



A Preliminary Evaluation of an Online Parent Training Based on Self-Determination Theory Aimed at Digital Parenting

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Abstract

Background In an age where technology is pervasive, parents may find it difficult to educate their children in a healthy use of digital devices.

Objective In this preliminary study, we explore the potential value of an online Parent Training (PT) based on Self-Determination Theory (SDT) in fostering parents' ability to regulate their children's use of digital devices. We also investigate whether the expected improvements can be ascribed to the specific PT provided or may be linked to other forms of training.

Methods Thirty-three parents and their 29 children participated in this study. Parents attended one of two PT, based on SDT or Behavior Therapy (BT), respectively. Participants filled in a self-report questionnaire before (T1) and after (T2) the PT sessions, and at a six-month follow-up (T3). The survey investigated parental autonomy support, structure, affiliation, behavioral strategies, and children's digital device-related problem behaviors.

Results Parents and children in the SDT-PT group reported an increase in their perceptions of parental structure and affiliation at T2 and T3, and a decrease in behavioral issues at T2; parents also reported higher values of autonomy support at T2 and T3. Compared with parents attending the BT-PT, those in the SDT-PT group reported higher perceptions of autonomy support, parental structure, and parental affiliation at T3.

Conclusions Despite several methodological limitations, including a small sample and the absence of a no-intervention control group, this study offers valuable insights for planning SDT-based interventions to support digital parenting, and triggers a series of considerations regarding psychological intervention sustainability.

Keywords Parent-training · Self determination theory · Digital devices · Parents · Children

Introduction

Nowadays, people are exposed to technology from a very young age, and as such, parents are supposed to not only guide their children in the real world, but also to educate them in a healthy use of digital devices (Adelman & Adelman, 2018; Wahyuningrum et al., 2020). The quality of digital parenting, i.e., parenting strategies “related to the rules of using digital devices both online and offline to protect children’s safety from the threat of its use” (Wahyuningrum et al., 2020, p.227), has a significant impact on the way children engage with digital instruments, and it is thus pivotal in preventing, or fostering, problematic behaviors among children related to technology usage. In this respect, numerous studies (e.g., American Academy of Pediatrics Council on Communications and Media, 2016; Buckingham, 2019; Livingstone & Haddon, 2009; Rideout, 2016) have showed that poor parent-child communication and conflict, restrictive mediation, and high or low parental control and monitoring are associated with the problematic use of the internet and technologies (for a review, see Nannatt et al., 2022), which in turn can negatively affect several areas of a child’s life, including attention, learning, sleep, vision, musculoskeletal health, and social relationships (Bozzola et al., 2019).

Given the crucial role of digital parenting, it is not surprising that parents report several concerns about how to behave and what educational strategies to use to promote conscious and healthy digital habits (Danet, 2020). For instance, they often feel overwhelmed by the amount of time their children spend on smartphones, tablet, and videogames, and find it hard to set appropriate limits (Reid Chassiakos et al., 2016). Furthermore, there is evidence that they struggle in balancing their children’s desire to engage with technology with their own apprehensions over screen addiction and other negative emotional and behavioral outcomes (Hinkley & McCann, 2018; Ishtiaq et al., 2021). For these reasons, parents may need support and resources to help them navigate the challenges of regulating their children’s use of electronic devices, thus preventing possible technology-related maladaptive behaviors (Bozzola et al., 2019). In the light of these premises, in this preliminary study we explored the potential efficacy of an online parent training aimed at supporting parent-child relationships and fostering parents’ ability to regulate their children’s use of digital devices.

Theoretical Framework

The literature has shown that behavioral issues in children, such as conduct problems, can be effectively tackled through early interventions focused on parenting. These programs, known as parent training, aim to enhance parenting skills and foster healthier parent-child relationships, thus leading to improved behavioral outcomes in children (Grolnick et al., 2009; Lundahl et al., 2006; Sanders et al., 2012). Parent trainings have been considered a best evidence-based practice in treating a range of childhood disorders, including autism (Byrne et al., 2023; Deb et al., 2020; Lichtle et al., 2020; Tabatabaei et al., 2022), attention deficit hyperactivity disorder (Doffer et al., 2023; Lee et al., 2022; Marquet-Doléac et al., 2024), disruptive behavior disorders (Beelmann et al., 2023; Bloss et al., 2022; Zarakoviti et al., 2021), and emotion-regulation problems (Zalewski et al., 2020). Despite their established efficacy, parent training interventions have not been systematically deployed to specifically target or prevent behavioral issues related to children’s engagement with technologies, such as screen time management and online safety (Danet, 2020), and their

application in this field thus remains largely unexplored (Saccà et al., 2022). This shortfall may stem from several factors. First, the rapid evolution of technology has outpaced the adaptation of traditional intervention frameworks (Hanelt et al., 2021), leaving a gap in addressing emerging educational challenges associated with digital media use. Although there are documents and guidelines addressing general aspects of digital education (e.g., Milovidov, 2020), they may well be insufficient, as some parents may require more targeted and tailored interventions (Allen et al., 2019). Based on these considerations, the first novel contribution of the present work lies in the preliminary evaluation of a parent training program specifically aimed at equipping parents with the necessary skills and strategies to foster responsible technology habits in their children.

Given this primary objective, an important aspect concerns the theoretical framework underlying the proposed intervention. Traditionally, parent training programs have predominantly adopted the principles of applied behavior therapies (BT; e.g., Chacko et al., 2016; Forgatch & Patterson, 2010; Lundahl et al., 2006;), designed to address specific parental behaviors that may contribute to child conduct problems, such as reward and punishment techniques, inconsistency, and poor discipline (Heubeck et al., 2016, 2023; Pezzica & Bigozzi, 2015). Despite their proved efficacy (for a review, see Chacko et al., 2016), BT-based parent training (hereinafter, BT-PT) have been criticized for neglecting important aspects of *optimal parenting* (Joussemet et al., 2018), such as self-regulation and autonomy (Allen et al., 2019; Mageau et al., 2022), which are instead fundamental aspects of children's adaptive use of technologies (Liu & Wu, 2023). These dimensions lie at the very core of the educational principles set out by the Self-Determination Theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2022), which assumes that individuals have basic psychological needs for autonomy, competence, and relatedness, which must be met by the relational context in order for youth to develop and thrive. According to SDT, optimal parenting comes from the co-presence of three key dimensions, which make it possible to satisfy the above-mentioned children's basic needs (Grolnick et al., 2021; Joussemet et al., 2018). In particular, based on this theory, parents (a) should be *autonomy-supportive*, that is, they should sustain their children's initiatives, legitimate their perspectives, offer them the opportunity to make choices, and inform them of the reasons behind the rules (Soenens et al., 2015; Vansteenkiste & Ryan, 2013); (b) should provide a *structured* educational context, that is, set clear expectations, consistent guidelines, and predictable consequences to facilitate their children's competence in planning and organizing their behavior (Farkas & Grolnick, 2010; Grolnick et al., 2014); and (c) should ensure a feeling of involvement or *affiliation*, that is, facilitate the construction of a relational climate characterized by acceptance and warmth (Skinner et al., 2005), thus offering their children time, attention, energy, and emotional support.

