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Feldhaus, Mathias Huebener, Susanne Kuger,
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**A Conceptual Framework for Analyzing Child Well-Being
in the Digital Era Based on Panel Data across Europe (Di-C-WELL)**

Lynda M. Sagrestano¹, Sabine Düval^{1,2}, Michael Feldhaus³, Mathias Huebener², Susanne Kuger^{1,4},

C. Katharina Spieß^{2,5} and Sabine Walper^{1,4}

1 German Youth Institute (DJI) Munich

2 Federal Institute for Population Research (BiB) Wiesbaden and Berlin

3 Carl von Ossietzky University of Oldenburg

4 Ludwig Maximilians University Munich

5 Johannes Gutenberg University Mainz

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Abstract

The development and upbringing of children have been significantly transformed by ongoing digitalization (the process of introducing the use of digital technologies to change how things are done) and digitality (how digital technologies shape experiences and culture;), including both risks and opportunities for children's health and well-being. However, understanding child development and well-being across Europe is hindered by a lack of comparable longitudinal data across countries. This paper introduces a conceptual framework (Di-C-Well) to be used to guide future panel research on child well-being in the digital era. The Di-C-Well conceptual framework integrates key aspects of different theoretical models to reflect the multidisciplinary nature of the project, combining elements from psychological, sociological, educational, and economic theory to integrate multiple levels of analysis, and to foster examination of the development of child well-being and the mechanisms of impact across interpersonal contexts, including family (e.g., parents and siblings), peer relations, institutional (e.g., learning), and further environments (e.g., neighborhood, region). The framework is intended as a theoretically grounded starting point to analyze child well-being in the digital era, and highlights opportunities for coordinated, cross-country research using harmonized measures and study designs. New data infrastructures emphasizing children and adolescents are needed across all European countries to realize these goals.

Keywords: Child Wellbeing, Conceptual Framework, Digitalization, data on children

1 Introduction

The development and upbringing of children have been significantly transformed by ongoing digitalization (the process of introducing the use of digital technologies to change how things are done) and digitality (how digital technologies shape experiences and culture; Negropte, 1995; 2015), including both risks and opportunities for children's health and well-being (e.g., Stoilova et al., 2024). Recent debates about the well-being of children have often centered on the role of digital media in the decline of mental health (Haidt, 2024; Orben et al., 2024; Twenge et al., 2022). However, most studies have significant caveats: conceptually, they include limited information on child well-being, they do not account for the multiple contexts that comprise the children's lives, and they do not systematically examine the impact of the complex evolving world of digital media on child well-being, which is accelerating with the introduction of generative artificial intelligence (AI). Moreover, they typically offer only a cross-sectional snapshot from a specific country and lack a longitudinal perspective. Most studies rely on subjective measures of media usage, which are inconsistently conceptualized and only weakly related to objective measures (Kaye et al., 2020; Mansfield et al., 2025). The public and policymakers hold varying perspectives on the role of digitalization in the upbringing and well-being of children, as evidenced by debates surrounding digital media in schools (Schmitz et al., 2025). However, understanding child development and well-being across Europe is hindered by a lack of comparable longitudinal data across countries (Goswami et al., 2016; Pollock et al., 2018). This paper introduces a conceptual framework to be used to guide future panel research on child well-being in the digital era.

The *GUIDE: Growing Up in Digital Europe* project was initiated to address some of the gaps in understanding child well-being across Europe (<https://www.guidecohort.eu/>). The plan of this EU wide project is to track child development from birth to early adulthood by using a multi-disciplinary accelerated longitudinal birth cohort design. GUIDE aims to provide panel data to better understand determinants and explanatory mechanisms of the development of child well-being in the context of parenting, daycare, preschool, school experiences, out-of-school activities, and wider family, social, and environmental contexts in the digitalized era. Once the GUIDE project is successfully implemented and

funded, its findings have the potential to support evidence-based policy and interventions aimed at improving children's well-being across Europe. Given this background, an interdisciplinary team of scholars from the German Youth Institute (DJI) and the Federal Institute of Population Research (BiB), who both are part of the GUIDE consortium, supported by the University of Oldenburg, proposes a conceptual framework that integrates key aspects of different theoretical models to structure the development of a European child and youth panel study. The conceptual framework aims to reflect the relevance of the project across many levels of analysis and academic disciplines, increasing the potential practical implications of the findings. Specifically, the framework combines elements from psychological, sociological, educational, and economic theory to integrate multiple levels of analysis.

