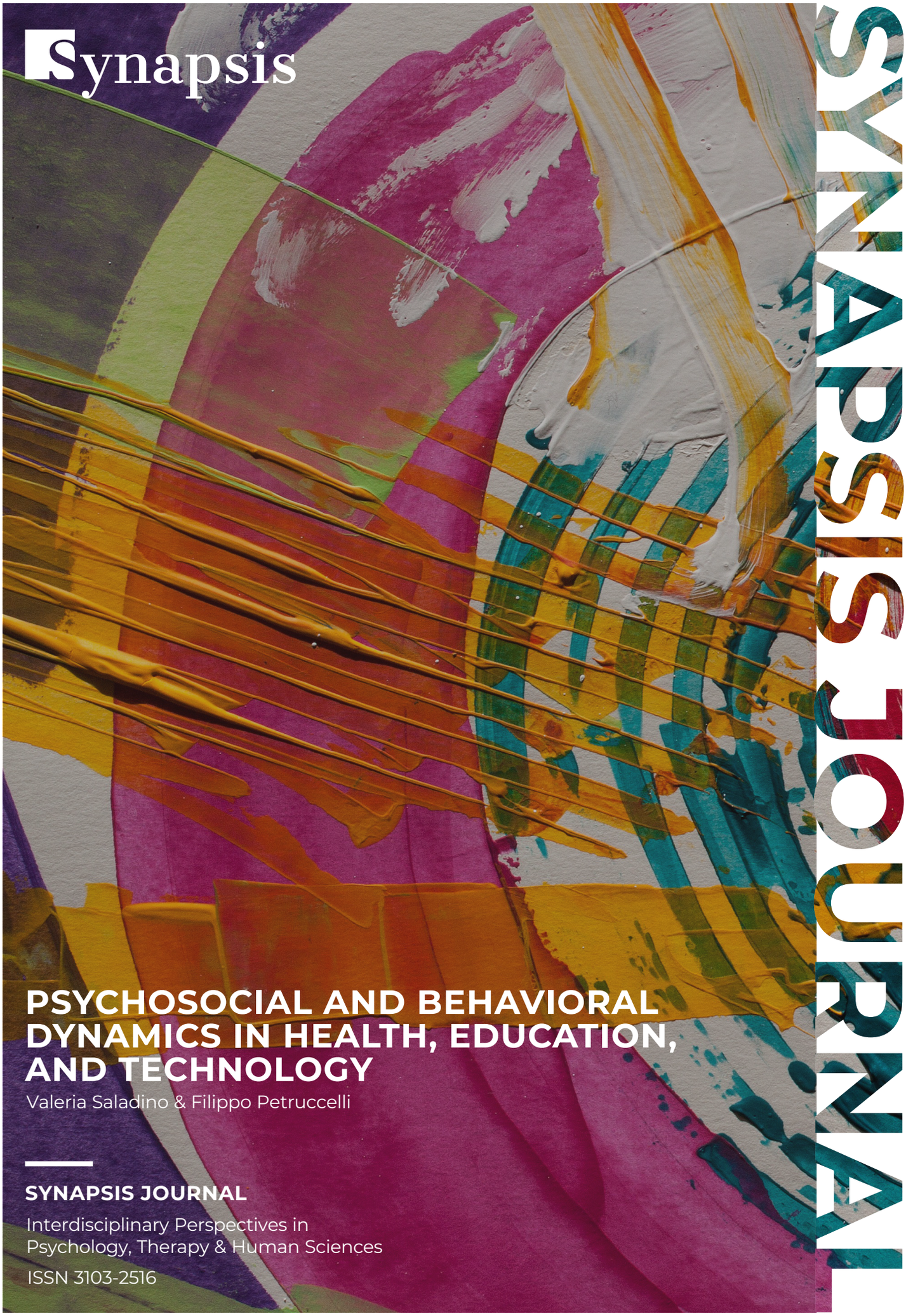

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Valeria Saladino & Filippo Petruccelli

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Valeria Saladino & Filippo Petruccelli

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Attachment Styles, Adverse Childhood Experiences and Gender Differences in Adolescents' Problematic Technological Behaviors: A Narrative Review

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Abstract

The present narrative review aims to explore the relationship between attachment styles, adverse childhood experiences (ACEs) and problematic technological behaviors (PTBs) among adolescents aged between 12 to 18 years old, with a specific focus on gender differences.

PTBs, which include problematic gaming, binge-watching, cyberbullying and dysfunctional Internet and social media use, manifest as difficulties in emotional regulation and interpersonal relationships.

According to recent research, insecure attachment styles and ACEs represent key risk factors, influenced by contextual variables such as gender. Insecure attachment and ACEs contribute to PTBs by impairing emotional regulation and interpersonal relationships. However, protective factors such as social support can buffer these negative effects, promoting healthier digital behaviors.

Furthermore, gender may influence these behaviors: generally, girls are more prone to social media overuse and emotional distress, while boys favor gaming as a coping tool.

Effective interventions should integrate these factors, emphasizing emotional regulation, resilience and digital awareness, with future research exploring cultural and contextual influences.

Keywords: problematic technological behaviors, attachment styles, adverse childhood experiences, gender differences, adolescents

Introduction

Attachment styles and adverse childhood experiences (ACEs) are fundamental determinants of an individual's psychophysical development and health across the lifespan. Attachment theory, formulated by Bowlby (1978), offers a comprehensive framework for understanding how early caregiver interactions influence relational patterns, emotional regulation, and psychological resilience later in life.

Within this framework, Bowlby identified three primary attachment styles: secure, anxious, and avoidant. A secure attachment style promotes a healthy balance between intimacy and independence, allowing individuals to establish stable, supportive relationships and to navigate social interactions effectively, even in digital environments. Instead, anxious and avoidant attachment styles, both classified as insecure, are associated with impaired emotional regulation and difficulties in forming and maintaining close, meaningful relationships. Adolescents with an anxious attachment style often crave intimacy but struggle with persistent fears of rejection, making it challenging for them to create genuine connections. On the other hand, those with an avoidant attachment style tend to distance themselves from intimacy, feeling uncomfortable with close relationships and finding it difficult to express emotions openly.

ACEs refer to traumatic and stressful events during childhood, including abuse, neglect, domestic dysfunction, and other forms of adverse childhood experiences. These experiences have been consistently linked to a broad spectrum of negative health outcomes that persist into adulthood. Physically, ACEs are associated with an increased risk of conditions such as cardiovascular disease, obesity, diabetes, and autoimmune disorders (Dube et al., 2009; Heerman et al., 2016; Suglia et al., 2018). Psychologically, ACEs contribute to mental health disorders, such as depression, anxiety, and psychosis (Varese et al., 2012).

In a meta-analysis conducted by Hughes et al. (2017), there’s compelling evidence that ACEs disrupt the normal functioning of the nervous, endocrine, and immune systems, highlighting the profound physiological and psychological impacts of these early experiences. Furthermore, research consistently reveals a dose-response relationship, in which the likelihood of adverse health outcomes increases with the number of ACEs experienced (Bethell et al., 2014; Heerman et al., 2016).

The interaction between ACEs and attachment styles plays a crucial role in shaping developmental trajectories and health outcomes. Children and adolescents exposed to ACEs are significantly more likely to exhibit insecure attachment styles, which exacerbate

emotional dysregulation and hinder relational stability. In this context, Verrastro et al. (2024) emphasize how early trauma increases the likelihood of maladaptive coping strategies, such as problematic technology use. This insight is consistent with further findings, which indicate that approximately 80% of children and adolescents with mental health disorders demonstrate insecure attachment styles, compared to only 20% who have a secure attachment (Stefini et al., 2013). Attachment disruptions, in fact, often manifest in behavioral problems, emotional instability, and impaired relational competencies. For instance, Derin et al. (2022) observed a higher prevalence of social anxiety disorder among adolescents with a history of ACEs. Similarly, Amendola et al. (2020) found out that childhood mistreatment is linked to emotional dysregulation in adulthood, often manifesting through maladaptive coping strategies, including excessive and problematic use of technology.

However, emotional intelligence has been identified as a significant moderator in the relationship between ACEs and attachment styles. Dewi (2022) emphasizes the role of emotional intelligence in reducing the negative effects of early adversities, pointing out the capacity of targeted interventions to enhance resilience in affected individuals.

In conclusion, the extensive evidence linking ACEs to insecure attachment styles and future adverse health outcomes highlight the critical need for early interventions and comprehensive support systems. As Kalmakis and Chandler (2014) suggest, a holistic framework that integrates psychological, physiological, and social dimensions is essential. This approach should not only address the long-term consequences of ACEs but also promote protective factors to effectively mitigate their impact. This is particularly crucial for adolescents, as effective intervention strategies may help reducing problematic technology use and other maladaptive behaviors by addressing the underlying emotional regulation and attachment challenges stemming from early adversity.

Materials and Methods

This narrative review was conducted through a systematic search of peer-reviewed literature in PubMed, APA PsycNet, and ScienceDirect. The search focused on the interaction between attachment styles, adverse childhood experiences (ACEs), and problematic technology behaviors (PTBs) in adolescents aged 12–18 years, with particular attention to gender differences. Studies were identified using relevant keywords and selected based on the following inclusion criteria: articles published in English, full-text availability,

publication within the last 20 years, and a focus on adolescent populations. Empirical research, including both quantitative and qualitative studies, as well as systematic reviews, were considered. Research on adult populations or non-psychological aspects of technology use was excluded. The selected studies were analyzed thematically to identify key trends, risk factors, and protective factors influencing PTBs, with a focus on the moderating role of gender and the impact of emotion regulation difficulties.

Results

Problematic Technological Behaviors (PTBs)

PTBs refer to the excessive and maladaptive use of technology that disrupts proper psychosocial functioning. Specifically, the literature identifies various PTBs, including problematic Internet use (PIU), problematic social media use, gaming disorder, binge-watching, and cyberbullying. These behaviors are often characterized by excessive involvement in online platforms, resulting in impaired daily functioning, mental health, and social relationships. Research indicates that addictive use of social media and online gaming can present symptoms resembling those of psychiatric disorders, including anxiety and depression, suggesting a complex interaction between these behaviors and mental health outcomes (Andreassen et al., 2016; González-Bueso et al., 2018). In this context, Saladino et al. (2024b) provide a crucial perspective by linking problematic social media use to emotional regulation deficits. They argue that individuals with difficulties in managing emotional responses are more prone to engage maladaptive digital behaviors, particularly when online activities serve as a compensatory mechanism for unfulfilled psychological needs. Specifically, the study identifies fear of missing out (FoMO) as a pivotal factor that amplifies the risk of developing dependency on social media platforms (Ibid).

Online gaming disorder is characterized by a loss of control over gaming activities, leading to significant impairment in personal, social, and academic functioning. Symptoms of this disorder may include neglect of personal responsibilities, social withdrawal, and adverse physical health effects such as sleep disturbances and poor nutrition (Columb et al., 2022). The prevalence of online gaming disorder has been associated to various psychological factors, including underlying mental health issues such as anxiety and depression, which can both contribute to and result from excessive gaming behaviors (Andreassen et al., 2016; González-Bueso et al., 2018). In addition, the recognition of Gaming Disorder as a diagnosable mental disorder by the World Health Organization (WHO) in the 11th revi-

sion of the International Classification of Diseases (ICD-11) in 2018, and the inclusion of Internet Gaming Disorder (IGD) in the research appendix of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) by the American Psychiatric Association (APA) in 2013, highlights the growing concerns regarding problematic gaming behaviors.

Furthermore, cyberbullying, an offense derived from problematic Internet use, involves the use of digital platforms to harass, threaten, or humiliate individuals who cannot easily defend themselves. Although similar to traditional bullying, cyberbullying has its own psychological characteristics. A key difference is that physical bullying occurs in settings such as schools and ceases when the victim is away from the bullies, whereas in cyberbullying the victim can potentially be reached anywhere, anytime via the Internet, increasing feelings of insecurity and vulnerability (Sourander et al., 2010). Studies have shown that victims of cyberbullying often experience heightened emotional sensitivity and psychological distress, which can negatively affect their performance in various areas, including work and education. Normalizing such behaviors through repeated exposure can perpetuate a cycle of victimization and aggression, further complicating social dynamics within online environments (Barlett et al., 2017).

Binge-watching refers to the consumption of multiple episodes of television series or video content in a single sitting. The design features of streaming platforms often encourage binge-watching by automatically playing back subsequent episodes, which can exacerbate the compulsive nature of this behavior (Flayelle et al., 2020; Saladino et al., 2024a). Research indicates that excessive binge-watching can have a negative impact on psychological well-being, particularly among adolescents, who may struggle to maintain a balance between online and offline life (George & Odgers, 2015). In addition, binge-watching has been linked to symptoms of anxiety and depression, especially when used as a coping method to manage stress and negative emotions. Individuals who watch TV series continuously, often find themselves trapped in a vicious cycle of addiction similar to other behavioral addictions, with a tendency to spend more time watching TV series than initially planned (Panda & Pandey, 2017).

In conclusion, problematic Internet and social media use, which includes cyberbullying, binge-watching, and online gaming disorder, presents significant challenges to mental health and social functioning, especially among young people. For this reason, researchers and professionals should understand these behaviors through a clinical lens

to develop effective strategies of prevention and treatment.

Attachment theory and ACEs as precursors of PTBs in adolescents

Contemporary research has shown a significant correlation between insecure attachment styles, characterized by anxiety or avoidance, and the development of maladaptive behaviors related to the use of digital technologies. Lancaster et al. (2019) demonstrated how avoidant attachment significantly increases vulnerability to negative outcomes in technology-mediated relationships, affecting the link between cyber abuse and the quality of interpersonal connections. This correlation is manifested through specific behavioral patterns, including excessive social media use, compulsive gaming, and various forms of dysfunctional online behaviors.

Adverse childhood experiences emerge as a crucial vulnerability factor in exacerbating these behavioral patterns. These vulnerabilities result in an increased propensity to develop behavioral addictions and difficulties in technology-mediated interpersonal relationships. Eichenberg et al. (2024) highlighted how anxious attachment, marked by fear of rejection, can lead to problematic Internet and social media use, aimed at seeking emotional validation.

Social media platforms have also been identified as potential triggers for problematic behaviors. The nature of these platforms, often encouraging continuous engagement through notifications and algorithm-driven content, can lead to addictive patterns of use. Research has indicated that short-form video watching, a prevalent activity among adolescents, can be particularly addictive due to features like auto-scrolling and personalized content delivery (Yang et al., 2024). These mechanisms contribute to a cycle of reinforcement that can intensify problematic usage patterns.

An in-depth analysis of problematic technological behaviors has revealed specific mechanisms through which insecure attachment contributes to the development of gaming disorder. These mechanisms include using gaming as a strategy to avoid confronting negative emotions, pursuing immediate gratification, and efforts to establish a sense of competence and control within the virtual environment. Individuals with insecure or avoidant attachment styles, as documented by Lim et al. (2019), often tend to refuge in gaming as a strategy to avoid emotional intimacy, using immersion in gaming as a mechanism to dissociate from painful emotional experiences and perceived threatening interpersonal relationships.

These patterns of avoidance highlight how insecure attachment contributes to the vulnerability of adolescents in developing gaming disorders, compounding the challenges already posed by their developmental stage.

The phenomenon of cyberbullying also emerges as a particularly complex manifestation of the interplay between insecure attachment and problematic technological behaviors. Mishna et al. (2020) pointed out that this behavior is perceived by young people primarily as a relational issue, rooted in attachment dynamics and emotional regulation difficulties. Adolescents with anxious or avoidant attachment styles show greater difficulties in establishing empathic relationships, increasing their vulnerability as both perpetrators and victims of cyberbullying. These individuals tend to exhibit higher online aggression, use cyberbullying as a maladaptive strategy to manage feelings of inadequacy, anger, and frustration.

Additionally, binge-watching emerges as another problematic behavior that is significantly influenced by attachment styles. Estévez et al. (2017) conducted extensive studies showing that adolescents with insecure attachment tend to use maladaptive coping strategies, increasing their risk of developing compulsive digital content viewing behaviors. This tendency manifests itself through specific patterns of media consumption, characterized by prolonged viewing sessions, difficulty controlling time spent in front of the screen, and using compulsive viewing as an avoidance strategy for negative emotions. Research has identified specific mechanisms through which insecure attachment contributes to the development of binge-watching, including the tendency to use media content as a form of emotional self-medication and as a substitute for meaningful interpersonal relationships.

Research on protective factors has provided valuable insights into mechanisms that promote resilience and mitigate the impact of adverse experiences. Reflective functioning has emerged as a significant protective resource. Borelli et al. (2014) demonstrated that enhanced reflective functioning can buffer the negative effects of adverse childhood experiences (ACEs) and insecure attachment on problematic behaviors. This mechanism operates by fostering mentalization, a capacity that enables individuals to develop a nuanced understanding of their own mental states and those of others, thus supporting emotional and relational stability. Secure interpersonal relationships also play a crucial role in promoting adaptive outcomes. For instance, Murphy et al. (2017) highlighted the importance of secure peer relationships in reducing aggressive behaviors and enhancing emotional regulation. These positive interac-

tions contribute to the development of effective coping strategies, offering a foundation for long-term psychological well-being.

Furthermore, evidence underscores the role of secure attachment to caregivers as a key protective factor. Studies have shown a negative correlation between secure parental attachment and the emergence of problematic behaviors, such as video game addiction, suggesting that a secure attachment bond can act as a safeguard against maladaptive outcomes (Estévez et al., 2017). However, it is important to point out that some research argues that the relationship between ACEs, insecure attachment styles, and PTBs is particularly complex and nonlinear. Widom et al. (2018) conducted extensive research highlighting that not all adverse experiences necessarily lead to negative outcomes, emphasizing the protective role of adaptive coping strategies and a supportive social environment. These findings suggest the importance of considering specific moderating factors and mediators to understand the relationship between early traumatic experiences and the development of problematic technological behaviors. Understanding these complex interactions is critical to the development of effective interventions. Lim et al. (2019) have emphasized the importance of therapeutic and educational programs aimed at promoting emotional regulation and enhancing individual and social resources. These interventions must necessarily consider the multifactorial nature of problematic technology behaviors, integrating approaches that address both attachment-related vulnerabilities and the consequences of early traumatic experiences.

The literature thus highlights how insecure attachment styles and adverse childhood experiences represent significant risk factors for the development of problematic technology behaviors, operating through specific mechanisms that include difficulties in emotional regulation, dysfunctional relational patterns, and maladaptive coping strategies. (Grady et al., 2018). However, the identification of protective factors and the development of targeted interventions offer promising prospects for preventing and treating these behaviors. This in-depth understanding of the underlying dynamics of PTBS suggests the importance of integrated approaches that consider the complexity of interactions between risk factors and protective resources in the context of problematic use of digital technologies.

Gender differences in PTBs

The scientific literature suggests that gender differences in technology use are more complex than commonly believed and reflect not only sociocultural influences, but they are also deeper psychological and relational dynamics. Although girls are often described as more likely to use social media to maintain relationships and seek social approval, evidence suggests that boys may also be influenced by similar dynamics, though they manifest these in different ways. For example, girls tend to use social media as a means of social confrontation, a behavior associated with depressive symptoms (Nesi & Prinstein, 2015); boys, although less prone to direct confrontation, may also use humor or aloof attitudes to cope with insecurities, reflecting gender norms that discourage vulnerability. However, gender identity is not limited to the traditional binary categories. Transgender and non-binary adolescents also display specific patterns of technology use influenced by their unique social experiences. Research indicates that transgender and non-binary adolescents face heightened risks associated with digital interactions, particularly due to experiences of social rejection, discrimination, and victimization (McInroy et al., 2019; Selkie et al., 2020). These challenges contribute to an increased likelihood of using technology as a coping mechanism, often leading to problematic behaviors such as excessive social media use or online gaming (Kaltiala et al., 2023). Such gender differences in technology use are closely related to socialization processes. Gender socialization, which shapes roles and expectations from childhood onward, encourages children to exhibit strength and control, repressing emotions such as sadness or vulnerability. This often leads to externalization of distress, expressed through aggressive or competitive behaviors, which may manifest in online games or competition on social media (Maschi et al., 2008). Girls, on the other hand, tend to internalize distress, developing problems such as anxiety, low self-esteem and depression. For transgender and non-binary adolescents, socialization pressures can be particularly complex. Many experience difficulties in finding safe spaces for self-expression, and digital platforms often serve as both a refuge and a source of stress. While social media can offer a sense of community and validation, it also exposes them to heightened risks of cyberbullying and online harassment, which negatively impact their mental health (Taliaferro et al., 2018). Moreover, attachment insecurity-more common in transgender and non-binary youth due to familial rejection-has been linked to greater vulnerability to problematic technology use (Kaltiala et al., 2023).This vulnerability is amplified by social media dynamics, where the pressure to conform to aesthetic and relational standards can intensify

personal insecurities and make adolescent girls more susceptible to a phenomenon such as cyberbullying (Marciano et al., 2020). Although often victims of online aggression, girls may also resort to relational forms of aggression, such as indirect cyberbullying, to manage personal conflicts or respond to social pressures. This cycle of victimization and perpetration reflects a complex interplay between emotional vulnerabilities and problematic coping strategies. Similarly, transgender and non-binary adolescents report significantly higher rates of online victimization compared to their cisgender peers, further exacerbating mental health challenges (Arcelus et al., 2016; Amendola et al., 2020). However, digital platforms also provide opportunities for resilience. Peer support, particularly through online communities, has been identified as a key protective factor that mitigates the effects of discrimination and psychological distress (Schimmel and Bristow et al., 2018). Regardless, gender differences in technological behaviors are not rigid or universal but they vary based on cultural and social factors. For example, while boys are often drawn to online games for reasons related to competition and intense sensation seeking, girls may participate in online games for reasons of socialization, challenging the stereotype that gaming is a male prerogative (Micallef et al., 2021; López-Fernández et al., 2019). Similarly, social media, although primarily used by girls to maintain relationships, can also be a means of exploring and affirming their identities, sometimes leading to problematic usage (Savcı et al., 2019). For transgender and non-binary adolescents, video games may serve as a tool for escapism, assisting them in navigating gender dysphoria and external stressors. However, they also face risks such as exclusion from gaming communities or exposure to gender-based harassment (Cho et al., 2013). In this context, insecure attachment styles emerge as a cross-cutting factor influencing problematic technology use in both sexes. For adolescents, online gaming can serve as a coping strategy for unmet emotional needs, providing a sense of control and an escape from distress. For girls, social media becomes a tool for coping with social anxiety, but overuse of these platforms often proves counterproductive, contributing to increased mental health issues such as anxiety and depression (Shek & Yu, 2016; Estévez et al., 2017). In transgender and non-binary youth, the intersection of insecure attachment and digital behavior is particularly evident. Many turn to social media and online platforms to seek validation and connection in ways that their offline environments may not provide. While this can foster resilience and community-building, excessive reliance on digital spaces

can also lead to social isolation and difficulties in forming real-world relationships (Rimes et al., 2017). The link between personal insecurities, social pressure and problem behaviors is particularly evident in adolescents with insecure attachment styles, who use social networks to navigate complex interpersonal dynamics. The connection between intensive use of digital platforms and negative experiences such as cyberbullying underscores the need for targeted interventions. Adolescent girls who experience or perpetrate acts of online aggression often report significant emotional symptoms, highlighting the urgency of promoting greater awareness of the risks of cyberbullying and encouraging the healthier use of technologies (D'Arienzo et al., 2019). Similarly, interventions aimed at transgender and non-binary adolescents should focus on fostering digital literacy, resilience, and supportive online spaces while minimizing the risks of cyberbullying and digital harassment. Parent training programs and awareness campaigns can enhance family acceptance, thereby reducing attachment insecurity and lowering the likelihood of problematic technology use (Meanley et al., 2021). Creating safe digital environments and educational strategies tailored to non-binary and transgender adolescents can promote healthier interactions with technology while supporting mental well-being (Giordano et al., 2021).