To date, the few studies testing SDT-based parent training programs (hereinafter, SDT-PT) have obtained positive results. For instance, SDT-PT were proved to be effective in sustaining parents to help their children to set learning goals for their school homework (Froiland, 2011), in increasing parents' and children's reports of parent autonomy support, and decreasing parents' and children's perceptions of controlling parenting strategies (Allen et al., 2019; Grolnick et al., 2021), and in reducing both parents' and children's reported levels of internalizing and externalizing problems (Joussemet et al., 2014, 2018; Mageau et al., 2022). Given these encouraging findings, the second element of novelty of the present study is to build our parent training intervention upon the theoretical framework of Self-Determination Theory. Although this approach has been little explored in the literature on

parenting programs – and, as far as we know, never explored in interventions addressing digital parenting – it appears particularly well-suited for application in digital education. In fact, by focusing on children’s autonomy and competence, as well as on building positive dynamics between parents and children (Joussemet et al., 2018), it may have the potential to address digital challenges preemptively, rather than solely correct maladaptive behaviors reactively.

A final aspect to consider regarding parent training interventions concerns the modality through which they are conducted. To the best of our knowledge, the SDT-PT programs implemented so far have only been delivered in person (Allen et al., 2019; Froiland, 2011; Grolnick et al., 2021; Joussemet et al., 2014; Mageau et al., 2022). However, with the advancement of technology and the increasing accessibility of online platforms, there has been a notable shift towards exploring the efficacy and feasibility of online-based interventions for behavioral parent training (e.g., Sullivan et al., 2021). While traditional face-to-face modalities have long served as the cornerstone for disseminating parenting strategies and support, the development of online parent training programs reflects a recognition of the evolving needs and preferences of modern families, as well as the acknowledgement of the potential benefits associated with leveraging technology to enhance the accessibility, scalability, and cost-effectiveness of parent training interventions (for a review, see Spencer et al., 2020). Based on these premises, the third novel contribution of the work presented in this article consists in the use of an online delivery mode to explore the potential efficacy of our SDT-based parent training program.

Aims of the Present Study

The first aim of this preliminary study was to test the potential efficacy of an SDT-PT online program in fostering an optimal parenting – i.e., autonomy supportive, structured, and involved – in the specific area of digital education. For the development of the parent training, we built upon an existing program (Joussemet et al., 2018) and adapted it (see the section “Parent Training Protocols”) so that the training sessions for parents focused on specific issues connected to children’s technology-related habits. The preliminary treatment efficacy was evaluated by testing the following two hypotheses. First (H1), in line with previous studies (Allen et al., 2019; Joussemet et al., 2014; Mageau et al., 2022), we expected that the parent participants would perceive an improvement in terms of their ability to support their children’s autonomy, provide them with a structure, and promote affiliation. Furthermore, they would perceive a decrease in their use of behavioral strategies (i.e., based on external rewards) – which were assumed to be incompatible with a parenting model based on basic psychological needs – together with a decrease in their children’s technology-related behavioral problems. Compared to the pre-intervention phase (pre-test), we expected to observe such changes both immediately after the parent training (post-test), and six months after its end (follow-up). Second (H2), we expected a similar trend in the participant children’s reports.

The second aim of this study was to test whether the expected changes could be ascribed to the specific parent training provided, or might be linked to any form of support offered to parents. To reach this goal, we compared for each time point of the data collection (pre-test, post-test, follow-up) the scores obtained by the participants in the SDT-PT, with those of the participants in a BT-PT previously validated in Italy (see Saccà et al., 2022). In this regard,

we expected to find no difference between parents' and children's reports at pre-test. In contrast, we hypothesized to find for parents and children in the SDT-PT groups significantly higher scores, both at post-test and at follow-up, for the dimensions of autonomy, structure, and affiliation, and lower scores for behavioral strategies (H3). Since the literature (Abikoff et al., 2015; Allen et al., 2019; Joussemet et al., 2014; McMahon et al., 2011) has shown that both these types of parent training (i.e., SDT and BT based) are effective in reducing children's behavioral issues, no difference between SDT-PT and BT-PT groups was expected for parents and children at post-test and follow-up on children's technology-related behavioral problems (H4).

Method

The study adopted a repeated measure design with three assessments (pre-intervention, post-intervention and six-month follow-up) and, although we did not have a control group, there were two intervention groups to be compared (SDT and BT based). The study was conducted with the approval of the Bioethics Committee of the University of Bologna (protocol number 224365/2020) and in accordance with the Declaration of Helsinki. The results of this work are presented in accordance with the TREND statement for the reporting of intervention evaluation studies with non-randomized designs (Des Jarlais et al., 2004).

Participants and Recruitment

The invitation to participate was disseminated to parents through a network of private centers (Tice Live & Learn), located in Northern Italy (Emilia-Romagna region), dealing in supporting families and schools through counseling and psycho-educational interventions. First, the researchers and center coordinators organized introductory meetings with interested parents. In these encounters, the principles behind SDT and BT based parent trainings were explained; parents were also informed that the parent-training sessions would be conducted online by two trained psychologists, and that both they and their children would be asked to complete online questionnaires at three separate times. To participate in the study parents were required to fulfil three criteria: (a) having one or more 10- to 14-year-old children (which in Italy corresponds to the lower-secondary school cycle); (b) reporting some difficulties in getting their child to stop using digital devices such as tablets, smartphones, or video games; and (c) having one or more children spending more than two hours a day using digital devices.