2 Child Well-Being in the Digital Era

Well-being is an important outcome both at the individual level and as a key component of a well-functioning society. Child well-being is a strong predictor of adult well-being and life satisfaction, which are in turn associated with a wide range of outcomes, including health, family formation, work performance, and life expectancy (e.g. Ruggeri et al., 2020). The pervasiveness of digitalization¹ in our lives has concomitant impacts on well-being across the lifespan (Büchi, 2024), and thus research on child well-being in the context of digitalization is vital for creating an environment where children can thrive. Interdisciplinary research on well-being in the social sciences has grown rapidly in the last decades (e.g., Ben-Arieh et al., 2014; Cataldo et al., 2024; Diener et al., 2018) reflecting the need for better conceptual understanding of the mechanisms by which children and youth flourish, how to maximize their potential, and how to assess and facilitate that process, for example via policies to minimize negative impacts on well-being.

There are many ways to conceptualize well-being, yet there is no unifying theory of child well-being. Some theorists focus on hedonic versus eudaimonic well-being as two distinct approaches to

¹ We use the term digitalization to broadly represent digitalization, digitality, and the digital transformation.

conceptualizing well-being. The hedonic approach focuses on subjective aspects of well-being such as the pursuit of happiness and pleasure and the avoidance of pain (e.g., positive emotions, life satisfaction, and the balance of positive over negative experiences; Kahneman et al., 1999). The eudaimonic approach, in contrast, focuses on achieving meaning, self-realization, and one's full potential (e.g., personal growth, purpose in life, autonomy, self-acceptance, and mastery; Ryff & Singer, 1998). Self-determination theory (Deci & Ryan, 2008) is derived from the eudaimonic perspective and argues that human motivation is driven by the fulfillment of three innate psychological needs, autonomy, competence, and relatedness, and suggests that when these needs are met, individuals experience greater intrinsic motivation, well-being, and engagement in their activities. Recent analyses demonstrate both overlap among components of various approaches, and evidence that well-being is a multidimensional construct that encompasses both hedonic and eudaimonic elements (Biswas-Diener et al. 2009; Proctor et al., 2015). As understanding of well-being continues to evolve, and the general consensus is that well-being refers to thriving across multiple life domains (Adler & Seligman, 2016; Diener, Scollon, & Lucas, 2003; Proctor et al., 2015).

Whereas there is a large literature on well-being among adults, there is less such research on children's well-being (e.g. Kuger & Loos, 2021). This might be related to the lack of longitudinal data on child well-being. But when considering children and youth in the discussion of well-being, a longer time perspective is needed. Well-being is not static, but changes over time, and thus includes both the present (being) and how the present influences future development into adulthood (becoming). This process takes place in contexts shaped by social structures and social inequalities, relationships and also by the child, and thus suggests that it is important to cultivate and promote those factors which enable children to reach their potential (e.g. Ben-Arieh et al., 2014). The early years are a crucial period for the development of well-being with family structure, resources, and parenting processes playing a particularly important role (Peter & Spiess, 2016; Rey-Guerra et al., 2023; Walper et al., 2023). Indeed, parental well-being is a strong predictor of child development and well-being (e.g., Datta Gupta, Jessen, & Spiess, in press). Further, the broader surroundings (e.g., neighborhoods), institutional (e.g., learning)

contexts, and the peer relationships they facilitate (Huston et al., 2015), as well as major life events, such as educational transitions, residential mobility, parental separations or unemployment, or illness of a family member can have profound impacts on child well-being (Walper et al., 2023; Peter & Spiess, 2016). In addition, global events (pandemics, climate change, war) affect the well-being of children across countries (e.g., Anger et al., 2024; Proulx et al., 2024). For example, the COVID-19 pandemic demonstrates consequences for parent-child relationships and family well-being (Huebener, Waights, & Spiess, 2025; Krueger & Walper, 2023; Kuger et al., 2022; Reim et al., 2024), with implications for child development.

In addition, the upbringing and development of children have been significantly transformed by ongoing digitalization, involving both risks and opportunities for children's well-being (e.g., Stoilova et al., 2024) with concomitant impacts across the lifespan (Büchi, 2024). Children are now born into an environment saturated by information and communication technology (ICT). Interpersonally, digital media is embedded in daily lives and interactions, in part replacing other 'analog' leisure activities while simultaneously intersecting with them through temporally parallel digital and analog engagements (KIM, mpfs, 2025; JIM, mpfs, 2025; miniKIM, mpfs, 2024). Although children begin using digital media at young ages (miniKim, mpfs, 2024), most of the research to date has focused on children aged 10-12 or older (Domoff et al., 2020). Thus, it is key to develop a deeper understanding of how digitalization and digitality are integrated into the lives of (younger) children and families, and how that may affect child well-being. Despite the breadth and depth of research on child well-being, studies on the relations between digitalization and child well-being vary widely in their conceptualization and measurement of well-being. Further, there is no unifying integrative framework that regards the many potential influences on child well-being and how it changes over time (particularly against the background of proceeding digitalization).