Discussion

This narrative review offers insights into the complex relationships between attachment styles, adverse childhood experiences (ACEs), gender differences, and technological problem behaviors (PTBs) among adolescents. The literature reviewed underscores that PTBs do not occur in isolation but rather arise from a dynamic interplay of psychological, relational, and contextual factors. Specifically, difficulties in emotional regulation and maladaptive coping strategies, insecure attachment patterns and peer relationships, as well as broader sociocultural influences - such as gender norms and exposure to adverse childhood experiences - collectively shape the emergence and manifestation of problematic technological behaviors. Insecure attachment styles emerge as significant predictors in the development of PTBs. Adolescents with anxious attachment tend to use social media compulsively, often to seek emotional validation and alleviate feelings of insecurity. Studies have clearly shown how obsessive monitoring of online interactions and emotional dependence on others' responses are typical manifestations of these individuals. On the other hand, avoidant attachment is associated with problematic gaming, where immersive gaming is used as a strategy to avoid intimacy and dissociate from

difficult emotional experiences. ACEs represent another key determinant of PTBs. Their influence operates through complex mechanisms, including alterations in emotional regulation and difficulties in building functional interpersonal relationships. However, the relationship between ACEs and PTBs is neither linear nor deterministic. As pointed out by Widom et al. (2018), protective factors such as social support and mentalization skills can significantly mitigate the impact of adverse experiences. Borelli et al. (2014) demonstrated that increased mental reflective capacity contributes to emotional and relational stability, reducing the risk of problematic behaviors. One particularly significant finding concerns the role of gender differences as moderators in PTBs. Girls are more vulnerable to dysfunctional use of social media, often driven by social comparison and the desire to maintain relationships. This exposes them to a higher risk of developing internalizing symptoms, such as anxiety and depression (Nesi & Prinstein, 2015; López-Fernández et al., 2019). Boys, on the other hand, show a greater predisposition toward problematic gaming, using it as a tool to cope with distress or seek intense experiences (Micallef et al., 2021). Binge-watching also exhibits differentiated dynamics: girls predominantly use it as a strategy to manage negative emotions, while boys perceive it to escape from external pressures (Estévez et al., 2017). Finally, cyberbullying reflects specific gender dynamics, with girls often involved in relational forms of aggression and boys prone to display more direct aggression (Marciano et al., 2020).

The risk of cyberbullying itself can be influenced by gendered behaviors. For example, girls may be more susceptible to relational aggression online, such as exclusion or spreading rumors, due to social expectations surrounding female behavior. Boys, conversely, may experience more direct forms of aggression, such as threatening messages or physical intimidation, as their behavior is often shaped by societal norms that emphasize competition and dominance. Additionally, individuals who identify as transgender, non-binary, or gender non-conforming may face unique risks on digital spaces, often stemming from societal rejection or discrimination based on their gender identity. These individuals might experience both relational and direct forms of aggression, which can be compounded by prejudice and lack of understanding regarding gender diversity. These gendered and identity-based patterns of behavior underscore the importance of considering a broader range of gender experiences when addressing vulnerability to cyberbullying and its impact on digital interactions.

Implications for Clinical Practice and Future Directions

Preventive and therapeutic interventions should consider an integrated approach, simultaneously assessing the influence of attachment styles, ACEs, and gender differences.

Attachment theory provides a solid foundation for developing clinical programs focused on emotional regulation and relational resilience. Furthermore, the implementation of school programs aimed at promoting digital awareness and reducing problematic technology use could provide an important preventive tool.

From a research perspective, a crucial step will be to investigate the causal dynamics underlying these interactions through longitudinal studies exploring the evolution of PTBs over time and the effectiveness of targeted interventions. Particular attention must be paid to assessing cultural and contextual influences, as well as to understanding how social norms and specific environments affect the relationship between risk factors and problematic behaviors.

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Educational Approaches for Environmental Sustainability

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Abstract

The planetary crisis, driven by abrupt climate change, calls for urgent action that integrates theory and practice. Environmental education has a crucial role to play in promoting change, advocated by scholars such as Bourdieu (1986) and Giddens (1990, 2009). This study examines how smart technologies, particularly artificial intelligence and virtual reality, can support teachers in environmental education. It examines Italian initiatives, including the metaverse-based courses at the University of Toronto and the AI-supported teaching activities of Didacta Italia 2023. Smart technologies are not neutral tools, but mediators that shape human-environment interactions, influencing behaviour and consumption patterns, in line with Latour's (2005) theories. The study evaluates the integration of these tools into environmental education curricula for Italian secondary school students, enhancing learning and promoting sustainability awareness. The study also addresses ethical issues, drawing on discussions by Heidegger (1977) and Trotta et al. (1981, 2023) on AI ethics. By experimenting with these tools in student workshops, the research aligns with Habermas's concept of "communicative action", emphasising dialogue for a sustainable society. The results provide insights into balancing innovation and responsibility, contributing to the academic and practical discourse on environmental education and sustainable development.

Keywords: AI and VR, educational approaches, social-ecological sustainability, technology

Introduction

The current planetary crisis, manifested by abrupt climate change, biodiversity loss and pollution, calls for urgent and coordinated action that combines theory and practice. In this context, environmental education emerges as a powerful catalyst for change, a concept supported by several sociologists such as Bourdieu (1986) and Giddens (1990) and recently explored by Hoang et al. (2021). Anthony Giddens (1990, 2009), one of the most influential contemporary sociologists, has devoted part of his work to exploring the dynamics of modernity and how they influence various aspects of social life. His analysis is set in the broader context of the theory of reflexive modernity, which offers interesting insights into the role of environmental education in our society. In particular, he reflects on our age, in which the consequences of our actions must be constantly evaluated and consciously managed. This is particularly relevant in the context of environmental risks. In his work "The Consequences of Modernity" (1990) and later in "The Politics of Climate Change" (2009), Giddens emphasises how globalisation and technological progress have increased our ability to change the environment, but also our responsibility to manage the associated risks. For Giddens (1990), environmental education is crucial to meet the challenges of reflexive modernity. It must promote critical awareness and in-depth understanding of the interconnections between human actions and the environment. Environmental education is not limited to imparting scientific knowledge but aims to form responsible and active citizens capable of participating in an informed manner in decision-making processes that affect the environment. In particular, the author emphasises three aspects: Critical Awareness: Environmental education must stimulate critical thinking about everyday practices and environmental policies. Individuals must be able to question the implications of their actions and policy decisions, developing a reflective mindset that considers long-term risks (Giddens, 2009).

Active participation: environmental education, according to Giddens, must also encourage active participation. Informed and aware citizens are more likely to engage in environmental initiatives, support sustainable policies and promote change within their communities (Giddens, 2009). Global interconnectedness: Another important aspect is the global interconnectedness of environmental problems. Education must therefore have a global perspective, helping individuals to understand how local actions can have global effects and vice versa. This approach is essential to develop global solidarity and international cooperation in dealing with environmental problems (Giddens, 2009). Giddens (2009) thus recognises that there are several challenges in implementing effective

environmental education. These include cultural resistance, the influence of economic and political interests, and the need to continually update educational programmes to respond to new scientific knowledge and changes in environmental dynamics. Despite these challenges, the author remains optimistic about the potential of environmental education as a tool for social transformation. He believes that through well-structured and informed education, it is possible to build a more resilient and sustainable society capable of facing the environmental challenges of the future (Giddens, 2009). In this regard and wishing to paraphrase Bourdieu's (1986) earlier discourse on habitus, we could argue that environmental habitus formation also plays an important role in our context. Environmental education has the task of forming the environmental habitus; indeed, through education individuals can develop an environmental sensitivity and ethics that influence their everyday behaviour (Bourdieu, 1986). Similarly, differences in habitus can lead to significant disparities in the perception of and response to environmental problems. Indeed, individuals from different backgrounds may have different approaches to sustainability based on their previous experiences and education (Bourdieu, 1986).

Moreover, to bring a practical example, in 2021 Hoang et al. addressed the importance of environmental education with a focus on Solid Waste Management (SWM) in developing countries. They pointed out that exponential urban growth has exacerbated waste management problems and found a significant discrepancy between students' environmental knowledge and actual practice. Lack of practical teacher training was identified as one of the main causes of this discrepancy (Hoang et al., 2021). Therefore, they suggested integrating environmental sustainability education into school curricula at all levels to bridge the knowledge gap and improve sustainable waste management. The latter is what we intend to explore in this paper from an initial questionnaire administered in full Covid to high school students with the intention of understanding young people's attitudes, values and knowledge towards the environment (Ministero dell'Istruzione e del Merito, 2024).

Theme and Literature

The concept of environmental education has undergone several transformations over the years. Suffice it to say that it was initially confused with civic education. In fact, as Azzoni (2011) points out, "if until the late 1970s the discipline was characterised by a predominantly informational approach" (Azzoni, 2011, p. 60), economic and demographic acceleration, as well as social transformations, allowed the concept to be modified. Starting in the 1980s, in fact, people began to talk about sustainable development, bringing

school and the world of work closer together, thus integrating the visions. These elements made it possible to correct errors, reflections and, above all, affinities with subsequent social transformations. This led to what is now environmental education, an activity destined, in its first phase of form and action, exclusively for schools: “the school is the place of choice for activating educational projects on the environment, sustainability, cultural heritage and global citizenship”, so says the Internet page of the Ministry of Education and Merit dedicated to environmental education and sustainability. However, unlike in the past, the appeal of the topic has changed. In recent years, in fact, the school has seen its educational responsibility expand to new transversal areas, school autonomy has laid the foundations for a different way of relating to the territory and the institutional and professional realities that operate there. This is not at odds with the ways in which this objective is pursued. Moreover, despite the presence of a School 4.0 Plan included in Ministerial Decree no. 161 of 14 June 2022, there are few applications. Lattes magazine, within one of its articles, defined the concept of the eduverse, arguing that “the eduverse offers the possibility of obtaining new “spaces” of social communication, greater freedom to create and share, offering new immersive educational experiences” (Rossi & Bianchi, 2023). This conceptual framework is interesting for two aspects, the first is that to make students participate, it is necessary to renew themselves, and renewal must necessarily pass through learning environments different from the current ones; the second motivation is the coining of a concept that manages to hold together different aspects, including that of imagination. The aim is to design, create, develop in an imaginative, hence non-traditional way, cultural aspects that have often only been read within texts. However, to date, these aspects, in a concrete way, have never been fully developed due to the infrastructural costs involved in acquiring certain technologies. Historically, in Italian literature, these aspects have been dealt with in civic education contexts identified with the guidelines dictated by the Constitution, the Charter of Sustainable Development and Digital Citizenship, arriving at the approximately 33 hours per year envisaged by the legislation and the various regulations that have followed over the years. In fact, as of 2019, Civic Education was reintroduced with Law 92 of 20/08/2019, even though its history is much older, dating back in fact to 1958, when Aldo Moro introduced it, in middle and high schools, with two compulsory hours of lessons per month, entrusted to the history teacher, without assessment (Allodola, 2021). The subject was removed from the school “programmes”, as a separate discipline, in 1990. Between 1990 and 2019, the subject was dealt with through afternoon

teaching courses, skills enhancement projects and ministerial projects aimed at certain types of students. Thus, neo-institutionalisation as a teaching subject is a big step forward, it would be necessary to upgrade the infrastructure to make it more "accessible" not economically, but practically, so that students can learn, by doing, certain notions. The main issue, as also emphasised by Allodola in 2021, concerns the structuring of courses and refers to the following areas of interest: «curriculum design; collegial management: the times, the books» (Allodola, 2021, pp. 154-155). On the latter aspects, the 33 hours and the books that can be used, enriching insights would be useful. Leaving aside for a moment the teaching hours that might seem few, the question of free textbooks is a difficult one, both in terms of the availability of up-to-date books, perhaps it would be better to use articles, and in terms of putting them into practice. Would it perhaps be useful to explore these issues with the current innovations we have at our disposal? By this we certainly mean artificial intelligence and the metaverse. The former guarantees that level of freedom of expression, through the imagination, which is useful for determining new knowledge and new paths of analysis; the latter, on the other hand, succeeds in rendering immersive activities that until now have always been carried out in school textbooks. As for the hours allocated to the didactics course, we believe that 33 hours in a year is relatively few, at least for the redesign of a course based on AI and VR systems. In fact, in the light of what has been highlighted and what we will read later, it would be interesting to set up a course based on "play", that is, on activities useful for learning practices, ideas and visions, which could lead to concrete learning on current environmental issues. This is because, to date, the most common activities in schools involve, at best, reading a few texts or, at best, a little planning of cases and perspectives. It would therefore be necessary to start introducing tools to ensure the intensity of learning during those hours. However, one of the aspects that must be considered certainly concerns the teaching spaces allocated to these activities. The current logic is to carry them out in a hybrid mode (offline/online), in the case we will see and in the proposed analysis, the entire design should be carried out in the metaverse. A comprehensive redesign is therefore required, not only of education, but also of thought processes and infrastructure. In the next paragraphs, we will explore these two elements in more detail through the few cases of analysis that exist today.

Youth and Environmental Education: A Pilot Exploratory Survey

The pilot study was conducted in 2022, following the various lockdowns due to Covid-19, by male and female students at a high school in the province of Naples. The initiative

took place during a training course aimed at students with the objective of initiating anonymous information gathering on environmental issues. The objective of the pilot study, whose purposive sampling consisted of 39 participants, was to investigate and understand young individual's attitudes, values and knowledge on the environment, as well as the consequences of Covid-19 on everyday life. The survey was conducted by means of a questionnaire with 20 questions and 5 sections (the complete questionnaire can be found in the appendix). The studies were conducted in accordance with the local legislation and institutional requirements. Informed consent for participation in this study was provided by the participants' legal guardians/next of kin. The characteristic part of this wave were the sections, which delved into relevant aspects of environmental education topics. We can say that interesting data was collected that allowed us to conduct in-depth studies in subsequent years. The following analyses were carried out with Python and the library used was Scipy. In detail, the five sections were: 1) Social and biographical data; 2) Attitudes towards the environment; 3) Knowledge of environmental problems; 4) Values; 5) Covid-19: what impacts on the environment and climate. The participants in this first survey were 39 people (Tab. 1) aged between 14 and 21 (Tab. 2); thus, they belonged to different age groups, with different attitudes among these cohorts.

Table. 1

Table. 2

The sample interviewed has the demographic characteristics shown in the two tables. Gender and age. This first analysis, which began as a pilot study and was therefore exploratory and geographically limited, gathered information only within the institution, hence the preference for a targeted sampling, because the project envisaged an exploratory survey among the students themselves. Therefore, what emerged, albeit with a small and most likely unrepresentative sample, is that most young students are not educated about proper waste disposal but manage to have "healthy" attitudes towards the environment. In fact, as Figure 1 shows, most of them, 34 out of 39 respondents, flush various types of waste down the toilet that should not be disposed of this way. However, most of them prefer to buy products made from recycled materials or spend more to buy biodegradable products, for example. This figure is interesting because it highlights two aspects: the difficulty on their part to properly inform themselves about proper waste disposal and the fact that they can find information about products made from recycled materials very easily through social networks.

Figure. 1

Another relevant issue is the environmental habitus, as Bourdieu (1986) describes it, which shapes the way individuals interact

with their surroundings. In fact, from the responses one can almost see an incongruence of attitudes between when one is in a private situation, for example within one's home, and when one is in a public context. This is because, as Goffman (1969) argues, it is important to maintain a certain role in public, so as not to evade the expectations that others have of them, especially when dealing with certain social contexts and with certain people belonging to such contexts (an example is being in a classroom and having to maintain one's "status" in the presence of teachers). In this regard, as Figure 2 shows, most respondents, around 64%, when in public contexts look for the appropriate container to dispose of the waste they produce, and only around 13%, a clear minority, throw their waste into the nearest container (regardless of the type of waste contained). This difference in attitude, however, demonstrates how important interactions with others are, how important emotional and empathic relationships are that allow one to empathise not only with those in front of one, but also with one's surroundings.

Figure. 2

As part of the demographic survey conducted, the parents' level of education was asked, among other questions in the appendix. The survey was conducted using a rating scale ranging from "no educational qualification" to "postgraduate qualification". Most of the parents, both mother and father, had a secondary school leaving certificate, with absolute frequencies of 17 and 15 respectively, while frequencies of 3 and 4 belong to the "post-graduate qualification" category. An attempt was therefore made to show a correlation between the parents' level of education and the children's behaviour towards recycling and waste disposal. Therefore, the children were divided into two groups, one with a father and mother with an educational qualification below a diploma and the other with an educational qualification above or equal to a diploma. Spearman's correlation was used to carry out this analysis, since data on the participants' behaviour was collected using a Likert scale; the same analysis was also carried out using Kendall's correlation and the results are comparable to those described in Tab. S3. In fact, it is possible to analyse, in general, that the behaviour of the respondents has no correlation with the level of education of their parents, with the exception of two specific cases which are: a) the purchase of recyclable products, in particular this depends on the level of education of the mother, and b) the carrying out of separate waste collection at home which depends on both parents.

Table. 3 Fig. 3 and 4, on the other hand, are the graphical representation, via boxplots, of what emerged from the correlations shown in Tab. 2. In these two figures children's behaviour is clearly more virtuous in the case where the parents' level of education is higher.

Figure. 3 and Figure. 4

Following this first exploratory survey, we tried to understand how environmental education is addressed in Italy and found that, except in sporadic cases, most environmental education is self-taught. This self-learning, of course, contains inaccuracies and confusion, which leads to the incorrect disposal of certain types of waste. At the end of this investigation, the students at the institute also produced a video to show what it means to incorrectly dispose of waste, showing real images of their own area. It could therefore be argued that the production of this video could also be a product of environmental education. What is important, however, is how new technologies today can be up to this task, generating involvement with people, making learning interactive. In fact, the following paragraph is intended as a starting point for the research being conducted by the laboratory of the Department of Political and Social Studies of the University of Salerno.

Analysis and Investigation of Virtualized Environmental Education

In the Italian context, there are very few examples to be analysed, some of which are limited to projects such as PCTO (Percorsi per Competenze Trasversali e Orientamento), which exist as repositories on various Moodle platforms, or in any case to passive activities involving lectures and no research path/activities. The only pioneering project that has inspired the Metaverse lab to move in this direction is the work of Professor Paolo Granata of the University of Toronto in February 2021, at the height of the pandemic. Granata, in collaboration with the University of Toronto, sent VR devices for his students to test (Auriemma, 2023). The experiment consisted of real virtual lessons, but not in DAD, as we are used to. It consisted of wearing a VR helmet and immersing oneself through the platform in a meta-version in which a part of the University of Toronto was recreated with classrooms and meeting rooms for real lectures. The campus and internal facilities, such as lecturers and classrooms, were developed using Unity software. The lecture was very successful, as can be seen in the YouTube video available at this link: https://www.youtube.com/watch?v=aRFr46EpHBc. Subsequent workshops were announced on Granata's Twitter profile, including the last one in May 2022, focusing on exploring the pedagogical potential of virtual reality for secondary school teachers (Auriemma, 2023). Some might think that these tools are currently used as systems that allow one to follow a lesson without too much effort. But the immersion they create and the interaction they allow make it possible to experience this "world" as something very stimulating. Suffice it to say that recent research by the Metaverse laboratory has shown that young people aged 18 to 25 who have used

virtual reality and artificial intelligence have very high levels of imagination. Moreover, contrary to what one might think, these techniques are not to be confused with the earlier Second Life or Habbo. In fact, although the metaverse has existed for years, thanks to the specific technologies of these two sites, and although these technologies, celebrated a few years ago and ready for a "revolution", have deep gaps in modern thinking, the metaverse is proving to be as bitter a discovery as the Internet was in its early days. The biggest difference that draws a sharp line between this kind of virtual society and today's society has to do with experience (Auriemma, 2023). Indeed, the metaverse we are about to visit offers a different and immersive experience, similar to Second Life and Habbo, but more complete. However, not all platforms fully integrate the vision of virtual reality with blockchain-based transactions. Immersiveness thus creates a shift from virtualisation to immersive virtualisation (Auriemma, 2023). These aspects are very important in the discourse of environmental education, because in metaversion research/action is the most important key to understanding and learning. Paradoxically, the different applications that exist for the viewer could learn, explore and act in the same function. Like Realverso, there is a digital environment in the form of a metaverse, dedicated to information and raising awareness on the goals of the UN 2030 Agenda for Sustainable Development and the innovative promotion of the Italian territory, starting from Basilicata (Lucanum Realverso). In this digital environment (cloud and accessible via a browser), characterised by a realistic 3D representation of villages, it is possible to carry out synchronous interaction between avatars (with sounds and reactions) and between avatars and objects using true virtual communication. This is possible thanks to the Internet of Things, implemented with the "digital twin" paradigm, which allows avatars to interact with real-world points of interest (e.g. the lights of a castle, the water flows of a fountain), virtualized and appropriately connected and synchronised with corresponding physical points of interest that are the subject of sensors and actuators' (Digital Enterprise Point, 2024). It is no longer a question of a change of "role" and "status", as Goffman (1969) would say, but of a complete fusion of these two aspects, so that artificial intelligence can be used as a support, as discussed at the Didacta Italia 2023 fair (Latour, 2005). In recent days, there has been talk of using artificial intelligence for the benefit of teachers and didactics as real assistants, guiding students along traditional knowledge paths with the technologies of the future. This leaves room for much discussion, certainly about the underlying values and morals, but also about the conditionality of post-human discussions. However, we believe that, as tools, they are opportunities not to be missed, as in our research, because integration with a

machine, indeed with artificial intelligence, is worth trying. Environmental education processes must necessarily go through these new tools to understand how knowledge and skills are transferred and how they can be transferred to artificial intelligence.

