy interventions: A meta-analytic review. *Journal of Communication*, *62*(3), 454-472.

26. Vahedi, Z., Sibalis, A., & Sutherland, J. E. (2018). Are media literacy interventions effective at changing attitudes and intentions towards risky health behaviors in adolescents? A meta-analytic review. *Journal of adolescence*, *67*, 140-152.

27. Vanderhoven, E., Schellens, T., & Valcke, M. (2016). Changing Unsafe Behaviour on Social Network Sites. Collaborative Learning vs. Individual Reflection. In *Youth 2.0: Social Media and Adolescence* (pp. 211-226). Springer, Cham.

28. Buijzen, M., Van Reijmersdal, E. A., & Owen, L. H. (2010). Introducing the PCMC model: An investigative framework for young people's processing of commercial media content. *Communication Theory, 20,* 427-450.

29. Livingstone, S., & Helsper, E. J. (2006). Does advertising literacy mediate the effects of advertising on children? A critical examination of two linked research literatures in relation to obesity and food choice. *Journal of Communication, 56,* 560-584.

30. Bulger, M., & Davison, P. (2018). The Promises, Challenges, and Futures of Media Literacy. https://digital.fundacionceibal.edu.uy/jspui/bitstream/123456789/227/1/DataAndSociety_Media_Literacy_2018.pdf

31. Lin, T. B., Li, J. Y., Deng, F., & Lee, L. (2013). Understanding New Media Literacy: An Explorative Theoretical Framework. *Journal of Educational Technology & Society*, *16*(4), 160-170.

32. Potter, W. J. (2004). *Theory of media literacy: A cognitive approach*. Sage Publications.

33. Potter, W. J. (2004). Argument for the need for a cognitive theory of media literacy. *American Behavioral Scientist*, *48*(2), 266-272.

34. Austin, E. W. (2007). The message interpretation process model. *Encyclopedia of children, adolescents, and the media*, 535-536.

35. Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior?. *Perspectives on Psychological Science*, *2*(4), 396-403.

36. Diamond, A. (2012). Executive functions. *Annual Review of Psychology, 64,* 135-168.

37. Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science, 6*(42), 1-11.

38. Welsh, M. C., Pennington, B. F., & Groisser, D. B. (1991). A normative-developmental study of executive function: A window on prefrontal function in children. *Developmental neuropsychology*, *7*(2), 131-149.

39. Rueda, M.R., Fan, J., McCandliss, B.D., Halparin, J.D., Gruber, D.B., Lercari, L.P., & Posner, M.I. (2004). Development of attentional networks in childhood. *Neuropsychologia, 42*, 1029-1040.

40. Diamond, A. & Lee, K. (2011). Interventions shown to aid executive function development in children 4-12 years old. *Science, 333*, 959-964.

41. Rimm-Kaufman, S. E., Curby, T., Grimm, K., Nathanson, L., & Brock, L. (2009). The contribution of children's self-regulation and classroom quality to children's adaptive behaviors in the kindergarten classroom. *Developmental Psychology, 45*, 958-972.

42. Van de Sande, E., Segers, E., & Verhoeven, L. (2015). The role of executive control in young children's serious gaming behavior. *Computers & Education, 82,* 432-441.

43. Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*(1), 68-78.

44. Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry*, *11*(4), 227-268.

45. Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY, US: W H Freeman/Times Books/ Henry Holt & Co.

46. Baumeister, R. F., & Vohs, K. D. (2007). Self-Regulation, ego depletion, and motivation. *Social and personality psychology compass*, *1*(1), 115-128.

47. Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.

48. Rogers, R.W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A Revised theory of protection motivation. In J. Cacioppo & R. Petty (Eds.), *Social Psychophysiology*. New York: Guilford Press.

49. Youn, S. (2009). Determinants of online privacy concern and its influence on privacy protection behaviors among young adolescents. *Journal of Consumer affairs, 43*(3), 389-418.

50. Lwin, M. O., Li, B., & Ang, R. P. (2012). Stop bugging me: An examination of adolescents' protection behavior against online harassment. *Journal of adolescence, 35*(1), 31-41.

51. Waddell, J. C., McLaughlin, C., LaRose, R., Rifon, N., & Wirth-Hawkins, C. (2014). Promoting Online Safety among Adolescents: Enhancing coping self-efficacy and protective behaviors through enactive mastery. In *Communication and Information Technologies Annual* (pp. 133-157). Emerald Group Publishing Limited.

52. Burns, S., & Roberts, L. (2013). Applying the theory of planned behaviour to predicting online safety behaviour. *Crime Prevention and Community Safety, 15*(1), 48-64.

53. Shillair, R., Cotten, S. R., Tsai, H. Y. S., Alhabash, S., LaRose, R., & Rifon, N. J. (2015). Online safety begins with you and me: Convincing Internet users to protect themselves. *Computers in Human Behavior, 48*, 199-207.

54. Boehmer, J., LaRose, R., Rifon, N., Alhabash, S., & Cotten, S. (2015). Determinants of online safety behaviour: Towards an intervention strategy for college students. *Behaviour & Information Technology, 34*(10), 1022-1035.

55. Tsai, H. Y. S., Jiang, M., Alhabash, S., LaRose, R., Rifon, N. J., & Cotten, S. R. (2016). Understanding online safety behaviors: A protection motivation theory perspective. *Computers & Security, 59,* 138-150.

56. Tippins, N. T. (2011). Overview of technology-enhanced assessments. *Technology-enhanced assessment of talent*, 1-18.

57. Shute, V. J., Wang, L., Greiff, S., Zhao, W., & Moore, G. (2016). Measuring problem solving skills via stealth assessment in an engaging video game. *Computers in Human Behavior*, *63*, 106-117.

58. Kumar, P., Vitak, J., Chetty, M., Clegg, T. L., Yang, J., McNally, B., & Bonsignore, E. (2018). Co-designing online privacy-related games and stories with children. In *Proceedings of the 17th Annual ACM Conference on Interaction Design and Children (IDC'18). doi* (Vol. 10, No. 3202185.3202735).

59. Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American psychologist*, *69*(1), 66-78.

60. Coovert, M. D., Winner, J., & Bennett Jr, W. (2017). Construct development and validation in game-based research. *Simulation & Gaming*, *48*(2), 236-248.

61. Adamou, B. (2018). *Games and Gamification in Market Research: Increasing Consumer Engagement in Research for Business Success*. Kogan Page Publishers.