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The association of technoference and parent-adolescent conflict about smartphone use with the well-being of adolescents

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Abstract: Technoference is usually defined as interruptions of face-to-face interactions due to mobile phone use. This study aimed to examine the association between technoference in parent-adolescent interactions due to parents' smartphone use, parent-adolescent conflict about adolescents' smartphone use, and adolescents' well-being. The sample comprised 282 children (60% are girls) aged 10 to 15 years and one of their parents. Adolescents rated their life satisfaction and positive and negative affect, and parents assessed technoference in parent-adolescent interactions on a newly developed measure. Adolescents and parents reported conflicts about adolescents' smartphone use on a newly developed measure. The results show that higher technoference is associated with parents' estimates of higher incidences of parent-adolescent conflict about the adolescent's time of smartphone use. Adolescents' estimates of higher incidences of parent-adolescent conflict over the time adolescents use smartphones and the content they consume, but not technoference are related to adolescents' lower life satisfaction and higher negative affect. The findings point to the importance of technoference for conflict in parent-adolescent interactions and of such conflict for adolescents' well-being.

Keywords*:* technoference, parent-adolescent conflict, life satisfaction, positive and negative affect, well-being

Povezava med tehnoferenco in konflikti med starši in mladostniki zaradi pametnih telefonov ter blagostanjem mladostnikov

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Izvleček: Tehnoferenco običajno opredelimo kot prekinitev interakcij v živo zaradi uporabe mobilnega telefona. Namen te študije je bil preučiti povezavo med tehnoferenco v interakcijah med starši in mladostniki zaradi uporabe pametnih telefonov staršev, konfliktom med starši in mladostniki glede uporabe pametnih telefonov mladostnikov ter blagostanjem mladostnikov. Vzorec je zajemal 282 otrok (60 % deklet), starih od 10 do 15 let, in enega od njihovih staršev. Mladostniki so ocenili svoje zadovoljstvo z življenjem ter pozitivno in negativno čustvovanje, starši pa so ocenili tehnoferenco v interakcijah med njimi in mladostniki na podlagi novo razvite lestvice. Mladostniki in starši so poročali o konfliktih glede mladostnikove uporabe pametnega telefona s pomočjo novo razvite lestvice. Rezultati kažejo, da je višja tehnoferenca povezana z ocenami staršev o pogostejših konfliktih med njimi in mladostniki v zvezi s časom mladostnikove uporabe pametnega telefona. Ocene mladostnikov o pogostejših konfliktih med njimi in starši glede časa uporabe pametnih telefonov in vsebine, ki jo mladostniki spremljajo, ne pa tudi ocene tehnoference, so povezane z nižjim zadovoljstvom mladostnikov z življenjem in bolj negativnim čustvovanjem. Ugotovitve kažejo na pomen tehnoference za konflikte v interakcijah med starši in mladostniki ter teh konfliktov za blagostanje mladostnikov.

Ključne besede: tehnoferenca, konflikti med starši in mladostniki, zadovoljstvo z življenjem, pozitivna in negativna čustva, blagostanje

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Adolescents' well-being in the context of digital technology use

Easy access to devices and various content on them, as well as prolonged screen time, has raised the question about the effect of device use on adolescents' well-being (e.g., Kliesener et al., 2022; Poulain et al., 2021). It was shown that with the expansion of mobile phones in 2012 when adolescents started to spend more time online and on social media, their well-being diminished compared to the well-being of adolescents who spent more time with their friends in person from 1991 to 2011 (e.g., Twenge et al., 2018). Moreover, in-person social interactions were consistently related to adolescents' greater happiness, while digital device-mediated communication was consistently correlated with lower happiness (e.g., Twenge et al., 2018).

The umbrella review of social media use and well-being showed that different types of social media use have mostly small (for the time-based predictors), occasionally moderate (for problematic social media use), but never a large association with well-being (e.g., Valkenburg, 2021). One of the reasons for inconsistency in the findings is not specifying the type of digital device use or activities and combining indicators of well-being with symptoms of mental health problems. The recommendation is to examine well-being separately from ill-being because ill-being is not simply the flip side of well-being and vice versa (e.g., Valkenburg, 2021). Well-being is usually conceptualized as a tripartite construct with the following components: a global subjective evaluation of one's life in general, referred to as life satisfaction, and the frequency of positive and negative affective experiences (e.g., Diener et al., 1999). Following these recommendations, this paper focuses on the well-being of adolescents, more precisely on their life satisfaction and positive and negative affect in relation to the use of a smartphone, as it is the most used digital device among adolescents in Croatia (e.g., Merkaš et al., 2024; Žulec et al., 2023).