Discussion

The debate on the power of algorithms and artificial intelligence (AI) systems presents itself as a broad and complex field of study, characterised by considerable theoretical and conceptual heterogeneity. The resulting debate ranges from computer science to philosophy, from sociology to economics, each contributing unique perspectives. The variety of approaches and interpretations reflects the multitasking nature of AI technologies, the implications of which extend far beyond the boundaries of the technology itself, involving ethical, social, political and economic issues. Consequently, the topic is inherently fragmented and dynamic, constantly evolving in response to technological innovations and changing social and cultural dynamics. In this context, it is crucial to emphasise how artificial intelligence (AI) is having a pervasive impact on everyday life. Its applications are increasingly prevalent in critical and high-risk sectors, such as healthcare, business, government, education and the justice system. The increasing adoption in these relevant areas is contributing to the formation of a society increasingly dominated by algorithms (Kaur et al. 2022, 2024). However, as mentioned above, the process is irreversible, and the influence of algorithms seems to expand as they spread into all areas of society (Battista, 2024). This presence often occurs without full awareness on the part of users, sometimes leading to an insidious usurpation of the role and identity of other social actors (García-Orosa et al. 2023). This situation poses new challenges for the governance and regulation of digital technologies, requiring critical analysis to fully understand how these dynamics affect existing social structures and democratic processes (Serpa & Sà, 2019). The replacement of human actors with algorithms can profoundly alter social interactions, power dynamics and perceptions of autonomy and control, making an informed and in-depth debate on how to manage and mitigate these effects imperative. According to Russell and Norvig (2016), artificial intelligence (AI) is not only capable of replicating thought and reasoning processes but can also emulate components of human behaviour. In other words, a comprehensive definition of AI must incorporate a two-pronged approach. On the one hand, it is necessary to adopt an anthropocentric perspective that includes the empirical sciences, which embrace and analyse notions of human behaviour. This implies a detailed study of the ways in which human beings perceive, process and react to information. On the other hand, it is

essential to focus on a combination of mathematical and engineering models, which provide the formal and technical framework for the development and implementation of AI systems. This integration of disciplines makes it possible to create intelligent systems capable of performing complex tasks, mimicking human cognitive and behavioural capabilities ever more accurately. Furthermore, several scholars have identified three distinct phases in the development of artificial intelligence research (Darlington, 2022). The first phase is characterised by advances in computing capacity and processing power, which have made it possible to solve complex problems and handle large amounts of data. The second phase focuses on the development of artificial neural networks, primarily designed to mimic the functionality of the human brain and improve the learning and adaptive capacity of AI systems. Finally, the third phase was dominated by deep learning, which revolutionised the field through its ability to analyse massive and complex data, leading to significant real-world applications. This final phase saw AI integrate and transform a wide variety of fields through its ability to learn autonomously and improve its performance over time. These three phases represent an evolutionary path that has taken AI from simple computational processing to sophisticated autonomous systems capable of having a real and tangible impact on contemporary society. This evolution makes it essential to adopt a socio-technical perspective in the study and application of artificial intelligence. The sociotechnical perspective emphasises the importance of considering not only the technical and engineering aspects, but also the social, cultural and ethical implications of AI. With AI influencing more and more aspects of everyday life and social structures, it becomes crucial to understand how these technologies interact with humans and the societies in which they are embedded. Consideration of all these aspects becomes crucial to ensure that the development and implementation of AI is geared not only towards technological innovation, but also towards welfare and social equity. This requires an ongoing dialogue to create a regulatory and ethical framework to guide the evolution of AI in a responsible and sustainable manner, with the timely adoption of concrete principles and parameters to guide its use, not least because technologies tend to be path-dependent (MacKenzie & Wajcman, 1999; DiGiuseppe, 2022; Sartori & Theodorou, 2022).

Conclusions

Based on the results presented in this study, we can draw some main conclusions. Environmental education in Italy is currently fragmented and often self-understood, leading to inaccuracies and confusion about proper

waste disposal. This suggests the need to develop more structured and systematic approaches to environmental education. For this, new AI and VR technologies offer interesting and exciting opportunities to make learning more interactive and effective, as the University of Toronto's pilot project demonstrates. However, the adoption of such technologies also raises important ethical and social issues that need to be carefully considered, such as the impact of algorithms on society and democratic processes. Furthermore, data in the literature have shown discrepancies between people's environmental attitudes in private and in public, underlining the importance of social and relational dynamics in influencing pro-environmental behaviour. In conclusion, we suggest that the integration of new technologies into environmental education represents a promising opportunity but requires a careful and considered approach to address the associated ethical and social challenges. Further large-scale research is therefore needed to better understand the dynamics of environmental education and develop innovative and sustainable solutions.

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Appendix

First wave questionnaire:

Section A: Socio-biographical data

1. Gender (male; female; nonbinary)

2. Age (14-17; 18-21; 21+)

3. Indicates province of residence (Caserta, Salerno, Avellino, Benevento, Naples)

4. Indicate the educational qualification of your parents (No qualification, Elementary school leaving certificate, middle school leaving certificate, professional qualification, graduate degree, post-graduate degree (Master's/PhD)

5. Indicate the employment status of your parents (employed, seeking employment, retired, homemaker, other status)

Section B: Attitude toward the environment

6. Think about your attitudes toward the environment. How often do you do the following? Please indicate the score on a scale of 1 (never) to 5 (very often) (I flush cotton, Q-tips and other waste down the toilet; I am willing to pay more for a product if I know that its production and use are environmentally friendly; I buy consumer goods made from recyclable and renewable materials; I take care not to leave waste in the environment; I often buy disposable products; When I brush my teeth I leave the water faucet running even while I am using my toothbrush; It is common in my house to sort my waste.

7. How important do you think it is that environmental controls are carried out? (Not at all - Very on a Likert scale of 1 to 5).

8. Imagine you are at the beach, and you must throw away the trash from the lunch you just ate. How would you behave? (I collect all the waste inside a plastic bag and wait for it to be picked

up by the garbage collectors; I throw it in the nearest container (regardless of the type of waste it contains); I look for the appropriate container for disposal;

9. Overall, how do you rate the quality of the environment in which you live? (Poor; Poor; Sufficient; Good; Excellent).

Section C: Knowledge of environmental problems

10. Indicate, among the categories listed, which one you think corresponds to proper disposal. (Disposal: Plastic; Paper; Glass; Unsorted; Organic; Aluminum; Don't know). (Waste categories: Tetra Pak; Greasy handkerchief; Cigarette butts; Diapers; Cans; Broken ceramics).

11. What medium do you use to learn/update about environmental issues? (Internet; TV; Books; Radio; Voluntary associations; School; Friends; Family; Newspapers/Quotidians; Magazines; Pamphlets; Events/Events; None).

12. In your opinion, what are the risks to our health that may result from the following phenomena? (Risks: No risks; Slight inconveniences; Diseases; Don't know) (Phenomena: Degradation of ecosystems; Landfills/Incinerators; Radioactive sources; Drinking water pollution; Air pollution (smoke); Air pollution (industries); Air pollution (traffic); River/lake pollution).

Section D: Values

13. How important is it to you to protect the environment? (Not at all important - Very important on a Likert scale of 1 to 5).

14. Do you use biodegradable products in your household? (Yes, no, don't know).

15. What contribution do you make toward the environment? (I avoid wasting water; I reprimand others if they waste water; I recycle; I use 0-mile food; I use public transportation; I move around on foot or by bike as much as possible; I volunteer in the environmental field; I would like to make a contribution to the environment, but I don't know how/what).

16. What means do you usually use to get around? (If I can, I prefer to get around on foot; I use my car or scooter to get around; As soon as I can, I prefer to use my bike; I prefer to get around by public transportation).

Section E: Covid-19: What impacts on the environment and climate?

17. To what extent do you think covid has had an impact on the environment? (Not at all - fully on a Likert scale of 1 to 5).

18. Where do you throw the waste, you use to protect yourself from covid (used masks, gloves, etc.)? (In plastic; In paper; In the trash; On the ground; I have no information about this).

19. In your opinion, is there a connection between environmental degradation and COVID-19? (Not at all - Fully on a Likert scale of 1 to 5).

20. Think about the impacts of COVID-19 on the environment and indicate on a scale of 1 to 5 (where 1 is not at all agree and 5 is extremely agree) your opinion with respect to the following statements: (Opinion: Not at all agree; Slightly agree; Somewhat agree; Strongly agree; Fully agree) (Statements: Forced distance from urban greenery has profoundly changed our perception about environmental heritage; Smart-working or distance learning has decreased the risks of air pollution; Lockdown is a good solution to improve air quality; Lockdown has allowed animals and some protected species a better quality of life; I think the environment has been more respected during lockdown; The waste we are producing during the pandemic (used masks, gloves, etc.) is a danger to the environment).

Table. 1 Gender

Gender	Absolute Frequencies	Relative Frequency
Male	26	25%
Female	10	67%
Not Binary	3	8%
Total	39	100%

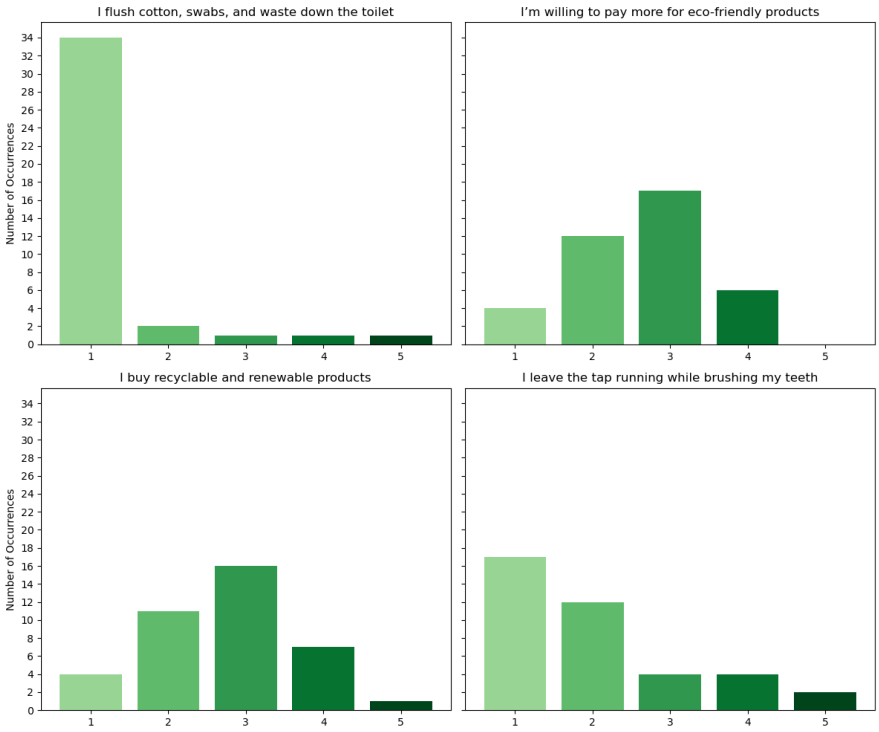
Table. 2 Age

Age	Absolute Frequencies	Relative Frequency
14-17	30	77%
18-21	5	10%
21 +	4	13%
Total	39	100%

Source: Survey March 2022 by author

Figure. 1 Think about your attitude toward the environment.

How often do you do the following things? Please indicate the score on a scale from 1 (never) to 5 (very often).



Source: Survey March 2022 by author

Figure. 2 Waste Disposal Behaviour at the Beach

Imagine you are at the beach, and you must throw away the waste from the lunch you just ate. How would you behave?

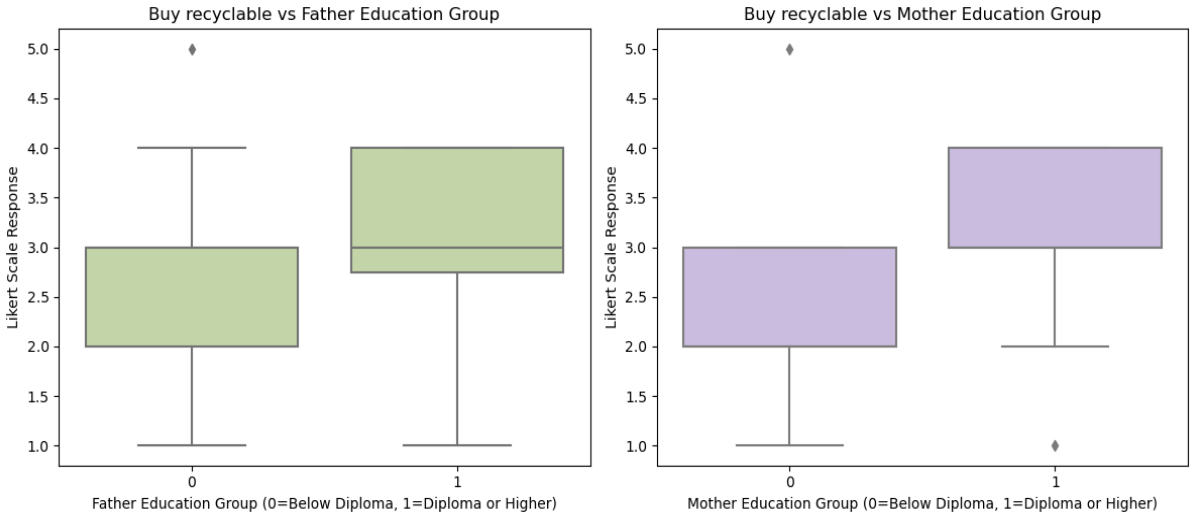
Source: Survey March 2022 by author

Table. 3 Correlations

	Father_Group_Correlation	Father_Group_p-value	Mother_Group_Correlation	Mother_Group_p-value
Flush waste	-0.163454	0.3201	0.082388	0.6180
Pay more eco	0.073898	0.6548	0.239982	0.1411
Buy recyclable	0.273071	0.0926	0.475066	0.0022 **
Avoid littering	0.176252	0.2831	0.282742	0.0811
Buy disposable	0.212644	0.1937	0.092740	0.5744
Waste water	-0.004920	0.9763	0.000000	1.0000
Recycle sorting	0.496602	0.0013 **	0.545087	0.0003 ***

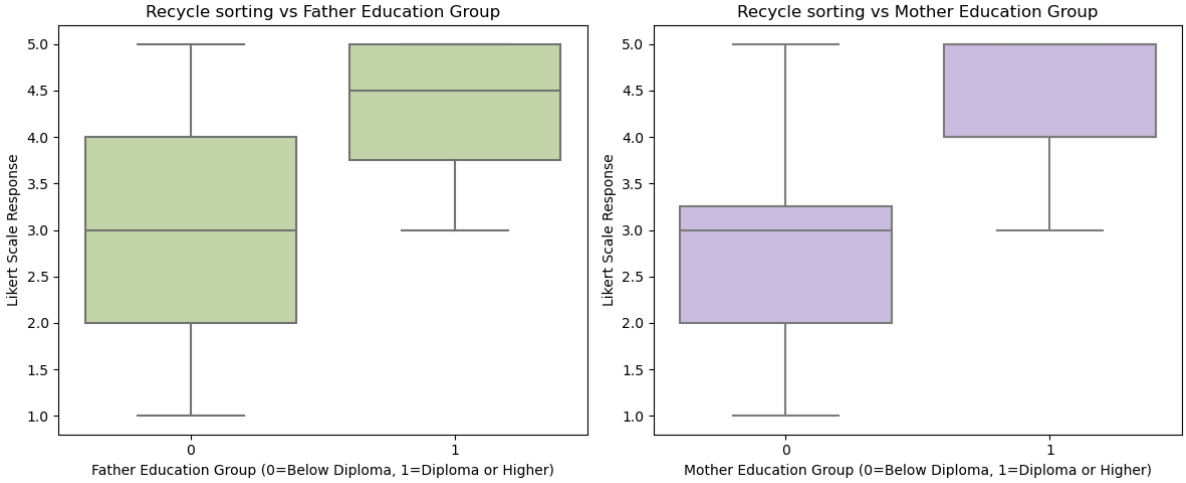
Source: Survey March 2022 by author

Figure. 3 Buy recyclable



Source: Survey March 2022 by author

Figure. 4 Recycle sorting



Source: Survey March 2022 by author

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Binge Eating Disorder Interacting with Distress Overtolerance and Parental Psychological Control

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Abstract

Binge eating is a rapidly growing eating disorder that severely compromises an individual's physical and psychological health, particularly affecting young adults of both sexes. Our study aims to examine the impact that parental psychological control and the tendency to overtolerate distress have on binge eating disorder.

The sample consists of individuals of both sexes aged 14-30 years. Measures include the Psychological Control Scale, the Distress Overtolerance Scale and the Binge Eating Scale. A mediation model was tested using a structural equation model with maternal and paternal psychological control as predictors, distress overtolerance as mediator and binge eating disorder as outcome. The model showed good fit indices and revealed that maternal psychological control directly influenced both distress overtolerance and binge eating disorder, while paternal psychological control directly influenced only distress overtolerance. The indirect effects of both predictors on binge eating through distress overtolerance were found to be significant.

The results highlight that high parental psychological control may lead to greater distress overtolerance, which in turn may increase the risk of developing binge eating disorder. Findings suggest that treatment of binge eating disorder may benefit from considering family interactions and the ways in which the young cope with distress.

Keywords: binge eating disorder, distress overtolerance, parental psychological control, young adults

Introduction

Binge eating disorder (BED) is defined by recurrent overeating episodes, in which individuals consume significantly more food than they would normally consume and experience a lack of control over their eating behavior (Agüera et al., 2020; Giel et al., 2022; Hilbert et al., 2020). Both the Diagnostic and Statistical Manual of Mental Disorders 5th edition DSM-5-TR (American Psychiatric Association, 2013) and the International Classification of Diseases ICD 11th revision (Almeida et al., 2020) recognize a number of key characteristics to identify BED: recurrent binges (i.e., consumption of unusually large amounts of food with a sense of loss of subjective control during the overeating episode), marked binge distress and the absence of inappropriate weight-reduction behaviors that characterize bulimia nervosa and anorexia nervosa. BED is recognized as a major public health problem with significant social and economic costs and is considered the most prevalent eating disorder among adults, affecting individuals of both sexes and all racial and ethnic groups (Giel et al., 2022; Keski-Rahkonen, 2021). The literature reports a strong association between BED and an increased risk of psychiatric and medical comorbidities (Agüera et al., 2020; Grilo & Juarascio, 2023; Keski-Rahkonen, 2021) as well as severe psychosocial impairment (Mohajan, 2023). Individuals with BED often experience difficulties in their professional, social, and interpersonal lives, often reporting feelings of guilt, disgust, and embarrassment as a result of eating (Mohajan, 2023). Although BED is strongly associated with obesity, people diagnosed with BED have different body image-related disorders, eating behaviors, and psychological and neurobiological profiles from people with obesity without BED. Despite the high levels of morbidity and associated psychosocial burdens faced by people with BED, this disorder remains under-recognized by health professionals (Giel et al., 2022; Grilo & Juarascio, 2023).

The role of family in eating disorders

Among the most important factors that the literature recognizes as associated with the development and maintenance of eating disorders and with the related distress in adolescents and youth, a prominent position is occupied by the family system and parent/child relationships (Erriu et al., 2020; Robertson, 2020). Specifically, in the analysis of parenting style, research shows that individuals with eating disorders related to binge eating disorder and obesity report less maternal and paternal care and greater overprotection than healthy individuals (Amianto et al., 2021). Specifically, the research reports that the “control without affection” parenting style, which combines lack of warmth and attention (poor parental care) with overcontrol (such as parental criticism and intrusiveness), is more frequently reported by both individuals with binge eating disorder and those with obesity, with no significant differences

between the two discomforts, compared to healthy individuals (Amianto et al., 2021; Depestele et al., 2017).