Intervention: Parent Training Protocols

Both the SDT-PT and the BT-PT took place online, using the Zoom online meeting platform, in the evening, and were conducted by two trained psychologists (fourth and fifth authors of this paper). In addition to the desire to maximize accessibility to the intervention while curbing costs, the choice of an online delivery mode was made necessary by the fact that interventions were conducted in 2020, at the peak of the Covid-19 pandemic emergency. During this time period, laws were in force in Italy, as well as in most European countries, heavily restricting face-to-face social contact.

Parent Training Based on Self Determination Theory

Among the few SDT-based parent training programs described in the literature, we chose to adapt the one proposed by Joussemet and collaborators (2018). This choice was determined by the promising and stable results of this intervention (Joussemet et al., 2018; Mageau et al., 2022), and to the wide dissemination of the original book (translated into more than 20 languages) that inspired it, titled *How to talk so kids will listen & listen so kids will talk* (Faber & Mazlish, 2012). After a first translation of the original model, we proceeded by adapting the protocol to the specific topic we were interested in, i.e., digital parenting. The adapted version of the program remained unchanged from the original one in terms of structure, comprising seven sessions (each lasting two hours), each of which focused on one macro-topic and aimed at promoting the acquisition of specific parenting skills (for a summary, see Table 1).

After a brief and general introduction, the first session started by discussing the dimension of *parental affiliation*, that is, the ability to recognize and accept children's technology-

Table 1 SDT-based parent training program adapted from How-to Parenting Program (Joussemet et al., 2018)

Aim and topic for each parent training session	Skills and activities
Session 1. Helping children in dealing with their feelings and wishes related to the use of digital devices.	<ul style="list-style-type: none"> – Active listening – Identify and label child's feelings – Help the child to verbalize his/her wishes
Session 2. Promoting parent-child cooperation in implementing rules and problem solving related to digital devices.	<ul style="list-style-type: none"> – Describe and explain the problem from the parent's perspective – Remind the child of the jointly agreed rules on the use of technology – Express the parent's feelings in a calm and controlled manner
Session 3. Promoting the development of alternative educational strategies to punishment (in case of undesirable behaviors related to the use of digital device).	<ul style="list-style-type: none"> – Express clear expectations – Show the child how to apologize and make amends – Show the child a range of possible alternatives and options – Take action, if needed – Engaging in technology-related problem-solving tasks with the child
Session 4. Encouraging autonomy in the use of digital devices.	<ul style="list-style-type: none"> – Let the child decide among more behavioral options, related to the use of technology – Recognize any challenges experienced by the child – Limit the number of questions – Answer questions raised by the child only after having stimulated his/her own reflections – Promote the use of external resources – Support the child's perspectives
Session 5. Describing desired vs. undesired behavior related to the use of digital devices, providing appreciation.	<ul style="list-style-type: none"> – Describe the child's behavior in a few words – Describe the parent's own feelings in the face of desirable / undesirable behaviors
Session 6. Getting children to experience the adoption of different behavioral patterns related to the use of digital devices.	<ul style="list-style-type: none"> – Notice unusual and desirable behaviors from the child – Provide the child with opportunities to try new behavior – Let the child overhear positive feedback about him/herself – Model appropriate behavior related to the use of digital devices – Recall one of the child's appropriate behaviors in the past – If the child returns to inappropriate behavior, state the parent's feelings and expectations
Session 7. Integration.	<ul style="list-style-type: none"> – Open discussion about participants' achievements and acquired skills

related emotions and ideas, even when different from those of the parents. To practice, parents were invited to put themselves in their children's shoes and exercise active listening with a welcoming approach. The second and third sessions, focused on the dimension of *structure*, sought to promote a cooperative attitude and the development of educational strategies other than punishment for undesirable technology-related behaviors. The fourth session sought to help parents to support children's *autonomy* and self-determination in relation to the use of digital devices. On this occasion, parents had the chance to practice strategies aimed at defining, together with their children, appropriate practices to be adopted when using devices within pre-established family limits and rules. The fifth and sixth sessions focused on discussing specific behaviors adopted by children in relation to digital devices. On this occasion, parents practiced the ability to describe desired and undesired behaviors, and to provide approval for the former and suggestions for improvement for the latter. Finally, the seventh session consisted of an open discussion about difficult-to-manage situations or previously learned behaviors and skills.

Parent Training Based on Cognitive – Behavioural Therapy

To have a benchmark with which to preliminarily compare the efficacy of our SDT-PT, we chose to implement a BT-based parent training focused on the topic of children's use of digital devices that had already been validated in Italy (Saccà et al., 2022). The detailed description of this intervention goes beyond the specific scope of this paper, and can be found in the original work by Saccà and colleagues (2022). In this paper, we just provide a summary of it in Table 2.

Measures

The questionnaires administered to parents and children comprised the same five measures: *autonomy support*, provision of *structure*, and *affiliation* were evaluated using three scales from the Perceived Parental Autonomy Support Scale (Mageau et al., 2015); parental *behavioral strategies* were measured through the Positive Parenting Scale from the Alabama Parenting Questionnaire (Essau et al., 2006); *children's digital device-related problem behaviors* were assessed with the Home Situations Questionnaire (Barkley, 2011; DuPaul & Barkley, 1992). The questionnaires for adults and children were modified slightly in their wording. Specifically, parents were asked to think about their own parental behaviors, and the severity of device-related behavioral difficulties of their children, while children were asked to think about their parents' behaviors, and their own device-related behavioral difficulties. In the explanations preceding the various scales, both parents and children were asked to specifically refer to situations that included the use of electronic devices. Participants responded to each item on a 7-point Likert scale of frequency ranging from 1 (never) to 7 (always), except for the last scale (children's device-related problem behaviors) ranging from 1 (Mild) to 7 (Severe). Furthermore, a section regarding socio-demographic information (age, gender, and nationality) was included at the beginning of the questionnaire.