Parent-adolescent conflicts about adolescents' smartphone use and technoference in the family

Parenting in the digital age is quite challenging, especially for parents of adolescents (e.g., Davis et al., 2019). The smartphone is usually perceived as a "transitional object" for children entering adolescence, providing them with a connection to, for example, their parents as they spend more time with their peers (e.g., Christensen, 2009; Wei & Lo, 2006). Many parents are aware of various risks when it comes to their children's digital activities (e.g., Blackwell et al., 2016; Lauricella et al., 2017; Mazmanian & Lanette, 2017), and are prone to control their child's smartphone use by setting restrictions, limits, and rules (e.g., Davis et al., 2019). Adolescents' views on the limits and rules on their smartphone use slightly differ from their parents' perspective because adolescents may perceive parental mediation as a violation of their privacy and independence due to adolescents' increased need for autonomy (e.g., Ghosh et al., 2018). Such a perception is related to adolescents' frustrations and usually results in conflicts between adolescents and their parents (e.g., Davis et al., 2019; Ghosh et al., 2018), especially when parents themselves fail to follow the policies they set for children, such as not using smartphones during mealtime (e.g., Blackwell et al., 2016; Davis et al., 2019).

Parents, like their adolescents, are trying to adjust and regulate their smartphone use (e.g., Bleakley et al., 2016; Davis et al., 2019; Lam & Wong, 2015), especially during face-to-face social interactions. But some of the smartphones' characteristics are enticing and intrusive (e.g., Oulasvirta et al., 2012). For example, Oulasvirta et al. (2012) showed that people have difficulties resisting the urge to check and respond to notifications on their smartphones. It is not unusual that sometimes smartphones interrupt social interactions (e.g., Hiniker et al., 2015; Liu et al., 2020; McDaniel, 2019, 2020; McDaniel & Coyne, 2016; McDaniel & Radesky, 2018). This phenomenon was first described by Gergen (2002), who called it an "absent presence". It refers to situations in which a person is physically present, but the mind of the person is somewhere else due to the distractions from a smartphone. "Absent presence" was later termed "technoference" (e.g., McDaniel, 2015; McDaniel & Coyne, 2016). Research on technoference started with studies on technoference in romantic relationships and continued with the effect of technoference due to parents' mobile phone use on children's development. McDaniel (2015, pp. 1–2) states that "technology interference or technoference includes times when and ways that technological devices intrude, interrupt, and/or get in the way of a couple or family communication and interactions in everyday life". Brief interruptions and distractions of face-to-face communication caused by, for example, parents' and children's, use of smartphones during parent-child interactions in literature are described as technoference (e.g., McDaniel, 2015). In this paper, we use the term technoference to describe situations of face-to-face parent-child interactions during which parents are checking or using a smartphone, as an intrusion, interruption, or distraction is assumed to have occurred. The focus in this paper is on technoference due to parents' use of smartphones, but technoference also happens when adolescents use smartphones during interactions with parents. The primary interest in technoference driven by parents' behavior is because parents serve as role models for their children and model communication patterns in the family, and technoference can impact families' functioning.

Technoference in parent-child interactions is well documented (e.g., Hiniker et al., 2015; Liu et al., 2020; McDaniel, 2019, 2020; McDaniel & Coyne, 2016; McDaniel & Radesky, 2018), and it happens due to both parents' and adolescents' use of smartphones (e.g., Davis et al., 2019). But parents' and adolescents' perspectives on technoference slightly differ. Davis et al. (2019) demonstrated a classic example of the fundamental attribution error (e.g., Fiske & Taylor, 1991) by showing that both parents and adolescents legitimized their own smartphone use while viewing the other's smartphone use as the primary cause of interpersonal disruption. Parents and adolescents are both making the fundamental attribution error, with each justifying their use of smartphones and not the others' use. They attribute another's actions to their character or personality (e.g., adolescents may say that their parents have problems with smartphone use because they are using them all the time), while attributing their behaviour to external situational factors outside of their control (e.g., adolescents may say that they need to use smartphones all the time because of the need for contact with friends or schoolwork). These perceptions may contribute to technology-related tensions in the family and conflict between parents and adolescents (e.g., Davis et al., 2019; Meeus et al., 2021). Moreover, McDaniel and Coyne (2016) explained that in situations of technoference parents might be sending the implicit message that their activity on a device is more important than interacting with their child at certain moments, which can lead to frustration and conflict. Meeus et al. (2021) show that technoference due to parents' device use is positively related to parent-adolescent conflict and adolescent's decreased satisfaction with family life.