3 Interdisciplinary Conceptual Frameworks on Child Well-Being in the Digital Era

The Di-C-Well conceptual framework integrates key aspects of different theoretical models to reflect the relevance of the project across many levels of analysis and the multidisciplinary of the project, increasing the potential practical implications of the findings.² Specifically, the framework combines elements from psychological, sociological, educational and economic theory to integrate multiple levels of analysis (see Figure 1).

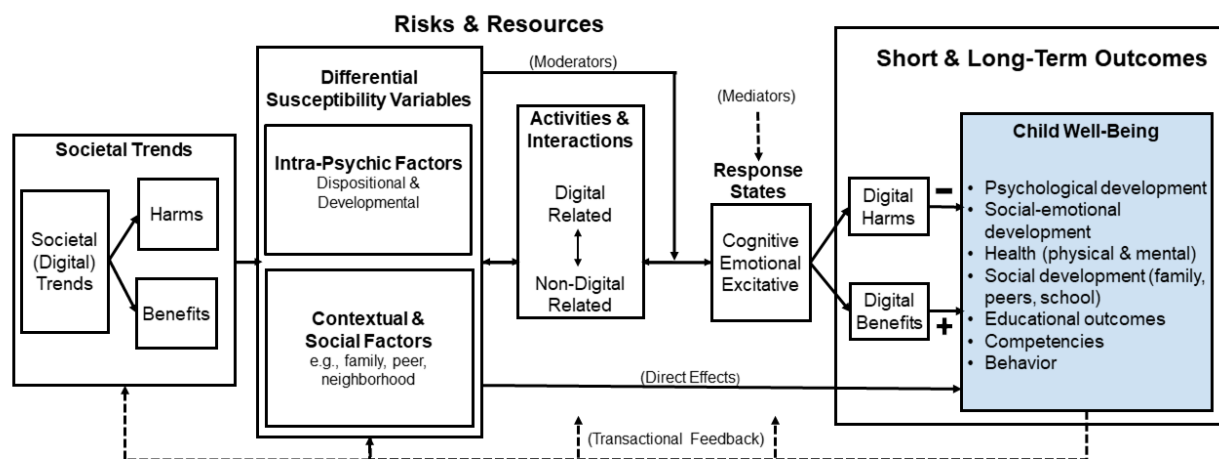


Figure 1. Di-C-WELL Conceptual Framework

One approach to understanding complex social systems is the Bioecological Model (Bronfenbrenner & Morris, 2006) which posits that individuals exist within multiple interconnected or nested contexts that are constantly evolving and inherently interdependent. Individual development is impacted by socialization processes and interactions in and with their surrounding and changing environmental contexts (family, peers, school, digitality), and individuals also exert influence on these systems. This is especially relevant in the developmental context as the impact of a child on surrounding systems and vice versa will change over time as the child grows or contexts change.

Cunha and Heckman (2007) conceptualize child development in a life-cycle approach that Conti and Heckman (2014) adopt for understanding children's well-being. Based on a eudaimonic approach to

² Note that there are additional theories, such as the Biosocial Approach (Harris & McDade, 2018), that relate to biological and physiological models of child development and are areas for further integration and research.

well-being, the dynamic model of skill formation notes that there are critical periods of brain development, such as early childhood, where investments are especially crucial for learning and development. Thereby, the model emphasizes the critical importance of early childhood development and the long-term benefits of investing in early childhood, as early skill development (cognitive, social, emotional, behavioral) forms the foundation for future learning and development and longer-term well-being. This model incorporates four main components, including 1) a measurement framework causally linking skills with outcomes (e.g., child well-being), 2) a framework for examining how investments and environments impact the development of skills or well-being, 3) parental preferences, which shape investments in children, and 4) family constraints, such as time and financial resources (Conti & Heckman, 2014).

Based on Bronfenbrenner's Ecological Systems Theory, Newland (2015) outlines a multistage framework for understanding how family dynamics influence child well-being, including key pathways and mechanisms through which family (mainly parental) well-being impacts child adjustment and development. Family well-being includes parental well-being, family self-sufficiency, family resiliency, and developmental parenting (affection, responsiveness, encouragement, teaching, engagement, positive discipline, and co-parenting) and can influence child well-being directly and indirectly (see also, Datta Gupta et al., in press). For example, a financially stable family can provide better educational resources, enhancing cognitive development. In addition, parents experiencing less stress are more likely to engage in positive parenting, which supports the child's emotional and behavioral development. Several factors moderate how family dynamics influence child well-being, such as child characteristics (e.g., temperament, resilience) and environmental factors, including early childhood education and care (ECEC) or school environment, communities, cultural context, and digitality.