Table 2 BT-based parent training program adapted from Saccà et al. (2022)

Aim and topic for each parent training session	Skills and activities
Session 1. Psychoeducation	<ul style="list-style-type: none"> – Provide information about children’s use of technological devices – Open discussion between experts and parents
Session 2. Preparing parents for change	<ul style="list-style-type: none"> – Explication of parents’ beliefs, attitudes, and behavior with respect to their children’s use of devices (through discussion, brainstorming and roleplaying).
Session 3. Becoming aware of the link between event or situation, child behavior, and consequences	<ul style="list-style-type: none"> – Acquisition, through discussion and simulation of daily life events related to the use of technological devices, of the main principles of the functional analysis ABC (Antecedent - Behavior - reinforcing and punitive Consequence)
Session 4. Supporting child self-regulation by setting rules	<ul style="list-style-type: none"> – Have parents identify, through discussion among themselves, a set of positive rules and routines to set with their children concerning the use of smartphones, tablets and video games
Session 5. Identifying and defining undesirable children’s behaviors related to technological devices	<ul style="list-style-type: none"> – Practice the ABC functional analysis with a focus on the consequences of undesirable behaviors
Session 6. Broadening the range of behavioral strategies to be implemented with children in relation to their use of technological devices	<ul style="list-style-type: none"> – Provide information about the use of reinforcement, token economy, response cost, and time out. – Apply the skills learned, using examples provided by experts and taken from parents’ daily life episodes – Create a small token economy project
Session 7. Anticipating children’s problem behaviors concerning technological devices	<ul style="list-style-type: none"> – Practice the ABC functional analysis with a focus on the antecedents of undesirable behaviors
Session 8. Being a positive role model	<ul style="list-style-type: none"> – Have parents identify and discuss with each other a set of functional behaviors, concerning digital devices, that can be used as models for their children (e.g., not using mobile phones during meals).
Session 9. Summarize	<ul style="list-style-type: none"> – Open discussion about participants’ achievements and acquired skills

Autonomy Support, Structure, and Affiliation

These three dimensions were assessed using three of the six 4-item scales of the Perceived Parental Autonomy Support Scale (P-PASS; Mageau et al., 2015), in its Italian version, which provides specular versions for parents and children (Nocito et al., 2020). *Autonomy support* was measured through the Choice Within Certain Limits subscale, which estimates, in terms of frequency, how much the parent involves their child in decision-making, provides alternatives for coping with situations, accepts their child’s perspective and supports their initiatives in relation to the use of technological devices. Similarly, the children’s version allows to bring out the frequency with which the child feels involved in the choices made by the parent. Item samples for the parent’s and child’s versions were, respectively: “I give my child many opportunities to make their own decisions about what they do” and “My parents give me many opportunities to make my own decisions about what I do”. Unfortunately, while the internal reliability was adequate or good for the parents (with Cronbach’s alphas ranging from 0.63 to 0.85 at different times of data collection), this was not true for the children (with Cronbach’s alphas ranging from 0.42 to 0.46). Due to this shortcoming, which was nonetheless consistent with issues related to the construct of autonomy support

found in previous studies (Molinari & Mameli, 2018), we decided not to report and comment on this scale for the children sample.

The *provision of structure* was assessed through the Rationale for Demands and Limits subscale, assessing the extent to which parents provide explanations and share motivations, rules and limits regarding their children's activities using technological tools. Item samples for the parent's and child's versions were, respectively: "I make sure that my child understands why I forbid certain things" and "My parents make sure that I understand why they forbid certain things". Cronbach's alphas for this scale ranged from 0.76 to 0.83 for parents, and from 0.81 to 0.87 for children.

Parental Affiliation was assessed through the Acknowledgment of Feelings subscale, which measures the parent's acceptance of their child's emotions, that is, how much the parent perceives that they understand the needs, thoughts, and feelings of their child and, in a symmetrical way, how much the latter perceives that they are understood by their parents. Item samples for the parent's and child's versions were, respectively: "I listen to my child's opinion and point of view when they disagree with me" and "My parents listen to my opinion and point of view when I disagree with them". Cronbach's alphas for this scale ranged from 0.65 to 0.71 for parents, and from 0.72 to 0.89 for children.

Behavioral Strategies

This dimension was assessed through the 6-item Positive Parenting scale of the Alabama Parenting Questionnaire (APQ; Essau et al., 2006), in its Italian validated version (Benedetto & Ingrassia, 2014). This scale – which in its original form already provides two specular versions, for parents and children, respectively – measures how often the parent adopts a parenting style including behaviors of reinforcement or reward with their child. Item samples for the parent's and child's versions were, respectively: "I compliment my child when they do something well" and "Your parents compliment you when you have done something well". Cronbach's alphas for this scale ranged from 0.68 to 0.85 for parents, and from 0.65 to 0.80 for children.

Children's Digital Device-Related Problem Behaviors

Children's digital device-related problem behaviors were assessed through the Home Situations Questionnaire (HSQ; Barkley, 2011; DuPaul & Barkley, 1992), which assesses behavioral (non-)compliance in children within settings that are common in the home environment, such as playing or doing homework. Of the 16 items belonging to the original situation list, for the purposes of this study we decided to retain 12 items, and to discard 4 items that were not consistent with the topic of the use of electronic devices (e.g., "Washing and bathing"). For each item, parents and children were asked to indicate in a dichotomous true/false manner whether behavioral difficulties were present in a particular situation (e.g., "At mealtimes"). If the answer was affirmative, they were asked to rate the severity of problem behavior on a 7-point Likert scale from 1 (Mild) to 7 (Severe), while in case of a negative answer, the response was coded with the score 0. Cronbach's alphas for this scale ranged from 0.87 to 0.91 for parents, and from 0.71 to 0.84 for children.

Procedure

After obtaining formal parental consent to participate in the study, parents were left free to decide which parent training to attend. Parents with more than one child were also requested to target only one of them for the study (see Joussemet et al., 2014). Parent and minor participants were asked to complete an online questionnaire at three different times: in a pre-intervention phase (pre-test, about ten days before the beginning of the parent-training), in a post-intervention phase (post-test, about one week after the end of the parent training), and in a follow-up phase (about 6 months after the end of the intervention). Regarding the administration of the questionnaires to minors, the online form was preceded by a short introductory video aimed at ensuring uniformity in giving instructions, explaining the study goals and how to fill in the survey, and emphasizing that the child could autonomously decide whether or not to complete the questionnaire. From baseline assessment to follow-up, no attrition was observed, and this was probably because parent-training sessions were carried out in the evenings, during the Covid-19 pandemic, when people were subject to the lockdown rules in compliance with the applicable Italian laws.