Technoference in parent-child interactions and children's well-being

Parents' difficulties in managing their own smartphone use (e.g., Bleakley et al., 2016; Davis et al., 2019; Lam & Wong, 2015) can be problematic for children's well-being because parents use smartphones during the time they spend with their children as well (e.g., Elias et al., 2021; McDaniel, 2019; Radesky et al., 2014, 2016). McDaniel and Radesky (2018) claim that parents who have developed problematic smartphone use also report significantly greater technoference in parent-child interactions. According to Abels et al. (2018), activities on smartphones may be immersive and therefore require cognitive effort, so parents might have difficulties balancing their attention between the phone and their child.

One mechanism through which technoference impacts social dynamics is by displacing (non)verbal interactions between children and parents (e.g., Kildare & Middlemiss, 2017; McDaniel, 2019; McDaniel & Coyne, 2016; Radesky et al., 2015), which makes parents less available to their children while using digital devices (e.g., Hiniker et al., 2015; Radesky et al., 2014, 2015). Indeed, research has linked technoference to poorer parenting quality (Beamish et al., 2019) and a variety of negative outcomes in children (e.g., Hiniker et al., 2015; Krapf-Bar et al., 2022; McDaniel & Radesky, 2018; Meeus et al., 2021; Radesky et al., 2014, 2015). Stockdale et al. (2018) explained these findings with adolescents' decreased perception of warmth in relations with parents, and Meeus et al. (2021) emphasized the importance of diminished parental emotional support in moments of technoference. Adolescents who frequently experience technoference due to parents' device use tend to feel less cohesion, connection, and trust in their relationships with parents, perceive less parental warmth; and less emotional support from parents, which are associated with negative developmental outcomes, such as lower well-being, anxiety, depression, and poorer prosocial behavior (e.g., Meeus et al., 2021; Stockdale et al., 2018). Despite that, it is important to keep in mind that minor, less frequent interruptions in parent-child interactions due to smartphone use are a common part of growing up in today's digital world. Stockdale and colleagues (2018) state that such minor interruptions are unlikely to affect parent-child relationships or developmental outcomes. Thus, when speaking of negative effects, one should keep in mind situations in which technoference happens very frequently in a relationship and is prolonged during interactions.

Parent-adolescent conflicts about adolescents' smartphone use and well-being

Due to technoference, adolescents' prolonged screen time, and sometimes not obeying rules of device use, conflicts between parents and adolescents can emerge (e.g., Beyens & Beullens, 2016; Davis et al., 2019; Meeus et al., 2021; Van Doorn et al., 2011). Parent-child conflicts about digital technology are of particular interest because digital technology represents a domain in which it is possible to experience a shift in authority. After all, adolescents as digital natives often use digital technology in a more proficient way than their parents. These conflicts might be intensified during adolescence due to the adolescent's need for more autonomy in the parent-child relationship (e.g., Ghosh et al., 2018) and because adolescents are more prone to test their parents' boundaries and openly disagree with them (e.g., Fuligni, 1998). Parent-adolescent conflict is very likely to affect well-being in the relationship – the negative affect of one person can easily trigger negativity in the other, especially if one person feels misunderstood or underappreciated in the interaction (e.g., Kostić, 2022; Meeus et al., 2021). Indeed, research has shown too much conflict might affect adolescents' adjustment and well-being (e.g., Branje, 2018; Shek, 1997; Weymouth et al., 2016; Zhang et al., 2022), increase negative (e.g., Laursen et al., 2016; Tucker et al., 2003) and decrease positive affect (e.g., Bülow et al., 2022).

Parent-adolescent conflicts could lead to adolescents' poorer psychosocial adjustment, which could further trigger conflicts with parents (e.g., Branje, 2018). According to the dynamic systems theory (e.g., Smith & Thelen, 2003), parent-adolescent dyads are self-organizing systems in which one's emotions and behaviours are constantly affecting and being affected by the emotions and behaviours of the other person (e.g., Hollenstein, 2013, Chapter 2). Flexibility to express different emotions and the ability to switch flexibly between emotions are important factors in parent-adolescent conflicts (e.g., Granic, 2005; Van der Giessen et al., 2015). This emotional variability enables parents and adolescents to try new patterns of interaction (e.g., Branje, 2018) and, through positive and negative emotions, renegotiate their relationship (e.g., Granic, 2005). When parents and children express their anger and frustration towards each other during a conflict, but at the same time show affection towards each other and express interest in each other's opinions, the conflicts might help them find new ways to relate to each other. Parents and children who only express anger or other negative emotions, or who express only positive emotions and are afraid to show anger, have more problems in renegotiating their relationship. The latter forms of conflict are found to be the risk factors for poorer adjustment in adolescents (e.g., Branje, 2018; Zhang et al., 2022) and experiencing more negative and less positive affect (e.g., Bülow et al., 2022; Tucker et al., 2003).