Several studies point to the significant impact of the family as a primary social agent in influencing the development and maintenance of dysfunctional eating behaviors in children (Amianto et al., 2021; Cella et al., 2022; Depestele et al., 2017; Erriu et al., 2020; Monteleone et al., 2020; Robertson, 2020). In fact, it is likely that the family context and parenting practices and styles in the area of eating may be a key risk factor for the development of negative eating habits in childhood, which may consolidate later and evolve into eating disorders. In exploring the nature and characteristics of the impact of parents on their children's dysfunctional eating behavior, research has found that families with children and adolescents who present with dysfunctional eating disorders are either entangled, intrusive and hostile towards the child's emotional needs or overly concerned about parenting. In contrast, affective and warm parenting has been found to moderate children's poor eating habits or maladaptive eating behavior (Erriu et al., 2020; Robertson, 2020). An important point in this regard is that the development of eating disorders in adolescence appears to be influenced by family members' perceptions of family functioning, particularly with regard to family cohesion, adaptability, and communication (Robertson, 2020; Romm et al., 2020). Some empirical evidence has indicated, in particular, that families with poor cohesion, low affective expression and excessive interpersonal dependence among members were found to have a higher risk of developing pathological eating behavior within them (Cella et al., 2022). In addition, research has shown that adolescents with eating disorders report high levels of dissatisfaction with family relationships, characterized by poor parental acceptance (family warmth, empathy, emotional support) and limited independence among family members. (Amianto et al., 2021; Cella et al., 2022; Depestele et al., 2017; Robertson, 2020). In contrast, adolescents and young who report emotional support from parents appear to be less likely to develop concerns about excessive weight, body dissatisfaction, and high ideals of thinness (Costa et al., 2015; Giordano et al., 2023, 2024). Research identifies positive perceptions of family relationships as an important protective factor from the risk of developing disturbed eating behaviors (Depestele et al., 2017; Giordano et al., 2023, 2024; Robertson, 2020; Romm et al., 2020). The development of eating disorders also seems to be influenced by the assumption of binding and unfavorable family rules. It has been found that families with eating disorders have particular rules regarding the restriction of thoughts, feelings and self-determination. Family rules related to the prohibition of discussing, solving problems, and talking about circumstances that might cause distress in the family are indicative of family rigidity; rules related to mutual support,

shared decision-making, and emotional bonding, on the other hand, would facilitate family cohesion. In particular, families with rigid rules that hinder or limit the expression of thoughts, feelings, and self (prohibition of exposing and talking about situations that may cause discomfort) are at risk of developing eating disorders, especially in cases where restrictive rules, demands, and controlling practices, such as restriction and monitoring, relate to food. Critical attitudes and family pressures toward body and fitness are also indicative of family involvement and rigidity, which strongly influence the development of distress by facilitating inappropriate eating habits. (Erriu et al., 2020; Giordano et al., 2023, 2024).

Parental psychological control

The association between eating disorders in children and adolescents and parenting styles has been studied by several researches (Amianto et al., 2021; Costa et al, 2016; Depestele et al, 2017; Robertson, 2020) that highlight the deleterious impact of a parenting style characterized by pressuring children to conform to one's schedule through deep and covert manipulative tactics, which generally tend to manifest in a form of parental psychological control. This control results in a restriction of autonomy and independence, which in turn evolves into internalizing symptoms and difficulties in children's relationships and social interactions. Parental psychological control is emotionally manipulative and intrusive parental behavior, having the aim to control the child's emotional state and to make children act, feel, and think in ways approved by their parents. This involves the use of tactics such as love withdrawal, guilt induction, conditional approval, shaming, or instilling anxiety and thought patterns, which are particularly harmful during adolescence, because they undermine the key function of adolescents' development of autonomy and self-direction, keeping them emotionally dependent on their parents. (Romm et al., 2020).

Parental psychological control is a risk factor for maladjustment not only during childhood and adolescence, but also in different periods of life, including young adulthood. In particular, contingent expression of love based on children's performance creates negative self-evaluations and maladaptive perfectionism, resulting in inducing rigid eating behaviors and related discomforts such as excessive exercise (Costa et al., 2015). In fact, higher levels of psychological control appear to be related to lower self-confidence and self-esteem and fear of failure, as well as higher rates of externalizing problems, such as physical and relational aggression, and moreover, to internalizing and mood problems, such as depressive symptoms, anxiety, loneliness, confusion, and lower social and interpersonal skills (Brenning et al., 2022; Costa et al., 2015, 2016).

According to the literature, parental psychological control seems to consist of two main components: psychological control of

dependence and psychological control of achievement. Psychological control over dependence can be defined as the use of psychological control in the domain of parent-child intimacy, where control is used as a means of keeping children within tight physical and emotional boundaries. Psychological control over achievement can be explained as the use of psychological control in the domain of outcomes, where psychological control is used as a way to make children conform to excessive parental performance standards. Both constructs have been found to be related to maladaptive consequences, particularly internalizing difficulties and disordered eating behaviors. Research shows that adolescents with eating disorders, compared to those without such disorders, tend to perceive parents, and particularly fathers, as more controlling. The quality of the relationship with one's father was found to be an important factor in the development of eating disorders: girls with anorexia described their fathers as intrusive and overprotective and as frequently turning to their daughters for sustenance and support (Monteleone et al., 2020). Studies report no differences between the various types of eating disorders in the area of psychological parental control, highlighting that individuals with eating disorders, regardless of the specific form of disorder they suffer from, tend to perceive lower levels of maternal and paternal care and tend to report a higher level of parental control than healthy individuals. In general, the literature tends to agree that ED patients tend to report that their parents are less warm and empathetic and that they used to limit their autonomy and independence during childhood (Depestele et al., 2017). At the same time, in much research, families with ED seem to be characterized by the presence of an insecure parental bond, a lack of intimacy and physical expressions of affection from the maternal figure, and, more generally, a reduction in bodily contact and expression (Amianto et al., 2021).

Distress overtolerance

Among the characteristics that research reveals in individuals who experience parental psychological control, one of the most interesting in our view is the tendency to overperform in order to match parental expectations and desires and to gain their approval and affection (Costa et al., 2016). Associated with this condition are attitudes of perfectionism and overcontrol, often accompanied by dysfunctional management of stressful and problematic situations through coping strategies characterized by total avoidance or, conversely, excessive tolerance of distress. The literature defines distress intolerance and distress overtolerance as maladaptive behaviors that result from an interaction between the ability to tolerate distress and the awareness and perception of distress, resulting in its habitual avoidance or overtolerance (Gorey et al., 2018). Scholars point out that, although in opposite ways, the two types of distress response both act in the same way as

a dysfunctional coping mechanism to deal with stressful experiences (Gorey et al., 2018; Lee & Kim, 2021; Lee, 2024). Although the individual's ability to tolerate stressful events and adverse psychological states tends to be emphasized in its adaptive values, most research has shown that excessive tolerance of negative emotions is associated with psychological maladjustment such as depression and anxiety (Gorey et al., 2018; Lee, 2024; Nealis et al., 2022; Zegel et al., 2023). In fact, distress overtolerance (DO) refers to the tendency to persist and endure pain even if it can be avoided (Lee, 2024) and thus can be seen as a lack of cognitive flexibility to cope adequately with negative emotions (Lee & Kim, 2021).

Gorey et al. (2018) hypothesize the existence of two subcomponents of distress overtolerance: the "capacity to harm" and the "fear of negative evaluation". The former would generally be related to individuals' ability to tolerate negative situations despite the fact that they affect their well-being; the latter to individuals' tendency to persist in experiencing stressful situations for fear of receiving negative evaluations from others if they stopped doing so. In the literature, distress overtolerance often appears to be related to the following individual characteristics: poor well-being, greater importance placed on achieving goals and meeting constraints, tendency toward perseverance and perfectionism, inability to disengage, and greater overall negative emotionality. In addition, DO appears to predict clinically relevant distress, such as alcohol abuse, depression and anxiety (Lee, 2024; Nealis et al, 2022), as well as being a construct of potential relevance to the symptomatology of PTSD, due to the strong inclination of individuals with DO to persist in extremely high levels of distress, ignoring its signs and consequently making the symptomatology more severe and seriously hindering its remission (Zegel et al., 2023). The link between a hyper-controlling family environment and the tendency to over tolerate distress can be detected in parent-child dynamics as early as childhood: for example, in a family with strict parents and high-performance standards, a child is unlikely to receive praise unless he or she performs a task at an exceptionally high level. Because of infrequent rewards, the child may learn to be a perfectionist and to persist in negative emotions no matter what; traits that would not be present in a child with low distress tolerance. These traits may continue into adulthood, resulting in an individual who relentlessly persists in the task at hand rather than disengaging and/or incorporating adaptive coping strategies. As a result, the individual with stress overtolerance engages more in strenuous or stressful work than others, reporting a poor sense of well-being, a tendency to judge negative emotions as irrelevant feedback for this/her behaviors, and to resort to dysfunctional ways to manage the exhausting rhythms they undergo and improve mood (e.g., alcohol abuse, restricted diet, and/or overeating) (Lee, 2024). In this sense, distress overtolerance can be conceptualized as both an

inability to disengage from the goal to be achieved and a tendency toward perfectionism (Gorey et al., 2018). One of the constructs analyzed to define the theoretical framework of distress overtolerance and to identify the underlying mechanisms is the hypercontrolled personality (i.e., excessive self-control), which shows numerous points of contact with the tendency to overtolerate distress. The literature argues that individuals with high levels of self-control seem to be biologically predisposed to avoid emotions and, as a result, may produce a pattern of behavior similar to that of individuals who over-tolerate distress, such as emotional inhibition, rigid cognition, and extreme perseveration and perfectionism; the latter two attitudes in particular, although they share many characteristics with OD, exhibit some important peculiarities that may help shed light on the potential relationships between over-tolerance of distress and psychopathology (Gorey et al., 2018; Lee, 2024; Nealis et al., 2022; Rand-Giovannetti et al., 2022; Zegel et al., 2023). Indeed, although persistence and perfectionism tend to be associated with depression and substance abuse in the literature, they seem to be considered strictly task-oriented, without emphasis on the inherent negative aspects. Therefore, they provide a good basis for understanding the mechanism underlying DO without being considered redundant with it, since distress overtolerance, unlike them, exhibits a negative meaning already in its very definition. (Gorey et al., 2018).

Hypotheses and objectives

Our study aims to analyze the role that distress overtolerance may play in the relationship between parental psychological control, analyzed distinctly in maternal and paternal figures, and binge eating disorder in a sample of young adults aged 18-30 years of both sexes, identified through a convenience approach in the Italian territory. Our first hypothesis is that a high level of children's perceived psychological control, by both mothers and fathers, is positively correlated with the risk of developing or aggravating the symptomatology of binge eating disorder, as well as with the tendency to excessively tolerate distress by persisting in stressful situations, even when it is not necessary and would be possible to interrupt them. The second hypothesis of our research is that distress overtolerance may play a mediating role in the relationship between maternal and paternal psychological control - analyzed as two separate independent variables - and binge eating disorder symptomatology as a dependent variable. The latter hypothesis is based on the constitutive features of distress overtolerance, which is structured as the habit of individuals to persevere in stressful and exhausting situations and to endure pain to the bitter end, even though they recognize that this behavior severely affects their physical and psychological well-being, deteriorating and compromising their health due to the habit of putting food and sleep needs, social relationships, and leisure time on the back

burner. To examine the interaction between the identified variables, we decided to test a mediating model consisting of parental psychological control style in the two forms of maternal and paternal psychological control as predictors, overtolerance distress as mediator, and binge eating disorder as outcome. Specific attention was given to the direct and indirect effects, through distress overtolerance, of maternal and paternal psychological control on binge eating symptomatology and the direct and mediating effects of distress overtolerance on binge eating disorder. Finally, we set out to investigate whether maternal and paternal psychological control might affect the variables studied differently, whether one parental figure tends to be perceived as more overprotective and hypercontrolling than the other, and whether the perception of any differences in this regard might be matched with a different impact that the two parental figures exert on both distress overtolerance and binge eating symptomatology.

Materials and Methods

Study Design

In the present study, we performed a preliminary correlation analysis among all of the variables under our study using Pearson's product moment correlation coefficients and then tested a mediation model calculated through Structural Equation Modeling, in order to examine whether distress over-tolerance was a potential mediator in the relationship between the independent variables identified in parental psychological control, in the double form of maternal and paternal psychological control, and the dependent variable represented by the binge eating disorder.

Procedure

Recruitment was carried out through the snowball method. As the questionnaires were to be administered online, it was necessary for each participant to have an electronic tool, a smartphone, tablet, or PC.

Individuals who took part in the research were asked to fill out a self-report questionnaire, which took about 15 min to complete. The form contained a description of the characteristics and purpose of the research, as well as the informed consent form, that the participants had to previously sign in order to view the questionnaires.

In accordance with the international guidelines of the Declaration of Helsinki 1964, last revision in 2000, and the ethical code of the Italian Association of Psychology (AIP), participation in the questionnaire administration phase was subject to the signature of an informed consent form by each participant. Participation was voluntary and no prizes or compensation were offered. Privacy was ensured at all stages of the study.

The study was approved by the Institutional Review Board of the Institute for the Study of Psychotherapies, School of Specialization in Brief Psychotherapies with a Strategic Approach

(reference number: ISP-IRB-2024-7, 23 May 2024).

Participants

The study targets a population of young adults aged 18–30 years of both sexes, recruited by the convenience sampling method. The only inclusion criteria were an age between 18 and 30 years and an adequate knowledge of the Italian language.

Variables

A mediation analysis was drawn through structural equation modeling (SEM). A structure with maternal psychological control (MPC) and paternal psychological control (PPC), distress over-tolerance (DO), and binge eating disorder (BED) as latent variables was used to examine a model in which MPC and PPC are considered as predictor variables, DO as mediator, and BED as outcome.

Measurement

Perception of parental psychological control: the variable was measured through the 8-item Italian version of the Psychological Control Scale-Youth Self-Report (Barber, 1996). The author provided evidence for the validity and one-dimensional factor structure of this scale. Subjects responded on a 3-point Likert-type scale ranging from 1 “not like her (him)” to 3 “a lot like her (him)”, with higher scores reflecting greater perception of parental psychological control e.g. “my mother/father brings up past mistakes when she/he criticizes me”. Subjects rated psychological control for both parents separately to examine the individual contribution of mothers and fathers. The scale has adequate psychometric properties and its reliability and validity have been also demonstrated in cross-cultural research (Barber, 1996; Barber et al., 2005; Rohner & Khaleque, 2003). The Italian version of this instrument is widely used in research and showed good internal consistency (α= .80 and .83 respectively for paternal and maternal psychological control).

- Distress overtolerance: the assessment of the variable was conducted using the Distress Overtolerance Scale (Gorey et al., 2018): a 16-item self-report questionnaire that measures an individual's tendency to endure very high levels of stress despite negative consequences for well-being, e.g., “I care more about completing a stressful task than its negative consequences on my health and happiness.” Each item is rated on a 6-point scale from 1 (*completely untrue of me*) to 6 (*completely true of me*). Scores range from 0–96 with higher scores indicating higher levels of DO. The instrument has a two-factor structure (i.e., Capacity for Harm and Fear of Negative Evaluation). The Italian version (Cheli et al., 2021) showed a very good internal consistency for the total scale which included all the 16 items (α=.91). This value resulted slightly lower but anyway good in the two subscales *Capacity of Harm* (CH; α=.89) and *Fear of Negative Evaluation* (FNE; α=.82).

- Binge eating disorder: the variable was assessed using the Binge Eating Scale, a widely

used self-report instrument developed to identify the presence and behavioral manifestations of binge eating disorder (BED). Developed by Gormally et al. (1982), the scale was designed to identify behaviors, emotions, and attitudes related to binge eating episodes among individuals who might be at risk of developing BED. Comprising of 16 items, the scale evaluates both the severity and frequency of binge eating episodes, which are central in diagnosing and understanding the disorder (Gormally et al., 1982). The scale is designed to capture the behavioral (eight items, e.g., large amount of food consumed), as well as the cognitive and emotional (eight items, e.g., feeling out of control while eating, preoccupation with food and eating) features of objective binge eating in overweight and obese adults. Each item presents a set of four statements arranged in a graded severity format, reflecting an increasing level of binge eating symptomatology. For each item, respondents are asked to select one of three or four response options, coded zero to two or three respectively, that best describes their experience e.g. "I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily". The total score ranges from 0 to 46, with a score of <17 indicating the absence of binge eating disorder, a score between 18 and 26 indicating a moderate-grade BED, and a score >27 indicating a severe-grade BED (Barstad et al., 2023). This scoring system has been validated through various studies, showing good internal consistency and satisfactory test-retest reliability (Timmerman, 1999). The Italian version of the scale reported good internal consistency reliability (α = .89).

All of the variables analyzed are quantitative, as evidenced by the exclusive use of self-report survey instruments, and all of the questions that make up the above questionnaire were defined as mandatory to ensure no missing data.

Each of these instruments has been validated in Italy and has been previously administered and analyzed in samples of adults and adolescents, demonstrating good levels of reliability and validity (Cheli et al., 2021; Costa et al., 2015; Di Bernardo et al., 1998). These data were confirmed by the results of our model, as shown in Table 1.

The Statistical Methods

Preliminary statistical analyses were conducted using IBM SPSS (Statistic Package for the Social Sciences) version 29. These included a descriptive analysis of the main characteristics of the sample and a correlational analysis of the identified variables using Pearson's product moment correlation coefficients with a bias-corrected and accelerated 95% confidence interval (CI) (BCa). The internal reliability of each selected instrument was tested through the use of Cronbach's α and the normal distribution through skewness and kurtosis values (Nunnally, 1975). The results are presented in Table 1.

R Studio version 4.3.2 with the lavaan package for R was utilized to assess the factorial validity of the employed measures, regression analysis, and the structural equation modeling (SEM) for the

identified mediation model. We used the parcellation approach in the SEM analysis for several reasons. First, this method reduces model complexity, improves normality (parcels tend to have more normal distributions than individual items), increases long-term sustainability, and ensures more stable parameter estimates. In addition, the parcels not only meet normality assumptions more easily but are also less susceptible to the influence of method effects (Little et al., 2002). In the present study, three parcels were constructed for each observed and latent variable. The resulting model is shown in Figure 1.

Results

Participants: demographic characteristics

A total of 1024 study participants aged between 18 and 30 years (min 18, max 30 years, M ± SD 25.28 ± 3.53 years), of whom 725 were female (70.8% of the total sample), completed the questionnaires. Regarding the sample's gender/sex identification, participants were asked to identify their male/female biological sex and, in a next question, were given the opportunity to select a third non-binary option to identify their gender identity. In the latter category, 0.9 percent of participants indicated that they identified as a non-binary gender. Both questions were mandatory. In terms of other demographic characteristics, 97.6% of participants reported that their sociocultural background was Italian. Most participants (45.5% of the total sample) were single. Furthermore, 40.7% of participants are graduated and the 40.7% are students. Regarding the sample size, we referred to the Monte Carlo power analysis for mediation models, which indicates that a minimum of 1000 participants is required to obtain a statistical power of 0.95 (Schoemann et al., 2017). Therefore, the sample size of this study is sufficient to ensure adequate statistical power.

Descriptive Data

The intent of focusing our investigation on young adulthood was in response to the goal of exploring a stage of individual development that, in the context of parenting style and parent-child interactions and relationships, tends to have a marginal space in the literature compared to adolescence, a stage of life which many studies place attention to, when analyzing parent-child relational dynamics. Obviously, the age of adolescence is crucial in individual development and particularly in the redefinition and transformation of parent-child relationships, which become more complex and difficult compared to childhood. However, many of the communicative and relational dynamics that are structured during adolescence tend to persist into early adulthood and sometimes tend to become more rigid and complex than they appeared in the adolescent period and thus more difficult to address and modify. In approaching maladaptive behaviors and psychological distress in young adults, there is a tendency to underestimate the role that the family,

particularly parents, can play in their development and course. This aspect emerges particularly in the treatment of eating disorders, where the parents of adult patients tend to be completely ignored, while they are often not only involved in the origin of the disorder, but continue to influence it overwhelmingly by being an important obstacle or resource in its maintenance and chronicity. Moreover, it is important to note that binge eating disorder, the subject of our study, tends to develop later than other eating disorders such as anorexia or bulimia, and to be more common among adults than among adolescents.

Outcome Data

The internal reliability and normality of the distribution of the data for each instrument used were tested through the use of Cronbach's α, Skewness and Kurtosis, showing good results, as well as all variables demonstrated statistically significant mutual correlation with a p value < 0.001, as illustrated in Table 1.

The model was evaluated on the basis of multiple indices of fit, as suggested by Bentler and Bonett (1980). All indices of fit were found to be adequate, with values of 0.99 for the comparative fit index (CFI) and the Tucker-Lewis index (TLI), and values of 0.02 and 0.03 for the SRMR (Standardized Mean Quadratic Residuals) and RMSEA (Mean Quadratic Approximation Error), respectively, thus well below the maximum thresholds recommended by Schermelleh-Engel et al. (2003). All values of the fit indices, including X2 values and degrees of freedom, are presented in Table 2.

Main Results

The results of Pearson's correlation coefficient analysis suggest a high degree of significance in the correlation between all the variables examined, with particularly robust correlations observed between distress overtolerance and binge eating disorder ($r = 0.46$, $p < 0.001$). Comparing maternal and paternal psychological control with both the variables distress overtolerance and binge eating disorder, we observed that paternal psychological control showed a less robust degree of correlation than that observed for maternal psychological control, but still statistically significant with values of ($r = 0.29$ and 0.23 $p < 0.001$) compared with values of ($r = 0.35$ and 0.31, $p < 0.001$).