Data Analysis

Since our measured variables did not show a normal distribution, the data were analyzed with nonparametric tests. In particular, to analyze differences between pre- and post-test, and between pre-test and follow-up, in the five considered dimensions (autonomy support, structure, affiliation, behavioral strategies, and children's digital device-related problem behaviors), Wilcoxon matched-pair tests were carried out in both groups (participant parents and children). The correlation coefficient r was computed as an effect size estimation, where $r=0.10-0.30$ represents a small effect, $r=0.30-0.50$ represents a medium effect, and $r>0.50$ represents a large effect (Cohen, 1988). In addition, we reported η^2 as a second measure of the effect sizes in our study (small=0.01–0.08, medium=0.09–0.24, and large \geq 0.25) and compared effect sizes from our study with findings from previous studies testing the effects of a similar intervention to provide context for the interpretation of our findings.

To compare the SDT-PT with the CBT-PT, between-group analyses were carried out for both parents and children through the Mann-Whitney U-test. Statistical analyses were run using IBM SPSS Statistics 25 and the significance level was set at 0.05. As the study did not include a no-intervention control group, there are no statistical analyses in this direction, although in the [Discussion](#) section we do provide information on previous studies on similar interventions including a control group to show how values for the outcome variables are not expected to increase over time without intervention, preventing the interpretation that possible changes were due to natural change.

Results

Sample Descriptives

A total of 33 volunteer parents (five fathers and 28 mothers; $M_{\text{age}} = 46.09$; $SD=4.62$), and 29 children (20 boys and nine girls; $M_{\text{age}} = 11.28$, $SD=1.31$) participated in this study (see

Fig. 1). The first group (SDT-PT) comprised 13 parents (one father, 12 mothers; $M_{age} = 46.77$; $SD=3.94$) and 12 children (six boys and six girls; $M_{age} = 10.33$; $SD=0.78$), while the second group (BT-PT) consisted of 20 parents (four fathers and 16 mothers; $M_{age} = 45.65$, $DS=5.06$) and 17 children (14 boys and three girls; $M_{age} = 11.94$; $SD=1.20$).

Intervention Outcomes

Consistent with our expectations (H1), the Wilcoxon matched-pair tests (Table 3) showed an increase in parents’ perceptions of autonomy support, parental structure, and parental affiliation both between pre-test and post-test, and between pre-test and follow-up. Partially in line with our assumptions, we also observed a significant decrease in parents’ perceptions of their use of behavioral strategies in the follow-up compared with the pre-test. Furthermore, parents rated their children’s behavioral issues as less severe in the post-test than in

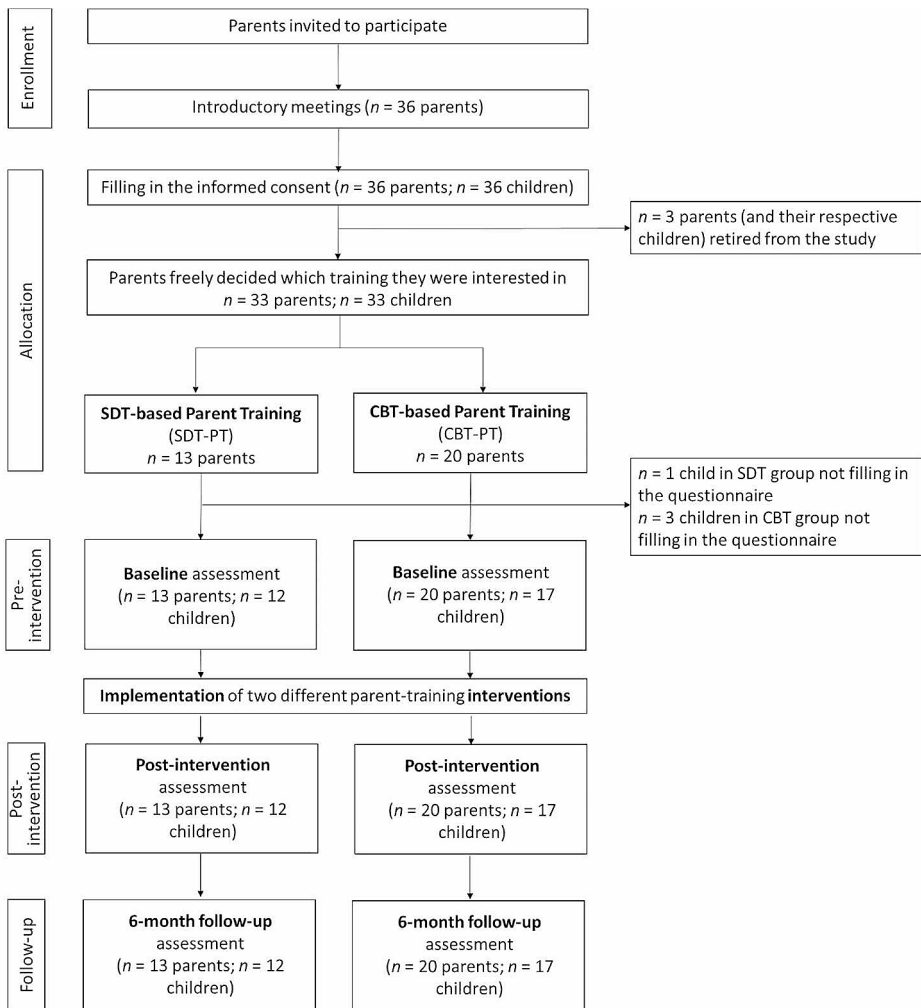


Fig. 1 Flow chart

Table 3 Differences in parents' perceptions between pre and post-test, and pre-test and follow up, on the outcome dimensions