The current study

Previous research indicates that technoference can increase the likelihood of parent-adolescent conflicts (e.g., McDaniel & Coyne, 2016; Meeus et al., 2021) and that technoference and parent-adolescent conflicts can negatively affect the quality of a parent-adolescent relationship, resulting in lower adolescent well-being (e.g., McDaniel & Coyne, 2016; Meeus et al., 2021; Stockdale et al., 2018). To the best of our knowledge, there is research on the topic of technoference and conflicts in a parent-adolescent relationship (e.g., Matthes et al., 2021; Meeus et al., 2021), but none of them considering different perspectives on parent-adolescent conflicts about the adolescent's smartphone use (i.e., at the same time parents' and adolescents') and technoference due to the parent's smartphone use in face-to-face parent-adolescent interactions. The perspectives of adolescents and parents on conflicts are important because previous studies found that they differ in their perceptions and estimates (e.g., Davis et al., 2019; De Los Reyes et al., 2012). Moreover, it is important to emphasize that most research in this domain is focused on parents of younger children, while only a smaller body of literature has examined parent-adolescent relationships in the context of smartphone use (e.g., Meeus et al., 2021; Rideout & Robb, 2018; Stockdale et al., 2018).

Thus, this research focuses on a parent-adolescent relationship, and it considers different perspectives on parent-adolescent conflicts about smartphone use. This study aims to examine the association between technoference in parent-adolescent interactions due to parents' smartphone use, parent-adolescent conflict about adolescents' smartphone use, and adolescents' well-being. Based on the existing literature, we expect that: a) higher technoference is associated with more parent-adolescent conflict over adolescents' smartphone use; and b) higher technoference and more parent-adolescent conflict over adolescents' smartphone use contribute to lower adolescent well-being, namely, lower life satisfaction, lower positive affect, and higher negative affect.

Method

Participants

Participants were 282 Croatian children (59.8% were girls) aged 10 to 15 years (M = 12.23, SD = 1.207) and one of their parents (80.9% were mothers). Most of the children at the time of the study attended 5th and 7th grade (29.5%), while 21.27% attended 6th grade, and 19.85% of children were in the 8th grade. Most of the children lived with both parents (86.7%) while others lived with only one parent (13.3%). The number of children in the family varied from 1 to 9 (M = 2.42, SD = 1.61). As for education, 58.7% of fathers and 49.1% of mothers had a high school education, while 37.3% of fathers and 48.4% of mothers have a higher degree in education. Only 4% of fathers and 2.5% of mothers have an elementary school degree. Most mothers and fathers were full-time employed (80.1% of fathers, and 73.1% of mothers), 5.1% of fathers and 14.2% of mothers were unemployed, 11% of fathers and 11.6% of mothers were employed part-time, while the remaining percent of parents (3.7% of fathers and 1.1% of mothers) were retired. For most families (66.9%), monthly income was below 730,00 EUR per family member, and for one-third of the families (33.1%), monthly income was above 730,00 EUR per family member.

Measures

Technoference due to parents' smartphone use during parent-adolescent interactions, meaning interruptions of parent-child face-to-face interaction due to parents' use of a smartphone, was measured with a newly developed 4-item scale constructed for this project. Parents rated how often they check a smartphone during a family meal, use a smartphone while they are talking to their child, check a smartphone if it rings even if they are talking to their child, and use a smartphone while with a child (e.g., during play, joint-free time) on a 5-point scale (from 1 – *never* to 5 – *always*). We conducted a factor analysis on the parents' answers including all items and using a Principal Axis Factoring (PAF). The Kaiser-Meyer-Olkin (KMO) measure for the parents' dataset was found to be 0.741, indicating adequate sampling adequacy for factor analysis. Bartlett's test of sphericity yielded a statistically significant result (χ^2 = 280.990, df = 6, p < 0.001), indicating that the variables were sufficiently correlated for factor analysis. All items loaded onto one factor according to the PAF results and explained 45.73% of the variance, with the following factor loadings: 0.561 for "check a smartphone during a family meal", 0.686 for "use a smartphone while they are talking to their child", 0.703 for "check a smartphone if it rings even if they are talking to their child", and 0.741 for "use a smartphone while with a child". The Cronbach Alpha coefficient for the scale was 0.765. The four items were averaged into one score, with a higher score indicating higher technoference in parent-child interactions due to parents' smartphone use.