In constructing the mediation model, with regard to the independent variables consisting of maternal and paternal psychological control, we used the parental psychological control scale, divided into eight items referring to maternal psychological control and another eight items reflecting paternal psychological control. Accordingly, we considered two different indirect variables: maternal psychological control and paternal psychological control. We chose not to include the total score of parental psychological control, i.e., the sum of the scores of the two scales, because we were interested in observing

perceptions of maternal and paternal parenting styles separately from each other to see if differences emerged in perceptions of the two parental figures and if so, whether a different impact on the variables analyzed would be found. The construct thus determined proved to be sufficiently stable and robust, with very satisfactory indices of fit. As for the mediator, which in our model is represented by distress overtolerance, we used the Distress overtolerance (DSO) scale, referring to its total score rather than to the two different scores related to the two constituent scales: 'ability to harm' and 'fear of negative evaluation'. The choice to use only the total score of the questionnaire arose from the intention to observe how the individual tendency to overtreat stressful situations as a whole, regardless of the specific weight that each of the two constituent scales may have, can act directly on the dependent variable constituted by binge eating disorder and as a mediator in the indirect relationship between the latter and the predictor variables. Finally, with regard to the dependent variable represented by uncontrolled eating disorder, we used the Binge Eating Scale in its total score, given by the sum of the responses of all 16 items that make up the questionnaire.

Since this construct showed good fit indices and the resulting model appeared robust and stable, it was decided to use it as the final model for the mediation analysis. The results that the model thus identified - reported in the structural equation modeling analysis - indicate that the direct effects of the MPC predictor variable on uncontrolled eating disorder are significant and seem to confirm the results of previous studies and the initial hypotheses proposed in this research. Different matter for PPC whose direct effects on BED were not found to be significant. Nevertheless, the indirect effect of both independent variables on binge eating disorder through distress overtolerance was found to be statistically significant, thus confirming our initial hypotheses.

The results are presented in Figure 2 and Table 3.

Errore. L'origine riferimento non è stata trovata.

Errore. L'origine riferimento non è stata trovata.

Discussion

The research findings seem to confirm our initial hypotheses, showing that the perception of being subjected to a high level of psychological control by parents may directly and indirectly influence, through the tendency to overtolerate distress, the development and/or maintenance of binge eating symptoms among young adults aged 18-30 years. Family functioning, communication among family members, perception of family support, and parent-child relationships appear in the literature as relevant protective or risk factors that are strongly involved in the development and/or maintenance of various and heterogeneous psychological distress, particularly those related to the perception of one's body image and the desire to control weight and body shape, such as eating disorders, compulsive exercise, body dysmorphia, and muscle dysmorphia (Amianto et al., 2021; Costa

et al., 2015; Depestele et al., 2017; Erriu et al., 2020; Giordano et al., 2023, 2024; Robertson, 2020; Romm et al., 2020).

Research recognizes among the most involved the factors in the psychological impairment of adolescents and young people, particularly in the area of eating disorders, a parenting style based on high psychological control, which consists of parents behaving or being perceived as overprotective, hypercontrolling, poorly involved emotionally and empathetically, poorly able to communicate effectively with their children, and above all, poorly inclined to foster their autonomy, independence and decision-making ability. The literature shows that among eating disorders, one of the most common and widespread in the youth population seems to be uncontrolled eating disorder (BED) (Giel et al, 2022); Keski-Rahkonen, 2021), which is characterized by recurrent episodes of objective overeating, without the presence of inappropriate compensatory behaviors, accompanied by the feeling of having lost control over one's eating, the tendency to gain weight, the risk of obesity, cardiovascular and musculoskeletal diseases, and feelings of shame, social isolation and chronic loneliness condition (Agüera et al. , 2020; Almeida et al., 2020; Giel et al., 2022; Hilbert et al., 2020; Mohajan, 2023).

Scholars point out that the prevalence and impact of this disorder are of great concern because of the profound association of BED with psychosocial impairment and psychiatric comorbidity, including post-traumatic stress disorder, substance abuse, mood disorders, suicide risk, as well as significant medical comorbidities such as obesity, type 2 diabetes, hypertension, (Agüera et al., 2020; Keski-Rahkonen, 2021; Mohajan, 2023; Udo & Grilo, 2018). At the same time, research highlights that current used interventions for BED appear to have insufficient efficacy, with a high percentage of patients, nearly 50 percent, failing to achieve complete remission of binge symptoms, as reported by Linardon (2018) in his meta-analysis of 39 randomized controlled trials with 65 treatment conditions, 40 of which were represented by cognitive behavioral therapy, and a total of 2,349 patients. (Linardon, 2018). Thus, there is an urgent need to increase knowledge of the potential risk and maintenance factors that influence the development and chronicity of BED and prevent complete remission of symptoms, in order to identify more targeted strategies that could significantly contribute to improving the effectiveness of clinical interventions. (Forester et al., 2023). Among the factors that may play a significant role in the course of the disorder, studies identify certain individual characteristics that appear to inhibit functional behaviors related to body care and attention, eating habits, and exercise management in adolescents and young people. Among the most common characteristics in individuals suffering from body image, eating, and exercise disorders, the literature highlights perfectionism (Bardone-Cone, 2020), emotional dysregulation, cognitive rigidity (Hovrud et al., 2020; Schaefer et al., 2020;

Williams-Kerver, 2020), hypercontrol with difficulty experiencing and accepting change, and uncertainty (Reilly et al., 2021). In this area, an interesting individual trait, related to those mentioned above but still under-researched, is the tendency to over-tolerate distress despite the knowledge that it compromises one's physical and psychological well-being (Rand-Giovannetti et al., 2022). Individuals who tend to tolerate discomfort excessively tend to ignore their feelings and emotions and move on, often regardless of whether this state of stress actually leads them to achieve their goals, which sometimes do not even correspond to what they really want and expect (Howells et al., 2024). Individuals who over-tolerate discomfort tend to experience in their lives only the dimension of duty, progressively losing the ability to have fun, to relax, to be carefree, and to take an interest in aspects of personal development outside of duties and stress resistance, all traits that appear prevalent and common in at-risk or eating-disordered individuals. Excessive discomfort tolerance often appears to be an end in itself and is aimed solely at proving to oneself and others that one is capable of completing set tasks even in adversity and at the cost of one's mental and physical well-being. Our research has shown that a high level of overtolerance of distress and parental relationships characterized by psychological hypercontrol by parents/caregivers, manifested by intrusiveness and restriction of children's self-determination, corresponding to less attention and lack of physical displays of affection and emotional closeness, appear to be important risk factors for the development and maintenance of binge eating disorder in young adults, evidencing significant both direct and indirect effects on it. Specifically, in our study, maternal psychological control seems to have a strong direct and indirect effect on BED through mediating distress overtolerance. As for paternal psychological control, it did not show a significant direct effect on BED, but at the same time revealed a significant indirect effect on the disorder through mediating distress tolerance. In future research, it would be interesting to examine the differential impact of parental figures on BED symptomatology using additional self-report questionnaires that can explore in more detail communication and relationships with maternal and paternal figure, as well as the functioning of the family as a whole. It would also be appropriate to supplement these instruments with qualitative interviews that would allow for more comprehensive data collection. Another goal in this regard might be to try to recruit a more gender-balanced sample, with a higher proportion of males than in the current study, to test whether the non-significance of the direct effect of perceived paternal psychological control on uncontrolled eating disorder might also have been influenced by the much higher proportion of females who participated in the current study.

Conclusions

The results of our investigation confirm the initial hypotheses and assumptions in the literature, underscoring the central role that a parenting style based on high psychological control over children and an individual tendency to over-tolerate distress can have on the psychological well-being of young people, particularly on the genesis of dysfunctional eating behaviors that can evolve into eating disorders, in the case of our study the binge-eating disorder. It is likely that young adults who have since childhood experienced parents who excessively controlled their behaviors, judged their achievements severely, trying to make them in line with their goals and expectations, limiting their self-determination and autonomy, have developed tendencies toward perfectionism, hypercontrol rigidity and tolerance of high levels of distress and discomfort. These were means of satisfying the need to meet parental expectations and desires and to gain positive evaluation and appreciation from others, demonstrating that they are able, while achieving their goals, to complete exhausting tasks regardless of their individual physical and emotional states, feelings and desires. However, it should be noted that the cross-sectional nature of the study and the exclusive use of self-reported instruments result in some limitations in the interpretation of the study results.

Limitations

The present study has several limitations. First, the cross-sectional nature of the study design precludes the possibility of making causal inferences among the variables under study. In fact, because of their inherent characteristics, cross-sectional models can only represent a specific moment in the much larger pathways and operations of the variables under investigation. To confirm the validity of the selected mediation model, future research should use longitudinal or experimental designs that provide a more complete and detailed understanding of the interaction between the examined variables. Such models allow for a more thorough evaluation of the results derived from the cross-sectional model. They allow causal inferences to be drawn and provide stronger evidence for the existence and functionality of the hypothesized relationships between the variables analyzed. A notable shortcoming of the present study is its exclusive reliance on self-report instruments, unsupported by qualitative diagnostic or confirmatory interviews. Although self-report instruments are undoubtedly the quickest method of data collection, they are not without inherent limitations. Self-reported responses may be exaggerated, respondents may be too embarrassed to reveal personal details, and various biases may influence the results. These include social desirability, appreciation, indulgence, acquiescence, and the need for consistency and rationality (Choi. & Pak, 2004). In addition, the failure to understand some words, the presence of sentences in negative form, or the use of language that might elicit

ambiguous or ambivalent interpretations may hinder participants' ability to respond promptly or effectively, especially when they are inattentive or influenced by the framing effect (Choi & Pak, 2004). The influence of personal memories and emotions on the interpretation of events, particularly those in the past, can also be a source of frequent and sometimes significant bias in participants' approach to questionnaires. To improve the accuracy and validity of such instruments, qualitative methods and/or clinical interviews should be incorporated with the aim of mitigating the limitations typically associated with self-report instruments. A viable strategy to mitigate this bias would be the implementation of a longitudinal design, which can reduce the inherent limitations associated with self-report interviews and improve understanding of the nature and direction of the relationships among the variables being examined. In addition, it would be useful to expand the study population by involving a sample of adolescents to gain a more complete understanding of the phenomenon and observe its characteristics and dynamics in the transition from adolescence to adulthood. The study of a population of other age groups would make it possible to observe the evolution of the phenomenon analyzed, particularly with regard to the impact that parenting style can have in a period of life inherently characterized by transformations and conflicts in parent-child relationships and communication, such as adolescence. This analysis would allow us to study, in a diachronic dimension, the effects of parental psychological control from adolescence to young adulthood, with the possibility of comparing perceptions of parental psychological control from the perspective of adolescents and young adults and identifying early signs of distress that may be related to it. Furthermore, it would allow us to examine the coping mechanisms that adolescents use to deal with stressful situations, which tend to become more stable and defined in adulthood, and the effects that the tendency to over-tolerate distress may have on eating disorders, which often emerge during adolescence and are likely to become chronic in adulthood.

Future Directions

The results of the present study, despite the important limitations mentioned above, may provide insights for the design and testing of clinical, social, or educational interventions to address binge eating disorder among young adults. From this perspective, the exploration of potential risk and protective factors related to binge eating disorder is crucial to make prevention and treatment interventions more effective and timelier, and to identify strategies that are more targeted to the specific characteristics of individuals experiencing the BED symptomatology. In the context of prevention, it would be useful for school professionals to pay attention to children and adolescents who have difficulty coping functionally with stressful tasks, while

experiencing negative emotions and a progressive deterioration of their social relationships and mental and physical health. Moreover, school professionals could be encouraged to pay attention, particularly with regard to adolescents and preadolescents, to potential dysfunctional eating behaviors and attitudes that may also emerge as a coping mode to tolerate a high level of stress in order to meet parental expectations and feel worthy of their love and appreciation. The fear of not meeting others' expectations and the strong need to avoid negative evaluation by others, even at the expense of one's own well-being and personal satisfaction, seem to share the experience of being subjected to parental psychological hypercontrol, dysfunctional distress tolerance, and the development of binge eating symptomatology. For these reasons, it might be important for professionals dealing with eating disorders, particularly binge eating, to pay attention to the role of the family context, particularly how individuals with BED or at risk of BED perceive attitudes and modes of interaction and communication with parents. In light of our findings, we believe that focusing on the relationships that adolescents and young people have with their parents/caregivers, by designing and implementing interventions aimed at improving parent-child interaction and communication and, through it, increasing autonomy and self-determination, can have a positive spin-off in preventing and overcoming binge-eating disorder and related distress. Similarly, early recognition of the tendency of these individuals to be overly perfectionistic and persistent in completing tasks, even in the presence of illness and unhappiness - an attitude that several scholars and clinicians highlight as typical of eating disorders - can be very helpful. Based on the latter considerations, an important strategy may be to work on young people's management and expression of emotions and cognitive rigidity: here the aim would be to unhinge the tendency to hypercontrol which was learned from their parents and then reproposed by themselves through dysfunctional interaction with their bodies and maladaptive resistance to pain, improving their ability to respond functionally to difficulties and promoting the practice of more functional coping strategies in dealing with stressful situations.

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Figure 1. The figure portrays the mediation model that was utilized. For purposes of clarity, only the direct paths are reported; parcels are not reported.

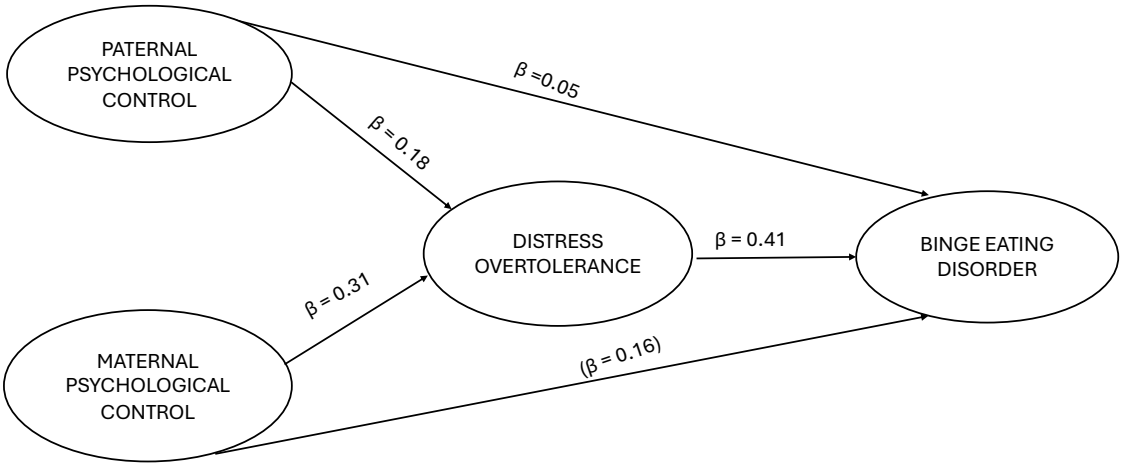


Table 1. Descriptive analyses, reliability and correlations

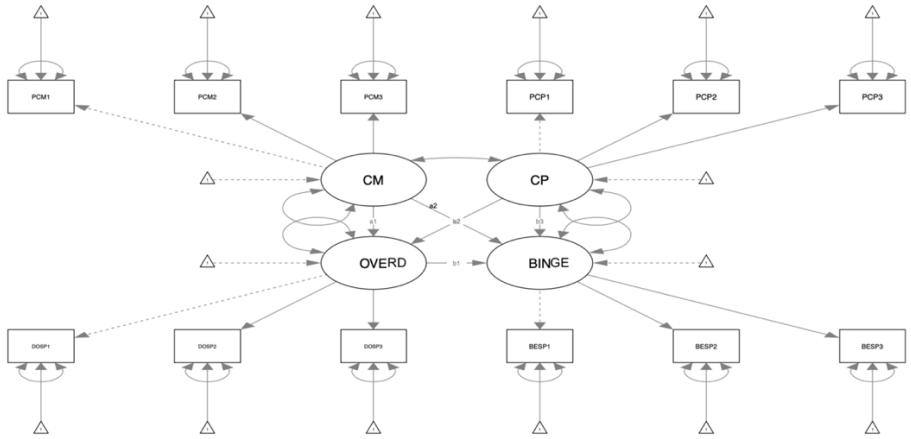
	M	SD	S	K	α	1	2	3
1. Distress overtolerance	88.4	29.9	.07	-.67	.92	-	-	-
2. Binge eating disorder	9.0	9.3	1.43	.76	.92	.46*	-	-
3. Paternal psychological control	11.9	4.0	1.17	.66	.86	.29*	.23*	-
4. Maternal psychological control	12.6	3.8	.84	-.05	.83	.35*	.31*	.39*

Note: N = 1024. *p < .01.

Table 2. Goodness-of-fit indices of the measurement models

	χ2	p	CFI	TFI	SRMR	RMSEA
Fit Indices	(48)=99.83	<.01	.99	.99	.02	.03

Figure 2. Sem Path of the selected model



Note: This figure outlines the Sem Path of the selected model, determined through the parceling approach. Specifically, in the plot, circles represent latent variables, rectangles represent observed variables, and triangles represent measurement errors. CM = Maternal psychological control with PCM1, PCM2, PCM3 representing its three constituent parcels; CP= Paternal psychological control with PCP1, PCP2, PCP3 representing its three constituent parcels; OVERD = Distress over-tolerance with DOSP1, DOSP2, DOSP3 representing its three constituent parcels; BINGE = Binge eating disorder with BESP1, BESP2, BESP3 representing its three constituent parcels. Only the direct paths are shown in the figure to ensure a clear reading of the model. The paths a1 shows the direct effect between maternal psychological control and distress over-tolerance, b1 shows the direct path between distress over-tolerance and binge eating disorder, a2 indicates the direct effect of maternal psychological control on binge eating disorder, b2 shows the direct path of paternal psychological control on distress over-tolerance, b3 represents the direct effect of paternal psychological control on binge eating disorder. For more details, see Table 3.

Table 3. Path Estimates of the structural model, SE and 95% CIs

Direct effects	β	p	SE	CI LL	CI UL
CP → OVERD	0.18	< .001	0.04	0.11	0.29
CM → OVERD	0.31	< .001	0.05	0.25	0.43
OVERD → BINGE	0.41	< .001	0.04	0.36	0.52
CP → BINGE	0.05	0.186	0.04	-0.03	0.15
CM → BINGE	0.16	< .001	0.05	0.09	0.28

Indirect effect of CP via OVERD	β	p	SE	CI LL	CI UL
CP → BINGE	0.07	< .001	0.02	0.05	0.13
Indirect effect of CM via OVERD	**β**	**p**	**SE**	**CI LL**	**CI UL**
CM→ BINGE	0.13	< .001	0.02	0.10	0.19

Note: The following table shows the values of standardized beta coefficients, standardized errors, *p* values and maximum and minimum levels of confidence intervals. OVERD = Distress overtolerance; CP = Paternal psychological control; CM = Maternal psychological control; BINGE = Binge eating disorder; β = standardized beta coefficient; *p* = level of significance; SE = standard error BC 95%; CI = confidence interval; LL = lower limit; UL = upper limit.

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Autism spectrum disorder and parents' daily life: Social challenges and personal perceptions within an audiovisual therapeutic treatment

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Abstract

Our research aims to explore the impact that the diagnosis of autism spectrum disorder (ASD) may have on the emotions, perceptions and daily life of parents of children with ASD Level 1, according to the Fifth Diagnostic and Statistical Manual of Mental Disorders. This study stems from a pilot project – Video-Pharmakon – developed by Azienda Ospedaliera San Giovanni di Dio e Ruggì d'Aragona (Salerno, Italy), in the Clinical Unit of Therapeutic Filmmaking and Documentary Videotherapy for Neurodevelopmental and Autism Spectrum Disorder. Video-Pharmakon project involved two pairs of parents and their child with ASD. Because scholars believe that the family system plays a key role in the success of children's therapeutic processes, in parallel with the children's course, we decided to reserve a great deal of space for videotherapeutic parent training, involving them in interviews designed to explore their perceptions related to ASD, parenting skills, and the couple's relationship. The interviews were videotaped, transcribed and analyzed through a multidisciplinary and qualitative computer approach. According to the literature, the diagnosis of ASD significantly affects parents' lives, which revolve entirely around their children, especially that of mothers. The data collected can therefore be useful for implementing parenting support interventions and improving the well-being of children and parents.

Keywords: Autism spectrum disorder; Therapeutic Filmmaking; Videotherapy; Qualitative research method; Text mining; Sentiment analysis; Text analysis.