Dimensions	Pre-test			Post-test			Follow-up			Wilcoxon matched-pair indexes						
										Pre and Post test			Pre-test and Follow up			
	M (DS)	Median	M (DS)	Median	M (DS)	Median	M (DS)	Median	Z	p	r	η^2	Z	p	r	η^2
Autonomy support	4.75 (0.42)	4.75	5.73 (0.89)	5.75	6.27 (0.44)	6.25	6.27 (0.44)	6.25	-3.054	0.002	-0.60	0.71	-3.191	0.001	-0.63	0.78
Parental structure	5.42 (0.49)	5.50	6.27 (0.67)	6.00	6.46 (0.56)	6.50	6.46 (0.56)	6.50	-2.790	0.005	-0.55	0.60	-3.192	0.001	-0.63	0.78
Parental affiliation	4.94 (0.29)	4.75	6.23 (0.52)	6.25	6.38 (0.47)	6.25	6.38 (0.47)	6.25	-3.188	0.001	-0.63	0.72	-3.195	0.001	-0.63	0.79
Behavioral strategies	5.99 (0.81)	6.17	6.18 (0.60)	6.33	5.03 (0.59)	5.00	5.03 (0.59)	5.00	-1.331	0.183	-0.26	0.14	-2.945	0.003	-0.58	0.67
Severity of behavior	1.67 (1.41)	1.42	1.12 (1.36)	0.67	1.40 (1.55)	0.92	1.40 (1.55)	0.92	-2.833	0.005	-0.56	0.62	-1.750	0.080	-0.34	0.24

the pre-test phase, while no significant difference was observed for this dimension between pre-test and follow-up.

As regards children (Table 4), in line with our predictions (H2) they obtained higher scores in the dimensions of parental structure and parental affiliation, and lower scores in behavioral issue dimension, both immediately after the parent training and in the follow-up condition. Contrary to our expectations, however, they reported significantly higher scores in the behavioral strategies dimension in the post-test, while no difference was observed for this variable between the pre-test and the follow-up.

To reach our second goal, a series of Mann-Whitney U tests were performed to check for any significant differences at each of the three intervention phases for parents and children belonging to the SDT-PT vs. BT-PT groups, respectively. Focusing on parents (Table 5), a pre-existing difference was found in the behavioral strategies dimension, significantly higher for the SDT-PT group. In the post-intervention phase, and only partially in line with our hypotheses (H3-H4), only one difference was found in the parental affiliation dimension, which was higher for parents in the SDT-PT group. Finally, a rather varied picture was observed in the follow-up. In line with our assumptions, in fact, parents belonging to the SDT-PT group reported significantly higher scores in autonomy support, parental structure, and parental affiliation, with no difference between the two groups on children's technology-related behavioral problems. Furthermore, with a turnaround from the initial phase, parents in the BT-PT group obtained a higher score in the behavioral strategies dimension compared to the SDT-PT group.

With respect to minor participants (Table 6), their results only partially confirmed our assumptions. Children belonging to the BT-PT group rated their own behavioral issues as more severe compared to the SDT-PT group in all the three phases, i.e., pre-, and post-intervention, and follow-up. In the post-intervention condition, no difference was observed as pertains to all the other tested variables. Finally, in the follow-up children belonging to the SDT-PT group registered higher scores in parental structure, with no difference in terms of parental affiliation and behavioral strategies.

Discussion

In this study, we aimed to preliminary explore whether an SDT-based online parent training was effective in promoting an optimal parenting in relation to children's use of digital devices. The results supported most of our predictions, and open relevant reflections both for research and practice, which will be discussed in greater detail below.

SDT-PT: Preliminary Efficacy Based on Parents' and Children's Perceptions

Our analyses indicated that, compared with the initial condition, in the post-test both parents and children perceived an improvement in their technology-related relationship in terms of provision of structure and affiliation, and such enhancements persisted over time in the follow-up. Furthermore, parents reported similar results in regard to autonomy support. Although some caution should be taken when interpreting these results, which derive from an intervention conducted with a small group of parents without a no-intervention control group, they still appear promising. A previous study on an SDT-based parenting interven-

Table 4 Differences in children's perceptions between pre and post-test, and pre-test and follow up, on the outcome dimensions

Dimensions	PRE (T1)			POST (T2)			FOLLOW-UP (T3)										
							Wilcoxon matched-pair indexes			Pre-test and Follow up							
	M (DS)	Median		M (DS)	Median		M (DS)	Median		Z	p	r	η^2				
Parental structure	4.90 (0.72)	4.75		6.06 (0.63)	6.13		6.17 (0.82)	6.50		-2.803	0.005	-0.55	0.66	-2.752	0.006	-0.54	0.63
Parental affiliation	4.94 (0.64)	5.13		6.02 (0.83)	6.13		5.96 (0.96)	6.25		-2.240	0.025	-0.44	0.42	-2.049	0.040	-0.40	0.35
Behavioral strategies	5.33 (0.73)	5.33		5.97 (0.60)	5.92		5.44 (0.98)	5.50		-2.156	0.031	-0.42	0.39	-0.463	0.643	-0.09	0.02
Severity of behavior	0.72 (0.91)	0.50		0.19 (0.33)	0.00		0.17 (0.27)	0.00		-2.527	0.012	-0.50	0.53	-2.668	0.008	-0.52	0.59

tion with a similar-age sample including a control group showed stability from pre-test to follow-up in perceived warmth, structure and autonomy support from parents reports in the control group (Grolnick et al., 2021). Another study showed a decrease in autonomy support and parental structure as perceived by parents in the control group (Allen et al., 2019). These findings support the interpretation that increases in these outcomes found in our study are not due to natural change but rather to the effect of the intervention. The only other similar study including children reports with a control group reported stable values for the perceived parental structure for children in the control group (Grolnick et al., 2021), again suggesting that our findings are not due to natural change. With regard to the effect size of changes, a previous study testing the efficacy of an SDT-based parent training found large effect sizes for parental autonomy support in parent reports from pre/post-test changes, but only medium effect sizes for parental structure and affiliation (Joussemet et al., 2014). Our findings of large effects on these dimensions of parental strategies are particularly consistent with a recent meta-analysis that shows how online parent trainings on a variety of subjects are indeed capable of producing change with large effects in relation to such aspects as encouragement and positive parental behaviors (Spencer et al., 2020). As for child reports, the same previous study found only non-significant effects with negligible to small effect size (Joussemet et al., 2014).