Parent-adolescent conflict over adolescents' smartphone use was assessed from both the child's and parent's perspectives, using the same list of items created for the study. Children and parents were asked to rate how often they argue about children's use of smartphones on 9 items using a scale from 0 – *never* to 4 – *always.* We conducted two-factor analyses, one on the parents' answers and one on the children's answers including all items, and using a PAF with oblimin rotation. The KMO measure for the parents' data was found to be 0.872 and for the children's data was found to be 0.817, indicating adequate sampling adequacy for factor analysis. Bartlett's test of sphericity yielded statistically significant results for both datasets (for parents' data: χ^2 = 970.627, df = 36, p < 0.001; for children's data; χ^2 = 632.908, df = 36, p < .001), indicating that the variables were sufficiently correlated for factor analysis. Factor analyses showed the two-factor solution on parents' (explained 50.83% of the total variance) and children's (explained 42.05% of the total variance) data.

The one latent factor of the measure was loaded with 4 items measuring conflict over time children spend using smartphones (items: how long the child uses a smartphone in general, when and for how long the child uses a smartphone compared to other obligations (e.g., homework, studying, house chores, etc), the time of day when the child uses a smartphone (e.g., before bedtime, during meals, etc), and playing games on a smartphone). Loadings ranged from .884 ("*how long the child uses a smartphone in general*") to .603 ("*playing games on a smartphone*") for parents' data, and from .727 ("*when and for how long the child uses a smartphone compared to other obligations*") to .398 ("*playing games on a smartphone*") for children's data. Items loaded on this factor explained 41.70% of the variance in parents' (the first factor in the PAF solution) and 8.16% of the variance in children's (the second factor in the PAF solution) estimates.

The other latent factor of the measure consists of 5 items measuring conflict about the content children consume using smartphones (items: the use of social network sites through a smartphone (e.g., Facebook, Instagram, Tik-Tok, Snapchat, etc), texting with friends on a smartphone, the time child spends talking with someone on a smartphone, the content he/she posts online using a smartphone (e.g., photos and videos), listening to music on a smartphone). Loadings ranged from 0.665 ("*texting with friends on a smartphone*") to 0.594 ("*the content he/she posts online using a smartphone*") for parent's data, and from 0.823 ("*texting with friends on a smartphone*") to 0.539 ("*the time child spends talking with someone on a smartphone*") for children's data. Items loading on this factor, conflicts about the content on smartphones, explained 9.13% of the variance in parents' (the second factor in the PAF solution) and 33.88% of the variance in children's (the first factor in the PAF solution) estimates.

The Cronbach Alpha coefficient for the factor conflict over time was 0.841 for parents and 0.708 for children, while the factor conflict about content was 0.781 for both children and parents. Four variables were created by averaging the items, with higher scores indicating more frequent conflict – parents' and children's estimates of conflict over time, as well as parents' and children's estimates of conflict about content.

Children's negative and positive affect were measured using the shortened version of the PANAS Scale (Mackinnon et al., 1999). Children rated how often in the last two weeks they felt on a scale from 1 – *not at all* to 5 – *very much*. The factor analysis (PAF method with oblimin rotation) showed a two-factor solution – positive affect (i.e., excited, enthusiastic, alert, inspired, determined) and negative affect (i.e., distressed, upset, scared, nervous, afraid) just like in the original study. Items loaded on the factor negative affect explained 29.55% of the variance, and items loaded on positive affect explained 16.99% of the variance. The Cronbach Alpha coefficient was 0.778 for the negative affect (5 items) and .825 for the positive affect (5 items) subscale, which is in accordance with Cronbach alpha values in the original paper by Mackinnon et al. (1999) (0.78 and 0.87 for positive and negative affect respectively). The average scores were created separately for positive and negative affect, with higher scores indicating higher affect in adolescents.

Children's life satisfaction was assessed using the Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Huebner, 1994; Seligson et al., 2003). There are five items covering satisfaction with five life domains (family, friends, school, self, living environment), as well as one item covering global life satisfaction. Children respond to how satisfied they are with each domain and global life using a scale from 1 – "completely unsatisfied" to 7 – "completely satisfied". Factor analysis (PAF method) showed a one-factor solution with this factor explaining 57.01% of the variance. The Cronbach Alpha coefficient for five items measuring satisfaction in five life domains was .807. The scale has already been used in research with Croatian children (Merkaš & Brajša-Žganec, 2011). Five items were averaged into a score indicating overall life satisfaction, with higher scores indicating higher life satisfaction in adolescents.