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by social and relational deficits. As reported by the American Psychiatric Association (APA, 2013), ASD is defined by the presence of impairment in the areas of social interaction and communication, as well as the presence of restricted and repetitive behaviors. People with ASD report difficulties in developing peer relationships, sharing experiences and communication, show little interest in others and less capacity for pretending or symbolic play, have restricted interests, tend to follow an inflexible routine, in their daily lives, and express intolerance toward change by reacting with distress, opposition and aggression. Several studies show a higher level of stress in parents of children with ASD than in parents of children with other developmental disorders (Alenazi et al., 2020; Lee et al., 2024). However parents of children with ASD who can rely on social resources and support are more likely to manage educational difficulties and experience lower levels of stress (Bent et al., 2023). Regarding gender differences in the implementation of coping strategies in response to stressful events, scholars demonstrate the existence of different coping strategies between men and women, considering men more competent than women in avoiding stress (Graves et al., 2021; Theodoratou et al., 2023). These findings could be interpreted by considering the different roles men and women tend to play in family management and child care (Reshi & Sudha, 2022). In particular, in families with disabilities, women seem to be more likely to be the designated caregiver and to mediate between the family and physicians (Gilmore-Bykovskyi et al., 2018; Pillemer et al., 2018; Schaffler-Schaden et al., 2021). Vadivelan et al. (2020) also highlighted gender differences in the attribution of meaning to illness and disability, reporting that women are more likely to blame themselves for their children's problems and to experience the disorder and disability as a threat to their identity. In the case of children with ASD, the characteristics of the disorder influence and change several aspects of parenting, often requiring the assumption of multiple roles and the implementation of new and more complex coping strategies (Saladino et al., 2021). Parenting a child with ASD, in addition to entailing greater responsibilities, can also generate ethical dilemmas, a sense of inadequacy, frustration, and various relationship problems. Children with ASD need more guidance, supervision and support than typically developing children, which entails a large investment of time and resources on the part of the family. In responding to children's needs, parents should acquire new skills and strategies (Sabatino et al., 2020; Saladino et al., 2021). Parents tend to give up everything in their personal, couple, social, and often work lives to focus exclusively on the needs of their children. As a result, they may experience loneliness, isolation and imbalance in the couple relationship (Markodimitraki et al., 2024). A common risk for families relating to disabilities or

neurodevelopmental disorders is the progressive reduction of communication and affectivity within the parental couple who tend to recognize only the parental role, ignoring the couple and negatively affecting the marital relationship (Ratri & Ratnasari, 2023). An additional challenge that parents of children with ASD face is stigmatization in the social context. Indeed, because of their difficulty in social behavior, these children tend to transgress social, spatial, or temporal boundaries (Alshaigi et al., 2020). Indeed, children may exhibit inappropriate social behavior, increasing the embarrassment, fear, distress and anger of parents who are faced with the "double duty" of managing their own feelings and emotions and the reactions or judgments of others. Indeed, children's failure to comply with social norms is attributed to parents' inability to educate and instruct them. In this context, parents often respond by scolding their children in public or by internalizing moral responsibility and developing self-stigma (Ibid.). According to the literature, intervention strategies for families with children with ASD should focus on developing social and communication skills, reducing the severity of children's dysfunctional behaviors, and increasing parental support (Dawson-Squibb et al., 2020; Deb et al., 2020; O'Donovan et al., 2019). In particular, parenting training has been shown to be highly effective in improving children's responsiveness, expressive language, and functional play and reducing behavioral difficulties, as well as improving the social and coping resources of the parental couple, thereby increasing their ability to provide appropriate care for their children (Saladino et al., 2020). Based on these considerations and assumptions from the literature, the present study aims to increase knowledge on the topic of parenting, specifically to explore how parents of children with ASD tend to perceive their role and relationship with their children and cope with the difficulties and challenges associated with the disorder, with a focus on exploring gender differences in coping with stressful events and emotions associated with ASD. As for children, the aim is to improve their social, emotional, and interpersonal skills, supporting them in perceiving and recognizing their own emotions and feelings and improving their ability to share and communicate them effectively to others, with the ultimate goal of improving the quality of life for both parents and children, providing more targeted guidance and suggestions to researchers, clinicians, and other professionals working in this field.

The Project

Our work derives from Video-Pharmakon pilot project developed by the San Giovanni di Dio and Ruggì d'Aragona Hospital (Salerno), in the Clinical Unit of Therapeutic Filmmaking and Documentary Videotherapy for Neurodevelopmental and Autism Spectrum Disorder, in collaboration with the Department of Political Science and Communication of the University of Salerno; the Department of Human, Social and Health Sciences of the University of Cassino and Southern Lazio; the Department of Medicine, Surgery and Dentistry "Salerno

Medical School"; the Laboratory of Audiovisual Storytelling (LABSAV) of the University of Salerno; the Department of Medical and Surgical Sciences "Magna Graecia" of the University of Catanzaro; the Institute for the Study of Psychotherapies in Rome; the socio-cultural association "Gruppo Pensiero"; the socio-cultural association "Sviluppo Psicosociale"; "Psicotypo," Association for Information and Updating in Psychology; and the Society for Research in Video and Filmmaking Therapy (REFIT). The present study involved two Italian male preadolescents, ages 11 and 13, diagnosed with high-functioning autism spectrum disorder (HFASD-Level 1), a moderate form of the disorder characterized by near-normal language skills and intelligence but social and behavioral impairments. The sample, including the two children and their parents, was recruited from the San Giovanni di Dio and Ruggì d'Aragona Hospital in Salerno, Italy, specifically from the Clinical Unit of Therapeutic Filmmaking and Documentary Videotherapy for Neurodevelopmental and Autistic Spectrum Disorder (Italy). The research team included a neuropsychiatrist, a psychologist-psychotherapist, a sociologist, and a filmmaker. As needed, the protocol included the involvement of other professionals to support the participants and professionals, such as educators, communication facilitators, and assistant directors.

Video-Pharmakon pilot project analyzed is based on a therapeutic intervention implemented through the use of audiovisual tools. With regard to the experimentation of these tools in therapeutic contexts, reference can be made mainly to the arts therapies, of which cinematherapy, documentary videotherapy and therapeutic filmmaking constitute some of the techniques that employ audiovisual language as a tool to raise awareness and promote change.

Documentary videotherapy is based on the patient's observation of his or her own therapeutic sessions. In this process, the patient is not a passive observer of an unfamiliar narrative, but rather the protagonist of his or her own life story reproduced on a screen, which can be viewed and reviewed, confronting different and sometimes unseen images of self. This technique allows for an unraveling like that operated by the mirror reflecting the individual's face, showing the patient a fundamental part of self that would be impossible to observe without it, allowing the patient to explore and interpret the reality he or she experiences from perspectives other than the usual ones. Cinematherapy presents itself as a process of redefining the setting, with the therapist working to recreate those environmental conditions by which the patient feels immersed in the story as if at the movie theatre, involved in a collective vision together with other patient-spectators. In a different dimension from those previously analyzed, therapeutic filmmaking is based on the creative participation of patients' biographical or fictional stories (Cohen et al., 2015). This technique involves participants telling their own story through video, simultaneously becoming scriptwriters, directors and actors of their own

film. The conception, construction and interpretation of the film represent the actual therapeutic process during which, through autobiographical and participatory storytelling, the patient is the first-person promoter of his or her own path of change (Sabatino, 2019, 2023, 2024). All these audiovisual resources are used at the same time as therapeutic support for patients and analytical material for researchers, as well as for the editing of the videomedications, administered during the therapeutic process. After the assessment phase, consisting of interviews and administration of questionnaires, the two children are involved in creative and playful activities with the aim of leading them to create their own film, of which they become scriptwriters, directors and editors thus perceiving themselves as protagonists of their visual narratives. The cognitive and emotional mechanisms associated with self-representation and storytelling in pictures enable participants to portray what is difficult to describe with words, giving them the means to express themselves and their own voice by interpreting them, incorporating them as happens during children's play. This process of self-description has a therapeutic effect in that it works on a double step, the construction of one's real story, with narrative tools particularly drawings and stories, and at the same time the assumption of the identity, emotions, thoughts and words of one's alter-ego, representing themselves, based on how they perceive themselves, and their heroes, based on how they imagine and construct them. The two steps are reinforced by the use of video tools that allow them to transform stories, drawings and games into a real film in which children are scriptwriters, authors, directors, cameramen and actors, experiencing all the steps related to film editing that overlap with the representation of their perceived personal identity and story and the construction of the new identity they would like to assume and the story they would like to live (Sabatino, 2024; Sabatino et al., 2021). The final narrative becomes the main outcome of the therapeutic journey. The audiovisual team guides the children during all stages of film making by teaching them how to use audiovisual tools, such as the camera, laptop and related instruments, and how to scan and organize the various activities of film construction and making, without intervening in the design and interpretation of the film by letting the children freely manifest their ideas, preferences and imagination. At the same time, the psychological team intervenes to stimulate children to explore their limitations and difficulties and to improve their emotional reactions and social skills, particularly with the aim of increasing their autonomy, self-esteem and self-efficacy, and facilitating communication with other children and team members. First, the group explains the rules of communication to facilitate the children to work as a team and support each other during the writing of the plot and all stages of making the film. The film plot, supported by the whiteboard, follows four main categories: characters, actions, desires and fears. Participants use colored markers to draw their storyboard,

gradually filling in the different categories. Children make their respective films, alternately playing the roles of protagonists, directors and actors. They choose scenes, build the storyboard and focus the story from their personal interests and learn to share and consider the partner's perspective. This process leads to increased interpersonal skills, flexibility, responsibility and autonomy. In addition, according to the peer-buddy approach, participants use the partner to receive feedback on their perceived identity, and this further enriches the process of building and defining their new identity (Sabatino & Saladino, 2023). After completing the sto-ryboard, participants decide on settings and arrange subsequent meetings to film the scenes included in the storyline. This process, called filmmaking therapy, consists of four sessions followed by two more meetings during which participants select the main scenes to edit their film. In these final meetings, participants are encouraged to share ideas and opinions, defining the meaning of the scenes and focusing on the main features of the plot from a visual and emotional point of view. The final version of the edited film is shown in a movie theater in the presence of the participants, their parents and the team. The viewing of the film is followed by feedback from parents and children who comment on the experience and share their emotions. According to systemic and strategic psychotherapy approaches that view the individual/patient as part of his or her social context and family system highlighting the mutual influence among its members and the profound influence of family interactions and communication on the outcome of therapy, particularly when the patients are children, we decided to give great space in the therapeutic process to the parents of the two children, therefore parallel to the therapeutic resumption with the pair of children, the team involved the parents in a training consisting of 4/5 meetings over two months. Based on the assumptions in the literature that reveals that the role of the family, particularly the parents, is crucial in the well-being of children especially in the presence of neurodevelopmental and/or psychological disorders, it becomes useful for research and clinicians to act on the family system directly or indirectly to promote mutual change and improve the well-being of all its members. Thus, our work focused on family support with the goal of leading a pair of parents to focus on their relationship and explore their feelings, emotions, and family dynamics. Another aspect of this work was to provide parents with specific educational tools and strategies to understand their children's emotions and behaviors, thus respecting their identity despite the disorder. They choose scenes, build the storyboard and focus the story from their personal interests and learn to share and consider the partner's perspective. This process leads to increased interpersonal skills, flexibility, responsibility and autonomy. In addition, according to the peer-buddy approach, participants use the partner to receive feedback on their perceived identity, and this further enriches the process of building and defining their new identity. After completing the

storyboard, participants decide on settings and arrange subsequent meetings to film the scenes included in the storyline. This process, called filmmaking therapy, consists of four sessions followed by two more meetings during which participants select the main scenes to edit their film. In these final meetings, participants are encouraged to share ideas and opinions, defining the meaning of the scenes and focusing on the main features of the plot from a visual and emotional point of view. The final version of the edited film is shown in a movie theater in the presence of the participants, their parents and the team. The viewing of the film is followed by feedback from parents and children who comment on the experience and share their emotions. Another objective was to provide the parents with resources for their individual and couple well-being, which would enable them to reduce the parental stress associated with coping with the disorder and to regain their individual identity, interests, social relationships and professional growth, and to improve the couple relationship by increasing communication and empathy with each other, especially by trying to balance the maternal and paternal roles, making the father more present and attentive in the care of the children and consequently relieving the mother of family tasks and responsibilities.

During the parent training, the psychotherapist, in collaboration with the other professionals in the team, uses audiovisual techniques to help parents develop a greater awareness of family dynamics, explore their relationship with each other, and recognize their feelings and emotions, with the aim of improving their parenting resources and strategies. Participants (parents and children) fill out questionnaires at the initial stage and then as follow-ups to monitor their achievements, one month, three, six and 12 months after the end of the therapeutic process. At each follow-up, the team conducts a 60-minute interview with each pair of parents and their child, videotaped by the director, in which the psychotherapist collects data to compare the results and assess the possible risk of losing the improvements achieved through the therapeutic course. These interviews represent the qualitative analysis on which the present study is based, which aims to investigate how parents perceive their respective roles as mother and father of children with ASD.

Materials and Methods

Participants

The study included two families consisting of a father, mother, and child with ASD identified and recruited from the San Giovanni di Dio and Ruggì d'Aragona Hospital in Salerno, Italy.

Procedures

This research was conducted in accordance with the international guidelines of the Declaration of Helsinki and the Italian Association of Psychology (AIP) and was approved by the Institutional Review Board of the Department of Human Sciences, Society and Health of the University of Cassino and Southern Lazio (Italy) and the Campania Sud Ethics Committee of the University of Salerno (Italy). Participants signed

informed consent forms. At all stages of the research, the privacy of participants was guaranteed. No prizes or compensation were granted.

Statistical analysis

The qualitative interview, formulated by the team's sociologist and psychologist, investigated the following elements of the parenting experience: (a) daily or-ganization; (b) perception of one's maternal and paternal role; (c) perception of ASD; (d) child-parent relationship; (e) couple relationship; and (f) perceived social support. The interviews, lasting an average of 60 minutes, following the guidelines provided by the Jefferson Transcription System, were videotaped and transcribed ver-batim, then analyzed and compared.

The data from the interviews were subjected to three different analyses, each with specific tools and fields of inquiry.

The first analysis, called Topic analysis, was conducted jointly by the sociologist and the psychotherapist, through a selective highlighting approach using R-based Qualitative Data Analysis (RQDA) software, which enabled them to identify and code the themes and structures that emerged from the interviews by isolating phrases or groups of associated phrases. Five main categories emerged from this method of analysis.

The second analysis, known as text mining, was based on natural language processing systems. Specifically, text mining procedures were applied to each interview to extract recurrent terms and attribute meaning based on the context of the parenting experience.

The third analysis is a linguistic analysis called Sentiment analysis, a computerized procedure that can assess the sentiment of the parenting experiences that emerged from the interviews and draw an appropriate comparison regarding both parental couple and gender.

R-based qualitative data analysis

RQDA is a qualitative analysis package that can be installed and run in the R system. Developed by Huang Ronggui in 2008 as a free CAQDAS application (Huang, 2014), it allows the user to work through interfaces based on graphical icons and visual indicators, rather than syntax. RQDA allows textual data to be loaded and treated as units of analysis; large datasets can be recorded, stored, indexed, sorted, retrieved, and visualized. The software ensures flexible coding and provides maximum transparency of the research process, which can be tracked at all stages by other researchers who can control how cases (data attributes) were classified and how data were coded and analyzed, increasing the rigor, validity and replicability of qualitative research. RQDA can also transform coded results into HTLM files, increasing the ability to share data and facilitating keyword searching.

Text analysis was used as the primary research tool to explore and interpret the experience of parents of children with ASD. The text of the interviews was gradually coded into 37 first-order theoretical dimensions that were then aggregated into 5 main dimensions. An inductive type of coding was used that involved textual

units (sentences) based on established concepts, variables and/or theories. In the coding activity, the team's sociologist and psychologist paid attention to “coding traps” (Gilbert, 2002) that can lead to de-contextualization of data, and to “flexibility of coding” (Friese, 2011), understood as the constant activity of comparing and improving coding labels to represent the issues raised.

Text mining

Text mining is a form of data mining in which the data consists of natural language texts, i.e., “unstructured” documents, which combines linguistic technology with data mining algorithms. Unstructured texts require extraction analysis to be converted into structured form. Text mining employs a multidisciplinary approach using information gathering, information retrieval, text analysis, information extraction, clustering, visualization techniques, database processing techniques, machine learning techniques, and data mining. In our study, text mining analysis is based on partitioning text into individual words weighted or normalized in various ways.

In general, text vectorization allows words to be transformed into a computer-understandable numerical standard and then indexed, that is, moved to a list of relevant words through a series of procedures. Text searching based on the basic unit of words allows the application of some of the most common text mining procedures, such as topic analysis and sentiment analysis, applied in our study with the open-source software Rstudio.

Topic analysis

The first step in identifying thematic words within interviews is normalization of text documents, also called text preprocessing, which involves several steps: text tokenization (division of text into words); removal of stop words (empty and meaningless words, such as conjunctions or adverbs); stemming and rooting (reduction of word roots); normalization (removal of typos and conversion of upper to lower case, removal of excess numbers and spaces, and punctuation); and structure recognition (identification of sentence boundaries, prepositions, periods within complex sentences, and word boundaries themselves). These steps are functional for automatic processing for term-document-matrix (TDM) creation. In the vector-spatial model, the text is analyzed according to the words that compose it.

Text preprocessing was performed on all documents, a list of all words used at least once in at least one interview was created, and all terms used only once in a single interview were removed. Each document is represented as a vector of numbers; a collection of documents will then be represented by a two-dimensional matrix in which each row corresponds to a document and each column to a word. Each element of the matrix is represented by an integer, most often equal to 0, indicating the frequency of the term in that document. In the Terms-Documents-Matrix we find in the rows the words and in the columns the documents in which the respective frequencies are contained;

from this matrix the 25 most common terms by parent pair and gender were extracted.

Sentiment analysis

Sentiment analysis is one of the most widely used applications of text mining for natural language processing. Sentiment analysis is based on labeling a sentence or a small paragraph. Specifically, two lists of words are used, one positive and the other negative, which are compared with those contained in the body of the text by assigning a positive or negative label to the texts based on a calculation performed through different counts. Sentiment analysis can be carried out at various levels of reading, considering a whole text or dividing it into parts to understand the sentiment of the various elements (corpus, document, sentences, words). This type of analysis involves several steps: (a) the documents are extracted and normalized (i.e., removal of typos and conversion of upper case to lower case, removal of numbers, spaces, and excess punctuation); (b) the list of positive and negative words is loaded and they are scored; (c) the results are aggregated to get the final output/display. The syuzhet package extracts sentiment from texts based on a number of dictionaries, implemented directly in the package, found in syuzhet (developed by the Nebraska Literary Lab), afinn (developed by Finn Nielsen), bing (developed by Minqing Hu and Bing Liu), and nrc (developed by Mohammad, Saif, and Turney). The name syuzhet comes from the research of Victor Shklovsky and Vladimir Propp, who divided narratives into two elements: the fabula and the plot, also called syuzhet. The syuzhet package has several interesting functions for classifying the feeling of a text. Its vocabularies make it possible to distinguish whether a text is positive or negative and to extract specific emotions. The output of the get_nrc_sentiment function shows us how emotions are distributed in our sentences, recognizing 10 types of emotional expressions: anger, anticipation, disgust, fear, joy, sadness, surprise, trust, negative, positive. The get _sentiment function provides a total score for each sentence, calculated from the chosen vocabulary. The text can be broken down into sentences using the get_sentences function or into tokens using the get_tokens function. It is also possible to create a representation of a single text (this function does not apply to unrelated sentences) to observe how sentiment changes within it, using the get_sentiment and get_transformed_values functions.

Results

The first analysis of the text showed a general overview of the experience of the parenting pairs. During the analytical reading of the text, the researcher identified the relevant meanings expressed by the participants during the interviews and, through a process of comparison and identification of similarities and dissimilarities, converted them into key words or a summary expression, called a “code.” Then, through the identification of groups of codes with similar meaning, the researcher derived conceptual statements called “categories.” This process led to a more abstract and complex

theoretical framework related to a specific topic. Through this inductive-abductive approach, the text of the four interviews was gradually coded into 37 initial codes, which were then aggregated into 5 categories. Each content code associated with the different categories is represented in **Table 1**. According to the results, the categories "ASD" and "Parenting" play a major role over the categories "Family," "Couple," and "Social and Public Space," revealing that parents' lives seem to revolve almost entirely around the child and his or her disorder. Parents organize daily life according to the needs of the child, reducing time for emotional relationships, hobbies and passions. In fact, the codes "Time for self/hobbies," "Self-image," and "Work" emerged in the "Parenting" category in a negative perception due to the tendency of parents, especially mothers, to give up self-care and work. Specifically, our results show that mothers tend to devote themselves completely to their children as full-time work (as evidenced by the presence of "work" in both "ASD" and "Parenting" categories), while fathers tend to devote themselves more to work and hobbies. Parenting is thus perceived to be only around child care, and free time is limited and spent primarily in associations and hospitals specializing in ASD and then in occasional relationships with relatives, as shown by the "Dependence/Role Idealization," "Hyper-responsibility," and "Abnegation and Absent Presence" codes. Most play/recreational time takes place in the home or in associations dedicated to ASD between the children and their mother, while very few are spent outdoors and with both parents and children. Parents' poor participation in the social context seems to depend on the child's difficulty in managing in public spaces. The study reveals that parents feel unable to understand their child's attitudes, behaviors, and moods, as revealed by the category "ASD," particularly in "Inability to decode," "Perception of autism," "Perception of emotional state," "Perception of socialization," and "Locus of control." Regarding the type of language used, there is a non-acceptance or an attempt to hide the disorder from oneself. In fact, the "Language Labels" code shows how parents rarely utter the word "autism," referring to it more often as "the problem." The html file generated by RQDA-converted to pdf and divided into two parts-illustrates the entire coding process. The first part contains a list of all the initial codes processed. The second part includes the textual passages in an ordered and systematic form corresponding to each code. Through thematic analysis, the 25 most common terms by parent pair and gender were identified. **Figure 1** shows the results of the thematic analysis conducted on the interviews. Among the most commonly used terms common to all interviews, the word "time" stands out, as also shown by the following related words: beginning, always, often, never, now, sometimes, years, afternoon and day.

The second is related to actions and includes: saying, taking, giving, doing, playing, going, staying, happening. Regarding the differences in the two pairs, in one it is the mother who is more focused on caring for the child, while in the other

it is the father who takes on this role, as described by the frequency of terms used for the organization of daily life, timing, household management, and expressions related to the child. For more information on the terms used and to compare differences and/or similarities at the couple and gender level, reference can be made to **Figure 2**, which shows for each parental couple four word clouds consisting of the most frequent terms that emerged during the respective interviews. Interview sentiment was measured by applying the syuzhet package functions. **Figure 3** shows the frequency of the 10 emotions recognized by the software (anger, expectation, disgust, fear, joy, sadness, surprise, trust, negative, positive) with respect to parent pairs and gender. The results show a prevalence of positive terms. In the case of woman 1, negative emotions follow positive ones, while emotions of trust and expectation, followed by joy, sadness, fear, anger, surprise and disgust, have a lower frequency. In the case of woman 2, positive emotions are followed by trust, which has a slightly higher frequency than negative emotions followed, in this case, by anticipation, joy, sadness, anger, fear, disgust, and surprise. In the case of man 1, positive emotions are followed by negative emotions and trust, which have the same frequency; then, with a slightly lower frequency, we find anticipation followed by joy, fear, surprise, sadness, anger and disgust. In the case of man 2, positive emotions are followed by trust and negative emotions by anticipation, fear, joy, sadness, anger, surprise, and disgust. Comparison by parental couple shows, in the case of couple 1, greater use of the 10 emotions by the woman, while in the case of couple 2 the situation is opposite. Finally, in terms of the frequency of emotions, greater similarity was reported between woman 1 and man 2. The results are depicted in Figure 3.