To sum up, with respect to findings from previous similar studies (Allen et al., 2019; Grolnick et al., 2021; Joussemet et al., 2014, 2018; Mageau et al., 2022) – indicating SDT-PT as effective in favoring *general* parenting practices geared towards meeting the three basic psychological needs of children – our study takes a step further by providing initial evidence that this parent training model could be effective even in the specific area of digital parenting. This is relevant, as digital devices have progressively become an integral part of adults' and especially children's lives, and have profoundly transformed the way young people communicate, think and act, creating a generation gap within which adults often struggle to navigate (Chapman & Pellicane, 2014; Nikken & De Haan, 2015; Sivrikova et al., 2020). Moreover, unlike previous parent training based on SDT, our intervention was held online. This has important implications for professional practice because, as compared with face-to-face interventions, the online format could have the potential to increase the sustainability and reduce the costs of the intervention itself (Baumel & Faber, 2018; DuPaul et al., 2018; Grodberg et al., 2022; Sadeghi et al., 2021).

As regards the dimension of behavioral strategies, our preliminary results were mixed. While for parents a significant decrease of this variable was observed in the follow-up, children reported its increase at post-test. On the one hand, it is possible that parents reduced their use of reinforcement strategies, which by definition are more related to behavioral therapy interventions, only once other SDT-based strategies had become stable. On the other hand, we could speculate that children's perceptions of the positive change in their parents' parenting approaches also extended to the reinforcement strategy dimension. Future studies, possibly based on larger samples and observational data in addition to self-reports, are needed to clarify these results.

Concerning the severity of behavioral problems, our expectations were only partially confirmed. Participating children reported a decrease in their behavioral issues at both post-test and follow-up. Although there are no previous studies with which to compare this specific result, the fact that children felt a stable advance in their behavior seems noteworthy, as the literature provides evidence that an improved self-perception has the capacity to posi-

Table 5 Comparison between SDT-based and BT-based parent-training programs (parents' sample)

Dimensions	SDT-PT group		BT-PT group		U	Z	p
	M (DS)	Median	M (DS)	Median			
Pre-intervention							
<i>Autonomy support</i>	4.75 (0.42)	4.75	5.09 (0.87)	5.25	97.000	-1.226	0.220
<i>Parental structure</i>	5.42 (0.49)	5.50	5.41 (1.04)	5.38	127.500	-0.093	0.926
<i>Parental affiliation</i>	4.94 (0.29)	4.75	5.38 (0.90)	5.25	105.500	-0.917	0.359
<i>Behavioral strategies</i>	5.99 (0.81)	6.17	4.91 (0.77)	4.58	43.000	-3.220	0.001
<i>Severity of behavior</i>	1.67 (1.41)	1.42	2.48 (1.45)	2.38	91.500	-1.420	0.156
Post-intervention							
<i>Autonomy support</i>	5.73 (0.89)	5.75	5.34 (0.87)	5.38	94.000	-1.339	0.181
<i>Parental structure</i>	6.27 (0.67)	6.00	5.70 (0.83)	5.88	84.000	-1.714	0.086
<i>Parental affiliation</i>	6.23 (0.52)	6.25	5.53 (0.76)	5.63	60.500	-2.578	0.010
<i>Behavioral strategies</i>	6.18 (0.60)	6.33	6.07 (0.61)	6.17	116.500	-0.501	0.617
<i>Severity of behavior</i>	1.12 (1.36)	0.67	1.33 (0.97)	0.96	93.500	-1.348	0.178
Follow-up							
<i>Autonomy support</i>	6.27 (0.44)	6.25	5.28 (0.91)	5.25	42.500	-3.250	0.001
<i>Parental structure</i>	6.46 (0.56)	6.50	5.74 (0.78)	5.75	58.500	-2.659	0.008
<i>Parental affiliation</i>	6.38 (0.47)	6.25	5.43 (0.80)	5.63	45.500	-3.135	0.002
<i>Behavioral strategies</i>	5.03 (0.59)	5.00	6.13 (0.49)	6.25	21.000	-4.029	0.000
<i>Severity of behavior</i>	1.40 (1.55)	0.92	1.14 (0.85)	0.96	127.000	-0.111	0.912

Table 6 Comparison between SDT-based and BT-based parent-training programs (children's sample)

Dimensions	SDT-PT group		BT-PT group		U	z	p
	M (DS)	Median	M (DS)	Median			
Pre-intervention							
<i>Parental structure</i>	4.90 (0.72)	4.75	5.31 (1.37)	5.50	60.500	-1.847	0.065
<i>Parental affiliation</i>	4.94 (0.64)	5.13	5.00 (1.64)	5.50	75.500	-1.178	0.239
<i>Behavioral strategies</i>	5.33 (0.73)	5.33	4.91 (1.42)	4.67	84.500	-0.776	0.438
<i>Severity of behavior</i>	0.72 (0.91)	0.50	1.27 (0.92)	1.25	56.500	-2.018	0.044
Post-intervention							
<i>Parental structure</i>	6.06 (0.63)	6.13	5.15 (1.44)	5.00	63.000	-1.737	0.082
<i>Parental affiliation</i>	6.02 (0.83)	6.13	5.09 (1.70)	5.75	70.000	-1.422	0.155
<i>Behavioral strategies</i>	5.97 (0.60)	5.92	5.85 (0.80)	6.00	101.000	-0.045	0.964
<i>Severity of behavior</i>	0.19 (0.33)	0.00	0.80 (0.67)	0.67	35.000	-3.006	0.003
Follow-up							
<i>Parental structure</i>	6.17 (0.82)	6.50	5.34 (1.10)	5.00	54.000	-2.137	0.033
<i>Parental affiliation</i>	5.96 (0.96)	6.25	5.32 (0.96)	5.75	65.000	-1.649	0.099
<i>Behavioral strategies</i>	5.44 (0.98)	5.50	5.71 (0.97)	6.00	84.000	-0.800	0.424
<i>Severity of behavior</i>	0.17 (0.27)	0.00	0.52 (0.48)	0.42	42.000	-2.696	0.007

tively affect mental health and wellbeing (Keyes & Ryff, 2000). Instead, for parents such an improvement was only observed immediately after the end of the intervention, with a large effect size. This is consistent with the result of a previous similar study, which found a large effect size for the decreasing of children's externalizing behaviors in parent reports from pre/post-test changes (Joussemet et al., 2014). Furthermore, results from a previous study on an SDT-based parent training (Grolnick et al., 2021), support the interpretation that the

decrease found in our study was not due to natural change. Indeed, these actors found no improvement in parents' reports of children's behavior problems in the control group over time without intervention. However, we do not know what happened between the post-test and the follow-up that flattened the perception of a children's behavioral progress in parents' reports. Perhaps the fact that data were collected in the middle of the Covid-19 pandemic in some way influenced our results. In fact, partly due to school-related needs (in Italy, schooling was fully online until the end of the 2019/2020 school year), partly due to the restrictions imposed on direct social contacts and outdoor activities, children were often kept busy with digital-related and online activities (Mascheroni et al., 2021), and this may have given them more opportunities to exhibit behaviors that their parents judged negatively or were a cause for concern. For these reasons, further studies are needed to clarify the effects over time of our parent training on children's device-related behavioral issues.