Procedure

The study was conducted under the research project *Digital technology in the family: patterns of behaviour and effects on child development*. The data used in this paper come from the first wave of longitudinal research done within the project. The research team contacted elementary schools in Zagreb and Zagreb County, Croatia. The material sent by e-mail to schools included: a letter of invitation for the principal, project approval, an informed consent form for parents and children, a copy of the questionnaire, and a protocol for school associates. In total, 22 schools were contacted, and six of them from Zagreb and Zagreb County agreed to participate in the study. School associates, namely school psychologists, provided the number of children in classes from 5th to 8th, and each school received sets of research materials. A total of 1096 sets were provided. Each set included an informed consent form for parents and children, a questionnaire for parents, and the first part of the questionnaire for children in an envelope. Children took the envelopes home and, if they and their parents agreed to participate in the study, they returned the envelope with the completed material to the school. In total, 25.7% of all contacted children and parents agreed to participate in the study. Those children who participated in the first part of the study later filled out the second part of the questionnaire during regular classes in school. The questionnaire for children was in two parts due to the length of the questionnaire. The questionnaire was administered by school psychologists, and the group administration lasted approximately 20 minutes. Every child and parent who participated received a coupon for the local zoo as a gift.

Results

Descriptive data on technoference, parent-adolescent conflict, and adolescent's well-being

Table 1 shows descriptive statistics for all the measures in the study. Results show that both parents (t = 20.74, df = 274, p < .001) and children (t = 10.87, df = 256, p < .001) reported more parent-adolescent conflict over the time adolescents spent using a smartphone compared to conflict about content adolescents consume on a smartphone. Parents' assessment of parent-adolescent conflict over time adolescents used a smartphone was the only type of conflict that can be described as on average happening often. Adolescents and parents reported that other types of parent-adolescent conflict happen sometimes on average (adolescents' rating of parent-adolescent conflict over time and about content, parents' rating of parent-adolescent conflict about content). Parents rated that technoference due to smartphone use is happening on average rarely, and 18.5% of parents report that their smartphone use never interrupts interactions with children, while 3.6% report it happens often, with only one parent (0.4%) indicating it happens always. Most parents (77.5%) reported that technoference happens rarely or sometimes. Adolescents were, on average, very satisfied with their lives and reported higher levels of positive affect and lower levels of negative affect.

The correlations presented in Table 2 show that both types of parent-adolescent conflict (over time and about content) from both sources of assessments (parents and adolescents) were significantly and positively interrelated.

Technoference was significantly and positively related to parents' ratings of parent-adolescent conflict over the time that adolescents spend using a smartphone, but the correlation was low. Technoference was not significantly associated with life satisfaction, negative affect, or positive affect in adolescents.

Adolescents' ratings of life satisfaction were significantly and negatively related to all four indicators of parent-adolescent conflict about adolescents' smartphone use. Negative affect was positively and significantly related to three indicators of parent-adolescent conflict, namely: parent-adolescent conflict over content from both adolescents' and parents' perspectives; and parent-adolescent conflict over time only from the adolescents' perspective. Positive affect in adolescents was not related to any of the four indicators of parent-adolescent conflict.

The contribution of technoference and parent-adolescent conflict to adolescents' well-being

To investigate the possible contribution of technoference and parent-adolescent conflict about the adolescent's smartphone use to the explanation of adolescents' well-being, two hierarchical regression analyses with life satisfaction and negative affect as criterion variables were conducted. In both regression analyses, the first step included adolescents' age and gender, and the second step included four indicators of parent-adolescent conflict about the adolescent's smartphone use and technoference. Because positive affect in adolescents was not significantly related to any of the conflict ratings or technoference, regression analysis with positive affect as a criterion variable was not calculated.

In the first hierarchical regression analyses, with life satisfaction as a criterion variable, the first step, which

Table 1
Descriptive statistics for all the measures in the study

	Minimum	Maximum	Mean	Std. Deviation
Conflict – parents – time	0.00	4.00	1.88	0.90
Conflict – parents – content	0.00	3.20	0.89	0.68
Conflict – adolescents – time	0.00	3.50	1.05	0.74
Conflict – adolescents – content	0.00	3.40	0.55	0.68
Technoference	1.00	4.50	2.04	0.70
Life satisfaction	1.40	7.00	5.77	1.06
Positive affect	1.00	5.00	3.02	0.89
Negative affect	1.00	5.00	1.93	0.84

Notes. The correlations among technoference, parent-adolescent conflict, and adolescents' well-being.

Table 2
Correlations between variables in the study

	1	2	3	4	5	6	7
1. Conflict – parents - time	—						
2. Conflict – parents - content	.530**	—					
3. Conflict – adolescent – content	.152*	.271**	—				
4. Conflict – adolescent - time	.419**	.183**	.471**	—			
5. Technoference	.165**	–.019	–.003	.100	—		
6. Life satisfaction	–.138*	–.191**	–.248**	–.295**	–.025	—	
7. Positive affect	–.104	–.086	.007	–.012	–.030	.161*	—
8. Negative affect	.072	.124*	.175**	.185**	.044	–.463**	–.211**

Notes. Gender: girls are coded as 1, boys as 2.
*coefficient is significant at the .05 level (2-tailed).
**coefficient is significant at the .01 level (2-tailed).

included age and gender variables, accounted for 5% of the variance in life satisfaction (Table 3), with age being the significant negative predictor (F = 6.195, p = .002). In the second step, indicators of parent-adolescent conflict about adolescent's smartphone use and technoference explain the addition of 10% of the variance in life satisfaction (F_{change}= 5.582, p < .001), with the adolescent's ratings of parent-adolescent conflict over time being the only significant and negative predictor. In total, this model explains 15% of the variance of an adolescent's life satisfaction (F = 5.927, p < .001).