Some of these considerations were integrated into Büchi's (2024) Digital Well-Being Framework, which focuses on understanding digital media's effects on well-being through three core constructs: digital practices and related proximal processes, proximal outcomes in the form of harms and benefits, and measures of well-being as distal outcomes. An individual's digital practices can lead to both harms

and benefits, and the balance of harms and benefits impacts individual subjective well-being, depending on the contexts in which they are embedded.

The Differential Susceptibility to Media Effects Model (DSMM; Valkenburg & Peter, 2013) synthesizes findings on the effects of media usage. It primarily focuses on integrating micro-level factors to better understand why some people are more affected by the positive and negative effects of media than others, and how these effects can be ameliorated. The DSMM identifies three broad types of conditional variables that affect media use and moderate its effects on individuals, which the model terms '*differential susceptibility variables*.' The differential susceptibility variables are pre-existing, that is, they can be assessed before the specific media-use situation. The first, *dispositional susceptibility*, refers to person-level characteristics such as gender, personality, attitudes, beliefs, and moods, some of which are more stable, and some of which are more transient, and all of which shape how media affects the individual. The second, *developmental susceptibility*, reflects cognitive, social, and emotional development, which moderates individuals' responses to media across different ages and stages. The third, *social susceptibility*, refers to factors in the social context, including interpersonal (family, friends, peers), institutional (e.g., school), and societal level contexts (e.g., cultural norms and values) that can amplify or mitigate effects of media exposure.

Differential susceptibility factors collectively influence media usage, including types consumed, frequency, and contexts in which usage takes place. The relationship between media use and media effects is mediated by '*media response states*.' These indirect variables originate from using media and include *cognitive* (selective attention and cognitive investment in media content), *emotional* (affective responses to media content, such as sympathy or empathy), and *excitative* (degree of physiological arousal in response to media) response states. The DSMM argues that media effects are strong and long-lasting when one or more of the cognitive, emotional, or excitative response states are activated. The differential susceptibility variables also serve as moderators between media use and media response states. In addition, media effects are viewed as transactional, i.e., they influence not only media use but also differential susceptibility variables and media response states.

4 The Di-C-Well Conceptual Framework

Figure 1 above is a visual representation of the Di-C-Well conceptual framework. The framework takes into account societal trends, including digital trends, which are associated with the differential susceptibility variables (e.g., dispositional, developmental, contextual, and social factors). These differential susceptibility variables are associated with the activities and interactions of individuals, and moderate how individual activities and interactions impact responses (cognitive, emotional, and excitative response states) to various activities and interactions. These response states reflect the benefits and harms of digital media, which are associated with child well-being across multiple domains in the short and long term. Child well-being also has a transactional impact on risks, resources, and response states, feeding back over time and across developmental stages. Because the model takes into account differential susceptibility factors at various levels of analysis, it can be used to assess the role of digitalization in child well-being across various ages and stages, from infancy to young adulthood.

5 Conclusion

The Di-C-WELL conceptual framework presented here is intended as a theoretically grounded starting point to analyze child well-being in the digital era. Once better data on children growing up in a digital world across different European contexts become available, the conceptual framework can be systematically developed further and empirically evaluated. Rich, longitudinal data would allow researchers using varying disciplinary approaches to assess the validity of underlying assumptions, test causal pathways, and potentially falsify elements of the model, use cutting-edge data-analytic techniques. Key research on the role of societal trends in digitalization on well-being, as well as contextual and social factors (e.g., cultural factors, economic trends, policy changes) and their interactions with individual level factors (e.g., dispositional, developmental) can be explored, with a focus on identifying key mechanisms for how these factors work together or separately to impact well-being in the context of digitalization, thereby contributing to a robust and evidence-based multidisciplinary understanding of children's well-being in the digital era. Further, the longitudinal data

emerging from use of this conceptual framework has the potential to inform public policy at the country and European levels, including developing early childhood digital guidance, enhancing school digital infrastructure, and developing parental support and information policies.

As a next step, the Di-C-WELL conceptual framework highlights opportunities for coordinated, cross-country research using harmonized measures and study designs, such as those implemented in the planned GUIDE project. These collaborative efforts could rigorously test the model, refine its components, and support the translation of findings into evidence-based policy and practice, ultimately enhancing children's well-being in the digital era. New data infrastructures emphasizing children and adolescents are needed across all European countries to realize these goals.

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