A Preliminary Comparison Between SDT-PT and CBT-PT

To explore whether the effects of our parent training depended on the specificities of the theoretical model we relied on, i.e., the SDT model (Joussemet et al., 2018), or were possibly associated with an overall support offered to parents, we compared, separately for parents and children, the results obtained in two intervention conditions, namely the SDT-PT and the BT-PT (Saccà et al., 2022). Regarding this part of our study, caution is warranted when interpreting the results. In fact, in the two conditions both parents' and children's paired groups significantly differed from each other at pre-test, even if only on one dimension, i.e., behavioral strategies for parents, and problem behaviors for children. Notwithstanding this critical issue, we can suggest some considerations on our findings.

As far as parents are concerned, in the post-test only one difference was found on the dimension of parental affiliation, higher for the SDT group. While this supports the greater emphasis given by this theoretical model to the emotional quality of the parent-child relationship (Skinner et al., 2005), the fact that no other differences were observed seems to suggest that, at least in the short-term, the effects of the two parent trainings were akin overall. It was only in the follow-up that the peculiarities of the two programs became more detectable. By reversing the baseline scenario, and in line with what we predicted, in the follow-up parents belonging to the BT group scored higher on the behavioral strategies dimension. This result is consistent with the structure of the BT-PT we implemented, which, compared to the SDT-PT, placed more stress on the use of strategies based on rewards for implementing desirable behaviors (Heubeck et al., 2023). Furthermore, consistent with what we commented on in the previous section, it is possible that the progress registered by parents in the SDT group when approaching their children's digital education valorizing their autonomy and initiatives, led them to the partial abandonment of other, rather incompatible, strategies based on external motivation (Allen et al., 2019). More interesting for the specific purposes of this work, in the follow-up parents in the SDT group registered higher scores than parents in the BT group on all three key SDT dimensions, i.e., autonomy support, provision of structure, and affiliation. These results seem to confirm, as expected, that different parent trainings act on different parenting dimensions. Furthermore, they also seem to indicate that such specific effects need time to be revealed, thus highlighting the importance to test the effects of parent training programs not only with pre- and post-test repeated measures designs (e.g., Allen et al., 2019; Froiland, 2011), but also by relying on follow-ups months from the end

of the intervention (Mageau et al., 2022). Finally, no difference between the SDT and BT groups was found in the follow-up as concerns parents' perceptions of children's problematic behaviors. While this result is in line with what we expected, it nonetheless requires further investigation, because as discussed earlier no improvement between pre-test and follow-up was found in this dimension for the SDT-PT.

With respect to children, results were only partially in line with our expectations and with what we found about their parents, with minors in the SDT group reporting higher scores for parental structure at follow-up. Albeit limited, this finding seems to confirm the specific effects fostered by parent training aimed at working on different parenting dimensions. Finally, particular caution should be used when interpreting the results concerning behavioral issues. Indeed, the children in the BT group scored higher than the participants in the SDT group already in the pre-test, and although the scores of both groups showed a decreasing trend in the post-test and follow-up, this initial significant difference was maintained over time. Therefore, the apparently stronger effectiveness of SDT-based parent training may not really be due to the effects of the intervention, but rather to the initial difference between the two groups.

Limits and Conclusions

While bearing in mind that the present study aimed to be a preliminary investigation on the effects of an innovative online SDT based parent training, there are some important limitations to be noted and addressed in future studies. A first and major limitation concerns the lack of a no-intervention control group. Further investigations including a control sample or a waiting list of parents and their children could help to better understand the influence of our SDT-based parent training on the technology-related parent-child relationship. Secondly, due to the small number of participants, our results must be interpreted with caution and do not lend themselves to generalization, thus highlighting the need for a large-scale study. Thirdly, our study was based on self-reported data. This means that we cannot take it for granted that our results match actual parenting practices or reflect real behavioral changes. For this reason, future studies should carefully consider the possibility to combine self-report questionnaires with observational instruments. Finally, the assignment of parents to the two parent trainings, SDT and BT respectively, was not performed randomly, but according to the participants' preferences. Although we are aware that this procedure is not ideal from a methodological point of view, it reflects what actually happens in professional practice, where parents are free to choose the intervention they find best suitable to their needs.

Despite these critical issues, the present study offers promising results and valuable insights for planning interventions aimed at supporting optimal parenting in the specific area of digital parenting, and at offering tangible help to families on an issue that is strongly felt and debated today. Moreover, this work triggers a series of considerations related to the sustainability of psychological interventions which, in a post-pandemic framework of increased demands for help, becomes highly relevant. Indeed, in the parent training we proposed, the group modality – which reduces economic costs compared to individual interventions – is combined with the chance to attend the course online from home, making it

compatible with family life, and paying due attention to the environment, another extremely sensitive topic that professionals should consider carefully.

Author contribution Conceptualization: Consuelo Mameli, Angela Saccà, Francesca Cavallini; Methodology: Consuelo Mameli, Angela Saccà, Francesca Cavallini, Valentina Grazia; Formal analysis and investigation: Valentina Grazia, Alessandra Albani; Writing - original draft preparation: Consuelo Mameli, Alessandra Albani; Writing - review and editing: Consuelo Mameli, Alessandra Albani, Angela Saccà, Francesca Cavallini, Greta Mazzetti, Valentina Grazia; Supervision: Consuelo Mameli, Francesca Cavallini.

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Data Availability The participants of this study did not give written consent for their data to be shared publicly. The data that support the findings of this study are available (in anonymized form) from the corresponding author [CM] upon reasonable request.

Declarations

Ethical Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Bio-Ethics Committee of University of Bologna, Italy (Date 09/10/2020 /No. 224365).

Informed Consent Informed consent was obtained from all adult individual participants included in the study. As pertains to minor participants, informed consent was obtained from their legal guardians.

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

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