The first step of the second regression analysis, with negative affect as a criterion variable (Table 4), did not contribute significantly to the explanation of negative affect (F = 2.603, p = .076), although gender was a significant predictor. In the second step, conflict variables and technoference significantly explained an additional 5% of the variance (F_{change}= 2.678, p = .022), with the significant predictors being gender and adolescents' ratings of parent-adolescent conflict over time. Female gender and more parent-adolescent conflict over time of smartphone use from adolescents' perspective significantly and positively contributed to higher negative affect. The model explained 7% of the variance in adolescents' negative affect (F = 2.682, p = .011).

Table 3

Prediction of life satisfaction by age and gender (block 1) and parent-adolescent conflict from adolescent's and parents' perspective and parental technoference (block 2) – hierarchical regression (N = 241)

	Block 1			Blocks 1 & 2		
	β	*t*	*p*	β	*t*	*p*
Constant		11.888	.000		12.064	.000
Age	–0.223	–3.517**	.001	–0.211	–3.401**	.001
Gender	0.029	0.462	.644	0.070	1.108	.269
Conflict – parents – time				–0.016	–0.197	.844
Conflict – parents – content				–0.072	–0.928	.056
Conflict – adolescents – time				–0.246	–3.252**	.001
Conflict – adolescents – content				–0.066	–0.931	.353
Technoference				–0.030	–0.495	.621
R		0.222			0.389	
R^2		0.049			0.151	
ΔR^2					0.102	

Notes: Gender: girls are coded as 1, boys as 2.
*coefficient is significant at the .05 level (2-tailed).
**coefficient is significant at the .01 level (2-tailed).

Table 4

Prediction of negative affect by age and gender (block 1) and parent-adolescent conflict from adolescent's and parents' perspective and technoference (block 2) – hierarchical regression (N = 241)

	Block 1			Blocks 1 & 2		
	β	*t*	*p*	β	*t*	*p*
Constant		3.409	.001		2.697	.008
Age	.049	0.763	.446	0.043	0.663	.508
Gender	–.142	–2.204*	.028	–0.173	–2.628**	.009
Conflict – parents - time				–0.023	–0.267	.790
Conflict – parents - content				0.046	0.563	.574
Conflict – adolescents – time				0.185	2.334*	.020
Conflict – adolescents - content				0.053	0.719	.473
Technoference – parents				0.061	0.950	.343
R		.146			.273	
R^2		.021			.074	
ΔR^2					.053	

Notes: Gender: girls are coded as 1, boys as 2.
*coefficient is significant at the .05 level (2-tailed).
**coefficient is significant at the .01 level (2-tailed).

Discussion

This study aimed to investigate the relationship between technoference in parent-adolescent interactions due to parents' smartphone use, parent-adolescent conflict about adolescents' use of smartphones, and adolescent's well-being in families with children aged 10 to 15 years. According to studies, technoference is negatively related to the quality of parent-child relationships (e.g., Hong et al., 2019; Meeus et al., 2021; Stockdale et al., 2018), parents' excessive smartphone use is associated with a lack of control over children's smartphone use and parent-child conflict about the smartphone from both children's and parent's perspectives (e.g., Matthes et al., 2021), and preadolescents who report more technoference for their parents also rate their relationships with the parents higher in conflict (e.g., Matthes et al., 2021; Meeus et al., 2021). Therefore, we hypothesized that technoference would be positively related to parent-adolescent conflict over adolescent smartphone use, but our hypothesis is only partially confirmed by the study results. Parents who report more technoference, meaning that they very frequently use their smartphone during parent-adolescent interactions, also tend to report more conflict with their children over the time children spend using a smartphone. However, technoference was not related to adolescent's estimates of conflict with their parents, which, among others, shows us the importance of having different perspectives regarding conflict estimates (e.g., Davis et al., 2019). The association between parents' and adolescents' estimates of conflict over time of adolescent's smartphone use is strong but estimates from different sources nevertheless had different associations to reported technoference by parents.