Discussion

The main purpose of this study was to investigate, through a qualitative analysis, the perceptions of the parental role, ASD, child-parent relationship, and perceived social support of two pairs of parents with children diagnosed with ASD. From the textual analysis conducted on four individual interviews, five categories emerged: “ASD” and “parenting,” “family,” “couple,” and “social and public space,” with the first two categories mentioned more often than the others. These categories revealed how parents' lives are significantly affected by their child's autism spectrum disorder diagnosis, as also evidenced by parents' tendency to focus only on their child's daily needs. In fact, the study shows that as far as parents' social lives are concerned, they mainly relate to organizations and associations dedicated to ASD support, significantly reducing the time they can devote to themselves, their hobbies and social activities, friends, and couple life. The workload associated with caring for a child with ASD seems to weigh more significantly on mothers who give up their work to devote themselves to the child, as confirmed by the negative meaning of the codes “Time for self/hobby,” “Self-image,” and “Work,” and the high presence of the codes

"Dependence/role idealization," "Hyper-responsibility," "Abnegation, and Presence/Absence" in the "Parenthood" category. This result is associated with the code "gender stereotypes" in the category "Social and public space" and is correlated with the codes "wife-mother role perception" and "husband-son-father role perception" in the category "Couple". Our results confirm the findings of recent literature that the diagnosis of ASD affects the parent's life by reducing the time spent on personal and couple activities. As a result, the parent may feel isolated and the couple relationship may become unbalanced (Markodimitraki et al., 2024). The progressive decline in communication and affectivity within the parental couple - which often focuses only on the parental role, ignoring and damaging the couple relationship - is a common risk for families with children with neurodevelopmental disorders, such as those with ASD (Ratri & Ratnasari, 2023). According to the gender perspective, mothers are more affected than fathers by work overload because of the tendency to attribute and internalize the role of caregiver (Reshi & Sudha, 2022). In fact, several researches confirm the designated role for women in mediating between family and physicians (Gilmore-Bykovskyi et al., 2018; Pillemer et al., 2018; Schaffler-Schaden et al., 2021) and their tendency to blame themselves for their children's behavioral and psychological problems (Vadivelan et al., 2020). Being a parent of children with ASD can lead to a sense of inadequacy and frustration because of the increased supervision and support these children need while growing up (Sabatino et al., 2020; Saladino et al., 2021) and fear of stigma from the social context (Alshaigi et al., 2020). Regarding the terms used by parents, thematic analysis revealed some common words related to the theme of time, perception, desires, intentions, and actions. The theme of "time" and "actions" could be related to parents' investment of time and energy in caring for their child with ASD and giving up time for the couple and themselves, as confirmed by the literature (Markodimitraki et al., 2024). A similar consideration is possible for the theme of "wishes and intentions" that appear totally directed toward planning and organizing the child's daily activities. This could be a defense mechanism aimed at reducing the sense of helplessness and guilt common to parents of children with ASD (Alshaigi et al., 2020). Finally, regarding the issue of "perception," it seems that parents remain on the cognitive and logical-rational plane, as evidenced by the use of language that tends to negate the emotional and affective component, favoring the sphere of concreteness and actions. Probably this type of language is driven by the same motivations found for the other topics, namely an attempt to decrease the self-blame associated with ASD children's behavioral problems. Analysis of feelings based on the interviews revealed 10 feelings (anger, expectation, disgust, fear, joy, sadness, surprise, trust, negative, positive). The use of the 10 identified emotions emerges more in couple 1 than in the other couples, denoting

greater maturity and emotional awareness. Finally, regarding the process of monitoring parents' emotions within the interviews, it emerges that woman 1 mostly reported a positive feeling for more than half of the interview, and then peaked negatively and concluded with neutral language. Woman 2 starts with a negative sentiment, then reveals a more positive sentiment that persists until the end. Man 1 begins the interview with a positive feeling, followed by a negative feeling and oscillates between these two components concluding with a negative peak. Similarly, man 2 oscillates between positive and negative feelings, but concludes with a positive peak. The data show an oscillatory pattern of parents' emotions, regardless of gender. One possible explanation could be related to the subjectivity of emotions associated with the child's disorder. Obviously, to obtain a broader assessment in this sense, more pairs would need to be recruited. In general, parents' negative emotions seem to be related to internalized stigma and fear of judgment from the social context. In fact, children with ASD tend to transgress social norms, leading parents to experience negative feelings, such as fear, distress, and anger (Saladino et al., 2021). The most common feelings among families with children with disabilities and neurodevelopmental disorders are often characterized by ambivalence both in dealing with the news of the diagnosis and in identifying and constructing their parenting style. In fact, parents are inevitably not emotionally and cognitively prepared to deal with the disorder, as is also reflected in their language expressions, from which difficulties emerge with respect to recognizing and managing emotions.

Limitations

Our research has some important limitations: first, the limited sample recruited, and second, the collection of only qualitative data, which potentially limits the generalizability of the results. Therefore, it is suggested that future studies on the topic involve a larger sample and also collect quantitative data to reduce interpretive bias and increase the scientific framework of the results.

Future implications

This article may represent a significant contribution in exploring the emotional state of parents and their perceptions of the diagnosis of ASD in order to implement more targeting and efficient interventions to support them in coping with the diagnosis, building the relationship with their children, managing couple relationship, safeguard socialization, work and recreational activities. In light of this, it might be useful for future research and clinical interventions to focus more on parents' self-empowerment, stress reduction, and improvement of their psychosocial well-being. It this sense it would be useful that these studies and interventions are not limited to the parental role, but involved the parent in all aspects of his/her identity, as wife/husband/partner, as worker, as individual with interests, hobbies, friends. This approach would restore the parent's identity as an individual, with a positive impact on parenting style, parent-child relationships, and communication, improving children's well-being.

Based on the data collected, we also emphasize that special attention should be paid to the caregiver role of women, considering the high investment of mothers in caring for children with ASD, which is associated with the gender roles and stereotypes that characterize the maternal figure, as highlighted by our study. These interventions can reduce mothers' self-blame and stigmatization toward the diagnosis of ASD and the resulting difficulties in managing their children's attitudes and behaviors, which often result in their withdrawal from work, social relationships, and self-care.

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Table 1. Description of codes and categories of parental interviews

Code Categories	Codes	Content
ASD	Attempted solution	Implementation of practices in an attempt to solve some problems related to ASD
	Decoding inability	Inability to understand attitudes, behaviors and moods related to ASD
	Disclosure	The child's degree of openness in telling about himself, in telling his experiences or in making his moods known
	Everyday life	Management of the daily routine
	Future	Hopes and plans for the future
	Job	ASD as a full-time job
	Linguistic labels	Terms and expressions used to refer to the ASD
	Locus of control	Perception of the degree of control, direct or external, of ASD-related events
	Maintenance of problem	Implementation of unsuitable practices for attempting to resolve some problems related to ASD
	Organisation of her/his son's activities	Management of the child's extracurricular activities
	Perceptions of autism	Perception of attitudes, behaviors and moods related to ASD
	Perceptions of change	Perception of the degree of change in ASD-related disorders
	Perceptions of socialization	Perception of the degree of interaction / integration with peers related to ASD
	Perceptions of the emotional state	Perception of the child's emotional state in different contexts and circumstances
	Projects	Participation in treatments and therapeutic projects for ASD implemented by public or private subjects
	Prospect in change	Wishes, hopes and goals for changing ASD-related problems
	Reciprocity	Degree of interest and involvement (parent-child) in each other's daily activities
	The problem	Highlighting of the critical issues related to ASD
PARENTHOOD	Abnegation	Spirit of sacrifice, absolute dedication to the good of the child and to one's duties accompanied by the renunciation of one's interests
	Activity	Daily activities carried out with the child
	Attribution of blame	Perception of possible wrong choices made in the educational process
	Decoding inability	Inability to understand and respond adequately to attitudes, behaviors and moods related to ASD
	Dependence/Idealization of role	Idealization of the role connected with paternity and maternity as defined by traditional cultural canons
	Gender stereotyping	Definition and division of parental roles according to traditional cultural canons
	Iper-responsibility	Extreme sense of duty connected with the role of parent
	Job	Conditioning of non-domestic work activities on the basis of commitments linked to the ASD
	Locus of control	Perception of the degree of control, direct or external, of ASD-related events
	Organisation of her/his son's activities	Management of the child's extracurricular activities
	Parental couple	Degree of agreement in parenting choices related to the educational process
	Perceptions of husband-father role	Perception of the role of husband / father, in a hypothetical and real sense, by the wife
	Perceptions of parent role	Perception of the role of parent, in a hypothetical and real sense, by the spouses
	Perceptions of wife-mother role	Perception of the role of wife / mother, in a hypothetical and real sense, by the husband
	Presence/Absence	How parents live their moments of absence from home and / or the moments of absence of the child
	Self-image	The subject's perception of himself and the image of the person he would like to be
	Time for yourself/Hobbies	Time that parents reserve for themselves and to cultivate their interests
FAMILY	Activity	Daily activities that involve the whole family
	Everyday life	Family organization of daily life
	Presence/Absence	How the moments of presence / absence of the child or parents are managed
	Reciprocity	Degree of interest and involvement (parent-child) in each other's daily activities
	Relationship with relatives	Interaction and moments of sharing with the extended family
COUPLE	Couple's relationship	Moments reserved for the intimacy of the couple relationship
	Parental couple	Degree of agreement in the choices related to the educational process
	Perceptions of husband-father role	Perception of the role of husband / father, in a hypothetical and real sense, by the wife
	Perceptions of parent role	Perception of the role of parent, in a hypothetical and real sense, by the spouses
	Perceptions of wife-mother role	Perception of the role of wife / mother, in a hypothetical and real sense, by the husband
SOCIAL AND PUBLIC SPACE	Associations	Relationship with associations present in the area for the management of disorders related to ASD
	Gender stereotyping	Gender definition and differentiation based on traditional cultural models
	Hospital	Relationship with hospitals in the area for the management of disorders related to ASD
	Perceptions of socialization	Perception of the degree of interaction / integration with peers related to ASD
	Projects	Participation in treatments and therapeutic projects for ASD implemented by public or private subjects
	School	Relationship of parents and children with educational institutions
	Social desirability	Tendency to pursue an image of normality understood as adaptation to the most shared norms within a society

Figure 1. Topic analysis: The 25 most common terms by parental couple and gender

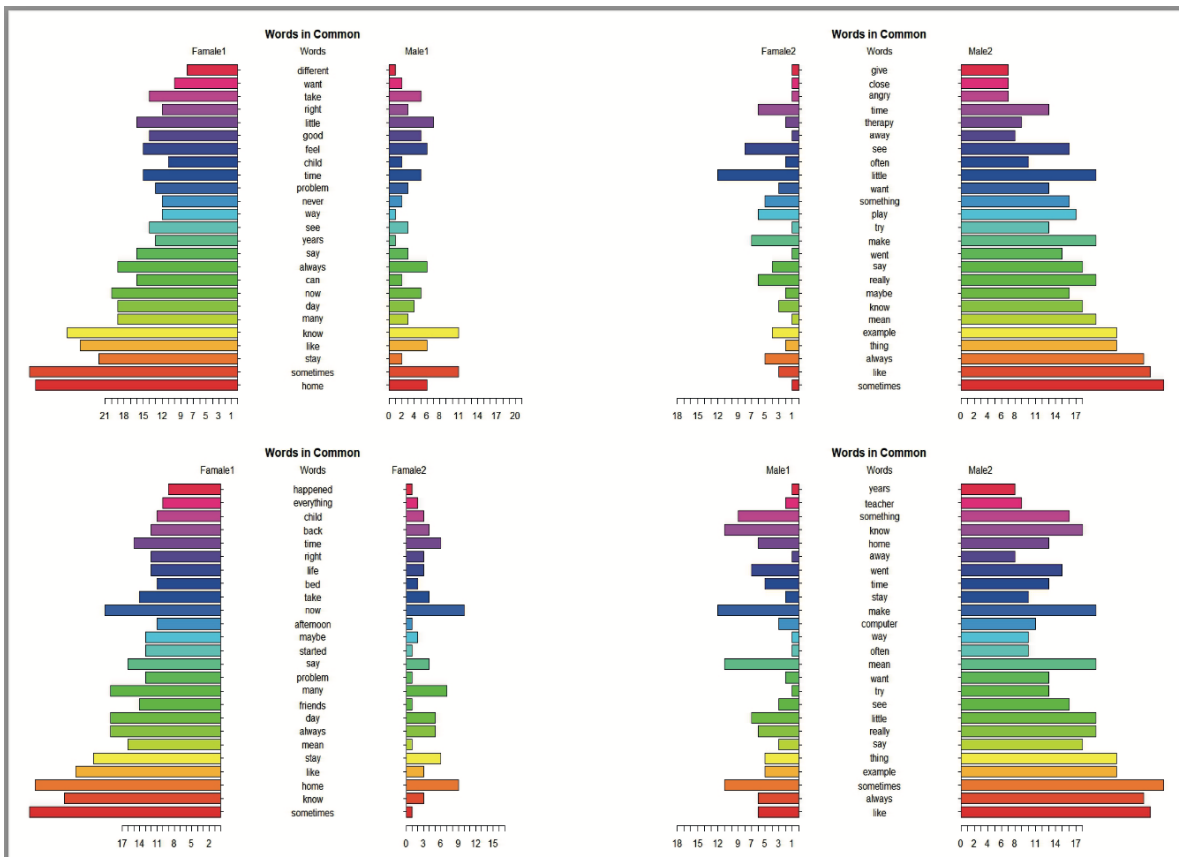


Figure 2. Text Mining: Words clouds compared per parental couple and gender

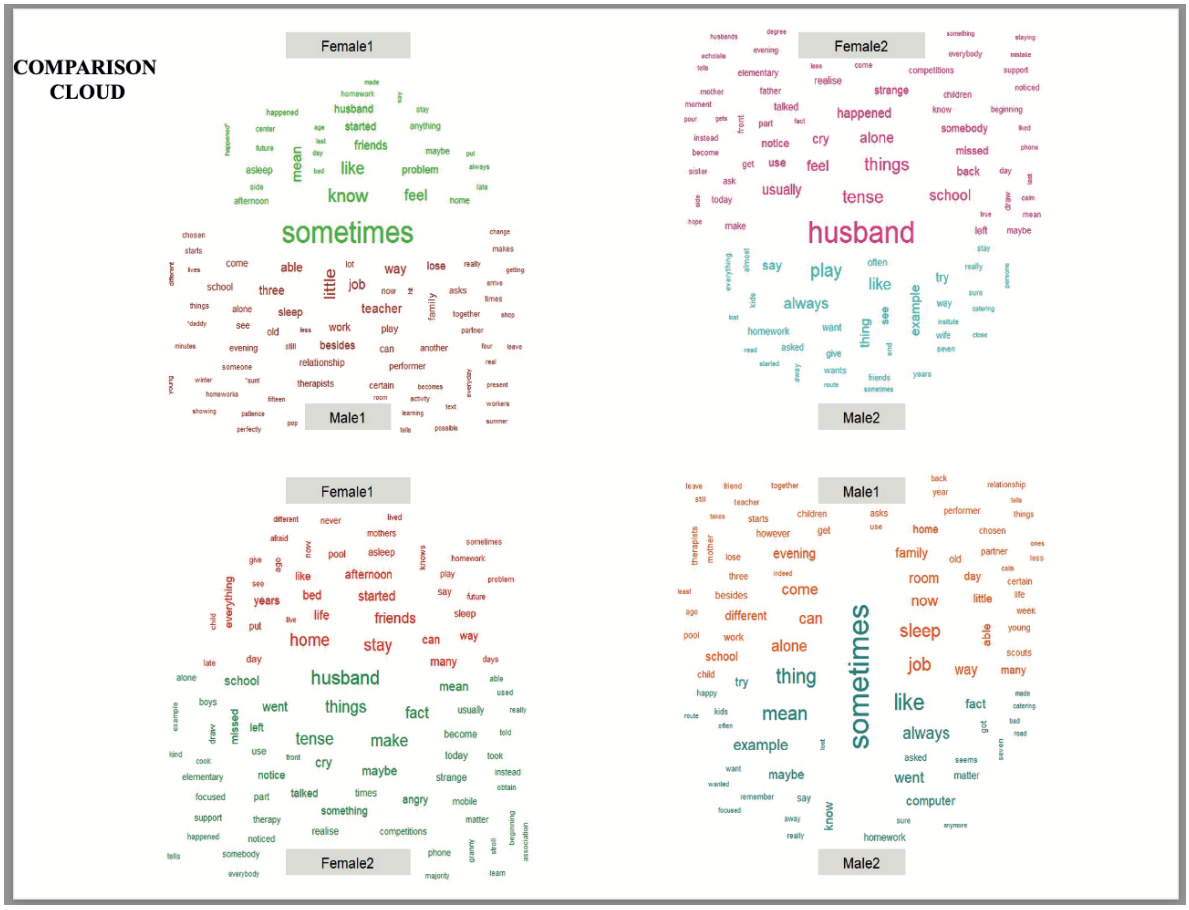
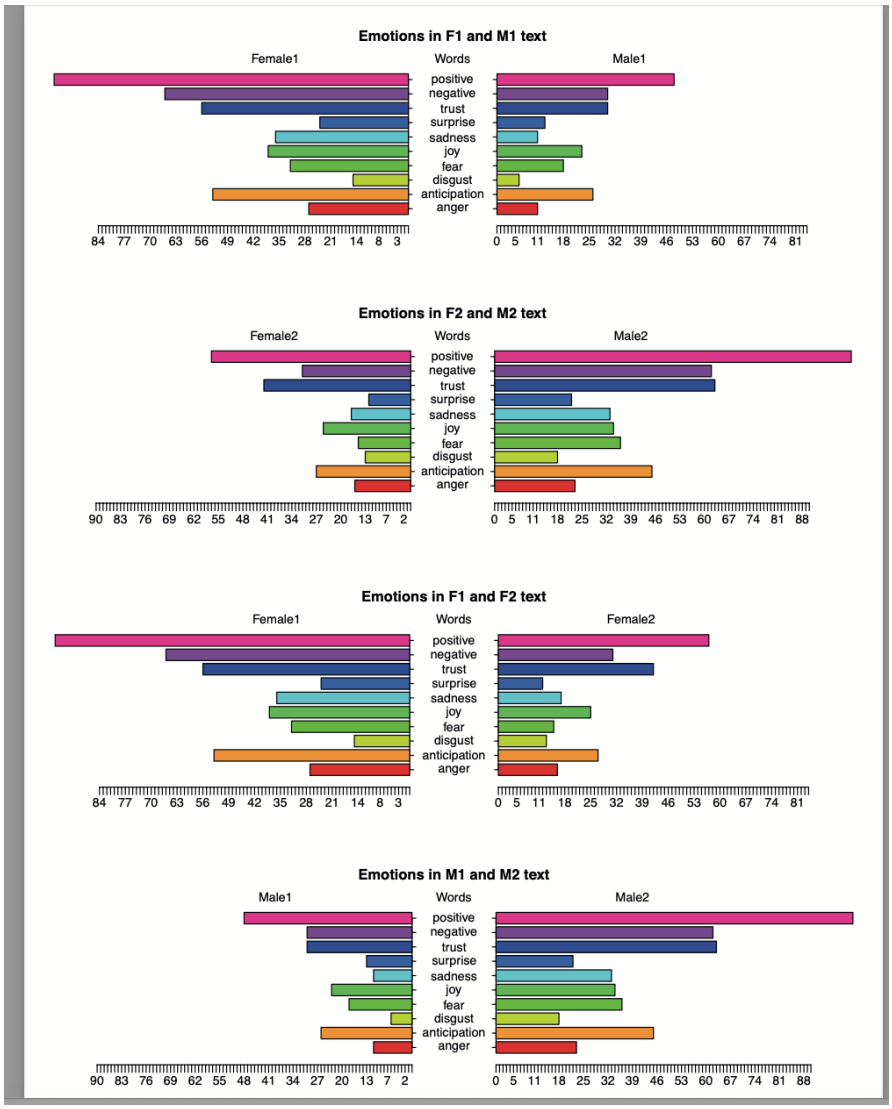


Figure 3. Sentiment Analysis: Frequency of 10 emotions (recognized by syuzhet package) compared per parental couple and gender



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The Role of Work Engagement in Driving Innovation and Transformation in Healthcare: A Brief Report on Telemedicine and Telerehabilitation

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Abstract

This study explores the relationship between work engagement and organizational innovation in the healthcare sector, with a focus on telemedicine and telerehabilitation. The study examines how healthcare professionals' engagement in their work can act as a catalyst for the successful adoption and implementation of new technological solutions that reshape service delivery models. By analyzing a case study on the use of telemedicine in neurorehabilitation, the paper highlights the critical role of work engagement in fostering empowerment, enhancing collaboration, and driving positive change in healthcare organizations. The research emphasizes the importance of integrating technology with human factors, such as professional autonomy, communication, and participation in decision-making, to improve both employee well-being and organizational performance. The results demonstrate that high levels of work engagement among healthcare staff are essential for achieving innovation, improving patient care, and ensuring the sustainability of healthcare services. Ultimately, the paper underscores the need for healthcare organizations to prioritize work engagement as a key driver for transforming healthcare practices and systems through digital innovation.

Keywords: Work engagement, healthcare Innovation, employee empowerment, organizational citizenship

Introduction

Organizational efficiency and the performance of planning are strongly connected to workers' commitment: the motivation of employees, much like that of managers, serves as the lever for change. Thus, analyzing workers' work engagement in complex sectors such as healthcare proves very useful in delineating this ecosystem and its overall engagement, revealing that there exists a single engagement context.

A mix of professional skills and relational abilities is an essential prerequisite for achieving excellent performance and triggering change management and a culture of transformation (Lent & Studdert, 2019; Liu et al. 2020; Giannopoulou & Tsobanoglou, 2020). Vision, the nature of the business, and the size of the organization undoubtedly impact the willingness to innovate. The healthcare context, particularly, represents the convergence of technological innovation and human relationships emerging from a new work environment.

In professional activities, literature highlights the role of individual skills, especially in managing relationships with clients or service beneficiaries. Similarly, this can be applied to workers' autonomy, their ability to self-motivate, and their capacity to act as "primary controllers" of their own performance.

Regardless of whether organizations are private or public, in implementing public policies, specialized and managerial skills combined with technological solutions represent the strength of the service, creating safe and motivating work environments for employees. The management of healthcare organizations is tasked with ensuring work process management models oriented toward accountability, models inspired by employee protection and merit recognition (Flynn et al., 2016). An organization improves by fostering behaviours in people that are oriented toward responsibility management, information sharing, and learning—not just individual and team learning but also organizational learning. Delaney and Huselid (1996) speak of "organizational citizenship," underscoring that both workers and managers must embrace empowerment as a fundamental element.

Shantz et al. (2016) direct work engagement toward four specific types of interventions: training; individual development actions; participation in decision-making processes Chakraborty et al., 2023); and communication between employees and managers.

-Training impacts both empowerment and organizational safety, helping reduce human error and, above all, fostering awareness of roles, the organization, and relationships with users. This training is not only technical but also includes communication, technological aspects, and soft skills.

-Individual development programs help operational management and stress management, leading to more conscious engagement

with healthcare organizations, which positively affects both personal and organizational performance (Cho et al., 2006).

-Increased employee participation in decision-making processes strengthens engagement and responsibility toward one's work. Providing structured opportunities to contribute, including through dissent or expressing opinions on management processes, becomes a valuable resource.

Effective communication between managers and employees facilitates better understanding of tasks, relationships, and interventions.

Across these four practices, the use of technology and technology-supported communication is a transversal factor. ICT- Information and Communication Technologies tools enhance empathy, communication speed, and deeper participation compared to traditional organizations.

In the study presented, in healthcare system, these four levers significantly influence workers' engagement. Work engagement is defined as "a positive, fulfilling state of mind regarding one's job, characterized by vigour, dedication, and absorption" (Salanova et al., 2005). Shantz et al. (2011) emphasize that the motivational process is influenced by critical factors known as "job resources," which enhance both organizational performance and well-being—key components of structural balance.

In this context, work is often burdened by significant administrative tasks that lie outside the cultural and technical training of doctors and nurses. These procedural aspects, often unpopular among healthcare staff, are necessary for management and operations. Technology alleviates these administrative burdens, enabling greater focus on healthcare issues.

The role of healthcare professionals thus becomes that of a "super-user": simultaneously serving the final healthcare service user and the healthcare organization (Smith et al., 2020). These professionals mediate, facilitate processes, customize services, and make them as accessible as possible. Visualizing the e-health system as a kind of exchange platform enabled by ICT, healthcare professionals can be metaphorically seen as super-users, holding the keys to refining service delivery. They are as engaged as the end-user, though from a different side of service delivery.

In this perspective, the concept of engagement aligns closely with corporate social responsibility and the long-term sustainability of healthcare services (Testa et al., 2017). This approach seeks to understand and explain the relationship between an organization and its stakeholders. From a broader viewpoint, sustainable development involves advancing engagement rather than limiting approaches to conflict resolution arising from differing expectations. Thus, value co-creation among service participants includes this additional figure - an intermediary between

management and the end-user - contributing to the co-creation process from an internal yet mid-way perspective (Lo Presti et al., 2019).

This study starts from an ICT application to healthcare, particularly a case of telemedicine, focusing on aspects of empowerment, engagement, and service redefinition, with important emphasis on the involvement of healthcare staff and their mode of engagement.

The spread of telemedicine technologies, understood in the broadest sense (both hardware and software), is now an established fact, affecting all healthcare facilities to varying degrees. Investments in this field continue to grow, albeit at a slower pace than desired, due to pressures from spending review cycles. The impact of these investments is already evident, with significant potential still emerging. This potential extends beyond mere improvements in efficiency or effectiveness and reaches into new configurations of service organization and delivery models. The latter aspect is particularly relevant today, as innovation is approached systematically, involving not only a large portion of an organization's members but also its external stakeholders (users, partners, policymakers, suppliers, etc.); while some innovations (such as the introduction of a robot for medication administration) have a localized and specific impact on processes, others (such as electronic health records or certain telemedicine applications) can have widespread effects, influencing multiple phases, roles, and relationships. These innovations create the conditions for an evolution in the service delivery system that both requires and enables a new way of accessing healthcare services.

However, for this to happen, the introduction of new technological solutions must be designed, implemented, and managed with full awareness of their real potential. It is essential to consider the risks and implications associated with changes that affect all dimensions of an organization and extend beyond its boundaries to include all actors in the system, from users to healthcare professionals.

The ability to broaden the perspective and shift the focus from technology as an end to technology as a tool for transformative change requires new conceptual frameworks. These frameworks should restore the strategic value of innovation and acknowledge the complexity associated with the systemic nature of the process.

Methods

This report provides an opportunity to focus on the role that digital technologies can play as an enabling and triggering factor for initiating complex change processes that lead to new service models. The research aims to enhance the understanding of the potential associated with the effective use of advanced telemedicine technologies and the conditions necessary for fully realizing this potential.

Specifically, two closely related research questions arise, addressing the fundamental issues needed to achieve the overall objective: (a) What changes in the "service system" model can be enabled by the introduction of digital technologies in healthcare service delivery processes through work engagement?; (b) How work engagement facilitates the activation of virtuous dynamics in the innovation process, being a trigger to permit the success of these innovation models?

The experimental project on which this case is based was initially planned during the COVID-19 pandemic. The research takes place in a highly complex and emergency-driven sector undergoing rapid evolution due to an unprecedented period of stress. These changes are placing constant pressure on healthcare organizations to introduce and manage innovations, which in turn requires new skill sets among sector workers and a different type of engagement compared to other service models (Windrum et al., 2008; Bloch et al., 2013; Djellal et al., 2013). The study is developed by examining the involvement of various actors (healthcare professionals both doctors and operators, and institutional stakeholders) in the care process.

Participants fulfil a questionnaire prepared by the project team as requested European funding of the project itself (see **Appendix**).

The questionnaire is anonymous, in accordance with the provisions of Legislative Decree no. 196/2003 and EU Regulation 2016/679, and the collected data has been processed in an aggregated manner. The types of providers included in the survey are neurologists, psychologists, physiotherapists, and nurses—those affiliated with the service—and they are profiled by gender, age, and years of service. The research was approved by the Project Manager.

Results

This study is based on a telemedicine application applied to neurorehabilitation. Telerehabilitation refers to the use of information and communication technologies to support rehabilitation services remotely. The Telerehabilitation service was started from a project submitted to the European Commission and funded by the Horizon 2020 programme. The data were collected using all contextual documents and 60 questionnaires were administered, with 51 responses received from staff units involved in the experimental process. The working groups follow the division by rehabilitation clusters but are engaged in homogeneous implementation protocols for procedures. The format is structured based on a Likert scale and was administered after six months of experimentation. Other documents on the context, in a broader ethnographic sense, were analyzed for comparison. The questionnaire aims to gather information on satisfaction, usefulness, and usability related to teleneurorehabilitation service

providers (physicians and healthcare professionals).

Regarding the questionnaire responses, out of 51 feedback entries, the sample consisted of 26 physiotherapists, 6 psychologists, 8 neurologists, and 11 nurses, 32 men and 19 women, with an average age of 48 and an average age of service of 16 years. The analysis of the responses was qualitative, and questionnaires were distributed and collected though Google Forms.

Concerning the effectiveness of telerehabilitation, 80% of the sample rated the process aligned with the clinical effectiveness recorded by the hospital (perceived effectiveness matches clinical outcomes).

Regarding usability-related questions, satisfaction drops to 65%, mainly due to the system's dependence on the technological interface and the need for adequate technical training, particularly for control reporting.

In terms of work engagement, satisfaction rises again to 75%, thanks to the fact that the pattern is motivating, appreciated by management, and highly valued by both caregivers and patients. Additionally, in the supporting documents of the experiment, healthcare operators demonstrated a high level of interaction with the operational innovation of the equipment and adaptability techniques.

Finally, regarding the last set of questions, healthcare staff observed strong involvement from both patients and their caregivers. This is likely due to the highly positive response from users, who expressed great enthusiasm about feeling continuously engaged in rehabilitation rather than only during scheduled sessions throughout the week or month.

According to the results, the advantages of using telerehabilitation systems include:

- ensuring continuity of care over time (after discharge) and across locations (from the hospital to the patient's home);
- potentially increasing the frequency and intensity of rehabilitation therapy delivery;
- significantly reducing service costs.

Discussion

The study project aims to assess the application of teleneurorehabilitation in terms of therapeutic effectiveness and compliance with the rehabilitation pathway the involved staff units. The results reported focus on the therapeutic personnel involved, aiming to highlight an engagement perspective that is particularly relevant for digital healthcare management and the role that the involvement of this type of staff entails. It fosters a procedural innovation that raises awareness among staff members who operate between patients/caregivers and department managers.

Based on the case study methodology, a qualitative analysis was conducted using questionnaires and document analysis to collect data on the teleneurorehabilitation experiment. The results showed that healthcare

professionals positively perceive the changes compared to traditional methodologies, as they are accustomed to in-person work. Conversely, when organizational changes do not align with technological changes, healthcare professionals may experience increased stress. This highlights the critical role of engagement in implementing these protocols. The process represents an almost entrepreneurial and co-evolutionary adaptation (Sambamurthy et al., 2003), as Rogers' innovation diffusion model (1995) emphasizes the perceived attributes of innovations as a key determinant of their successful organizational adoption.

From a managerial perspective, innovation is an idea or practice perceived as “new” by individuals, groups, or organizations. According to the innovation diffusion model, the perceived attributes of innovations significantly influence awareness, attitudes, adoption or rejection, implementation or resistance, and ultimately, the reinforcement of behaviours (Rogers, 1995).

Specifically, within such a novel context as teleneurorehabilitation, innovations can also be hindered by users or therapists due to their significant divergence from traditional therapeutic habits. On the other hand, in this project, we observe mid-to-long-term levels of observability, meaning that the results are visible and easily assessable from a broader perspective.

The questionnaire included the following categories: (1)the relationship between technology and rehabilitation and the areas where this relationship has the greatest impact (service accessibility, reduced travel, overall health needs satisfaction, patient management, treatment effectiveness, team collaboration, and information exchange among professionals); (2) the operational utility of telerehabilitation; (3) work simplification: ease of use of tools, productivity, user-friendliness, flexibility, and ease of learning; (4) comparison with traditional rehabilitation methods; (5) the speed at which the operator learns to use the system; (6) the level of innovation attributed to the system; (7) satisfaction with the teleneurorehabilitation experience (expectations, satisfaction, future perspectives, knowledge of other systems, and relationship with telemedicine); (8) overall assessment; (9) knowledge sharing with colleagues; (10) relationship with other professions.

Regarding work engagement positively influences workers satisfaction: the 75% of participants attributed it to the motivating nature of the program, its appreciation by management, and the strong positive reception from caregivers and patients. Given the nature of the disease, patients require constant interaction with hospital staff, meaning that engagement in one group influences the other. Supporting documents also showed that healthcare professionals were highly

interactive in innovating operational procedures and adapting tools.

The study investigated the effects of technological innovation on organization, worker engagement, and family/patient involvement in the teleneurorehabilitation project. These effects were analyzed from the perspective of healthcare workers, who experienced changes in organizational structure and management, as well as shifts in patient and caregiver attitudes due to the impact of highly innovative technologies.

Specifically, regarding organizational and managerial effects, the study found that:

-There was improved collaboration between healthcare staff and patients/caregivers, as well as among staff members with different specializations and hierarchical levels. This also fostered collaboration between traditionally separate sectors, such as psychology and medicine, through interdisciplinary teamwork.

-The adoption and implementation of new rehabilitation technologies must be accompanied by an effective communication interface and appropriate training to foster necessary and virtuous engagement.

-Patients and families demonstrated a strong willingness to collaborate, both for ongoing and post-therapy monitoring.

-Users expressed high satisfaction with this type of system, even compared to traditional rehabilitation methods.

As reported in the **Table 1**.

Conclusion

The process of managing healthcare services, due to the increasingly urgent demand, the growing resources to be allocated, and the considerable aging of the population, has in recent years led to the search for a new model of sanitary systems. This model seeks to combine effectiveness and efficiency with humanization, ensuring that service personalization becomes a lever for the proper use of public resources rather than just a scenario for small-scale experimentation.

Through innovation, technology, and new forms of communication, many aspects have been redefined, and the system is evolving toward different paradigms. In general, the goal of this process is to establish new forms of organization by modelling a new concept of service, with particular attention to healthcare.

Work engagement is a critical factor in enhancing both individual and organizational performance. A highly engaged workforce leads to increased productivity, improved job satisfaction, and better overall well-being among employees. When individuals feel valued, empowered, and connected to their roles, they are more likely to be proactive, innovative, and committed to the organization's goals.

To sustain high levels of work engagement, organizations must foster a positive work environment that encourages participation, professional growth, and meaningful recognition. Leadership plays a fundamental role in

creating a culture of engagement by promoting open communication, supporting career development, and ensuring that employees have the necessary resources to succeed.

Ultimately, investing in work engagement benefits not only employees but also the organization. It strengthens team cohesion, reduces turnover, and enhances overall efficiency. As workplaces continue to evolve, prioritizing engagement will remain essential in adapting to new challenges and achieving long-term success.

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Appendix

Following the questionnaire used in the study presented. This questionnaire is in original language.

Il seguente questionario ha lo scopo di rilevare alcune informazioni sul gradimento, l'utilità e la usability relative ai provider (medici e professionisti sanitari) di servizi di teleneuroriabilitazione. I dati raccolti potranno fornire indicazioni per la pianificazione e il miglioramento della qualità dell'organizzazione e del servizio offerto.

Il questionario è anonimo, i dati raccolti saranno trattati in modo aggregato nel rispetto della legge sulla privacy, coerentemente con quanto previsto dal D.Lgs.n 196/2003 e dal Regolamento UE 2016/679.

La ringraziamo per la collaborazione

Il questionario viene compilato in data

Età

Sesso ☐ M ☐ F

Anni di servizio_____

Qualifica (ad es.: neurologo, psicologo, fisioterapista, infermiere, etc.): psicologa

---

1. Pensa sia necessaria l'introduzione delle nuove tecnologie in ambito medico/riabilitativo?

A. Sì, certamente
B. Sì, talvolta
C. No, non molto
D. No, per niente
E. Non so/non ho un'opinione in merito
F.

2. In base alla sua esperienza, la teleriabilitazione...
(Indicare la sua opinione per ogni voce su una scala da 1 a 5, dove 1= totalmente in disaccordo e 5= totalmente d'accordo)

2.1	Migliora l'accesso ai servizi sanitari	1	2	3	4	5
2.2	Riduce il tempo di spostamento per il paziente da casa in ospedale	1	2	3	4	5
2.3	Soddisfa maggiormente i bisogni di salute del paziente	1	2	3	4	5
2.4	È una procedura utile per una migliore presa in carico del paziente da parte del medico/operatore	1	2	3	4	5
2.5	Aumenta l'efficacia del trattamento sul paziente	1	2	3	4	5
2.6	Consente di allungare la durata del trattamento con conseguente maggiore efficacia dello stesso	1	2	3	4	5
2.7	Consente al paziente di imparare correttamente lo svolgimento degli esercizi e di effettuarli in autonomia anche dopo la fine della terapia ufficiale	1	2	3	4	5
2.8	Migliora la qualità delle diagnosi, perché il lavoro in team di varie categorie di esperti fornisce una conferma clinica	1	2	3	4	5
2.9	Migliora il trasferimento di competenze tra gli operatori coinvolti nella somministrazione del servizio	1	2	3	4	5

3. Pensa che la teleriabilitazione da lei sperimentata sia stata una procedura utile nella presa in carico del paziente?

A. Sì, certamente

B. Sì, in alcuni casi

C. No, non molto

D. No, per niente

E. Non so/non ho un'opinione in merito

4. Riguardo all'utilizzo degli strumenti di teleriabilitazione ritiene che:

(Indicare la sua opinione per ogni voce su una scala da 1 a 5, dove 1= totalmente in disaccordo e 5= totalmente d'accordo)

4.1	É stato semplice usare questo sistema	1	2	3	4	5

4.2	Il suo lavoro potrebbe diventare più produttivo usando questo sistema	1	2	3	4	5
4.3	Le piace usare questo sistema	1	2	3	4	5
4.4	Questo sistema consente di fare qualunque cosa desideri fare	1	2	3	4	5
4.5	Questo sistema è facile da imparare	1	2	3	4	5

5. Pensa che una buona relazione operatore sanitario-paziente sia importante per il buon funzionamento di un progetto di teleriabilitazione?

A. Sì, certamente

B. Sì, talvolta

C. No, non molto

D. No, per niente

E. Non so/non ho un'opinione in merito

6. Esprima la sua opinione riguardo alle seguenti affermazioni:

(Indicare la sua opinione per ogni voce su una scala da 1 a 5, dove 1= totalmente in disaccordo e 5= totalmente d'accordo)

6.1	Le visite effettuate attraverso un sistema di teleriabilitazione sono le stesse delle visite effettuate di persona	1	2	3	4	5
6.2	Quando ho commesso degli errori usando il sistema, potevo rimediare facilmente e velocemente	1	2	3	4	5
6.3	Nel sistema di teleriabilitazione ho potuto parlare facilmente con il paziente	1	2	3	4	5
6.4	Il sistema mi permette di dedicare più tempo al paziente	1	2	3	4	5

7. In genere, ha bisogno di molto tempo per accettare nuove tecnologie o esperienze?

A. Sì, certamente

B. Sì, talvolta

C. No, non molto D. No, per niente

8. Quale grado di innovazione attribuisce al servizio di teleriabilitazione?

A. Nessuno

B. Basso

C. Medio

D. Elevato

E. Molto elevato

F. Non so/non ho un'opinione in merito

9. Le seguenti affermazioni riguardano la sua soddisfazione in merito all'esperienza con la teleriabilitazione. (Indicare la sua opinione per ogni voce su una scala da 1 a 5, dove 1= totalmente in disaccordo e 5= totalmente d'accordo)

9.1	La teleriabilitazione incontra le mie aspettative	1	2	3	4	5
9.2	Sono soddisfatto di quello che la teleriabilitazione offre al paziente	1	2	3	4	5
9.3	Mi piacerebbe che il paziente continuasse ad usufruire del trattamento in teleriabilitazione	1	2	3	4	5
9.4	Mi piacerebbe che il paziente sperimentasse altre tecniche di teleriabilitazione	1	2	3	4	5
9.5	Mi piacerebbe saperne di più sulla telemedicina	1	2	3	4	5
9.6	La teleriabilitazione aiuta a cambiare il modo di gestire la patologia	1	2	3	4	5
9.7	Preferisco che si utilizzi la teleriabilitazione rispetto alla riabilitazione tradizionale	1	2	3	4	5

10. Qual è la valutazione complessiva della sua esperienza di teleriabilitazione?

A. Insoddisfatto

B. Poco soddisfatto

C. Sufficientemente soddisfatto

D. Molto soddisfatto

E. Completamente soddisfatto

F. Non so

11. Consiglierebbe la teleriabilitazione ai suoi colleghi?

A. Si

B. No

C. Non so

12. Accetterebbe positivamente l'introduzione della teleriabilitazione come nuovo approccio di riabilitazione?

A. Sì, certamente

B. Sì, in alcuni casi

C. No, non molto

D. No, per niente

E. Non so/non ho un'opinione in merito

13. In base alla sua esperienza come valuterebbe i vantaggi della teleriabilitazione per le seguenti figure professionali: (Indicare la sua opinione per ogni voce su una scala da 0 a 10, dove 0= nessun vantaggio e 10= il massimo dei vantaggi)

13.1	Neurologo	0	1	2	3	4	5	6	7	8	9	10
13.2	Fisiatra	0	1	2	3	4	5	6	7	8	9	10
13.3	Psicologo	0	1	2	3	4	5	6	7	8	9	10
13.4	Infermiere	0	1	2	3	4	5	6	7	8	9	10
13.5	Fisioterapista	0	1	2	3	4	5	6	7	8	9	10
13.6	Terapista occupazionale	0	1	2	3	4	5	6	7	8	9	10
13.7	Tecnico della riabilitazione psichiatrica	0	1	2	3	4	5	6	7	8	9	10
13.8	Logopedista	0	1	2	3	4	5	6	7	8	9	10
13.9	Educatore professionale	0	1	2	3	4	5	6	7	8	9	10
14.0	Dietista	0	1	2	3	4	5	6	7	8	9	10

Table 1. Staff Engagement (Source: own elaboration)

Concept	Definition	Relationship with engagement
Empowerment	The use of sophisticated tele-neurorehabilitation equipment and the targeted training related to it.	Strong synergy between empowerment and engagement due to the involvement of the user in the telemedicine system, which features a high degree of personalization based on staff experience.
Activation	Through usability and the customization of protocols, the role of healthcare professionals is highly proactive.	The dyadic and institutional relationship between doctor and operator is reshaped considering proactive involvement.
Self-management	The rehabilitative nature of the service inherently promotes self-management, allowing professionals a degree of autonomy that is fundamental.	There is not merely a transfer of knowledge but rather true involvement of healthcare professionals.
Adherence	Greatly enhanced by devices, data management, and parameter monitoring.	The contest supports engagement.
Compliance	Highly complex due to the acute patient setting of the hospital but facilitated by caregiver involvement.	Staff engagement and testimony are highly beneficial to therapeutic compliance.
Shared decision-making	Crucial, especially in rehabilitative care. Telerehabilitation is based on this organizational model.	Shared decision-making consciously increases engagement.
Involvement and participation	As stated in the previous item.	As stated in the previous item.