As mentioned before, parent-adolescent conflict is not unusual and it often happens because of the disbalance between adolescents' need for more autonomy and the parental need to control their children's behaviours (e.g., Ghosh et al., 2018). As children get older, they strive for more autonomy and privacy, and, in this process, they often resist previously established rules regarding digital technology (DT) use established dominantly by their parents. This change is likely to create a ground for parent-child conflict in general. Considering the high saturation of contemporary life with digital devices, and in particular smartphones, adolescents' use of these devices, which additionally changes as they get older, represents a potential additional source of tension in the family. Studies show that parent-child conflict is often related to children's use of DT (e.g., Beyens & Beullens, 2016; Davis et al., 2019; Meeus et al., 2021; Van Doorn et al., 2011) and families often do not have clear rules or media plan which means that rules are often set on the go (Kotrla Topić et al., 2023). Moreover, parents' use of smartphones is also important for family dynamics. McDaniel and Coyne (2016) argue that parental use of smartphones during family interactions might be viewed by children as an implicit indication that the device is more important than them at certain moments and this might result in frustration and conflict.

Distinguishing between the type of parent-adolescent conflict that is related to smartphone use and technoference is also important. Results from this study showed that when parents frequently used their smartphones during interactions, they also reported more conflict with adolescents over adolescents' smartphone use, or more specifically about the duration of such use, not the content that adolescents consume with smartphones. This is an important finding because it shows that smartphone use can be related to parent-child relationship in different ways – through parents' smartphone use during parent-adolescent interactions and through parent-adolescent conflict about the time that adolescents use them.

One important factor that needs to be addressed when discussing these findings is adolescent's smartphone use. Some studies show there is a link between problematic DT use by parents and children (e.g., Hong et al., 2019; Hefner et al., 2019). It might be that parents who report more smartphone use during interactions with adolescents are struggling to regulate their own smartphone use, and their children might experience the same problem. Consequently, trying to set limits to adolescent's use of smartphones then results in conflict.

The second study hypothesis was regarding the contribution of higher technoference and higher adolescents' and parents' estimates of parent-adolescent conflict over adolescents' smartphone use in explaining adolescent's well-being. Studies show that parent-adolescent conflict can have a negative effect on children's well-being (e.g., Silva et al., 2020, Kostić, 2022; Meeus et al., 2021), decrease their positive affect (e.g., Bülow et al., 2002) and increase their negative affect (e.g., Laursen et al., 2016). What is more, technoference experienced by parents can negatively affect parent-adolescent relationships and lower their well-being (e.g., Stockdale et al., 2018). However, our hypothesis was only partially confirmed. Adolescent's estimates of conflict with their parents about the time they spend using a smartphone were a significant predictor of their life satisfaction and negative affect. More conflict contributed to less life satisfaction and more negative affect in adolescents. The percentage of the variance explained is small (15% for life satisfaction and 5% for negative affect) but it still points to a contribution of parent-adolescent conflict about smartphone use to adolescent's well-being. Again, it is important to notice the importance of having different perspectives in a study, since only the adolescents' estimates of parent-adolescent conflict over smartphone use were predictive of their well-being, and not of their parents. Additionally, in exploring negative affect, the female gender was shown to be a significant predictor. Previous studies show that gender differences in negative affect appear in adolescence when girls begin to experience more negative affect than boys (e.g., Esteban-Gonzalo et al., 2020). Technoference, meaning the frequency of parents' use of smartphones during face-to-face parent-adolescent interactions, did not contribute to the explanation of adolescents' well-being in this study. This may indicate that other factors are more important for an adolescent's well-being, for example, adolescents' perception of their parents' smartphone use during interactions might be more important than the perception of their parents.

As for the occurrence of technoference, results showed a relatively low rate of occurrence as reported by parents in this study. Parents on average reported it happens sometimes, and 17.7% of them reported they never engage in this type of behaviour. Earlier studies in which naturalistic observation methods were used (e.g., Kelly & Ocular, 2021) have shown that technoference due to parents' smartphone use occurs much more frequently than what is reported in studies relying on self-report measures (either from parents themselves or children's assessments of parental behaviour). For example, Kelly and Ocular (2021) in their observational study showed that 46.8% of parents out of 79 parent-child dyads observed used smartphones during the interaction with children. On the other hand, McDaniel (2021) showed that the average score on technoference for fathers and mothers was 2.7 (*SD* = 1.25) and 2.9 (*SD* = 1.27) respectively, and the range of answers was from 1 – *strongly disagree* to 6 – *strongly agree*. In the second study reported in the same research paper (McDaniel, 2021), the average scores were somewhat higher, namely 3.3 (*SD* = 1.1) for fathers and 3.34 (*SD* = 1.3) for mothers. It is possible that when asking parents, they tend to provide socially desirable responses since this type of behaviour has been heavily criticized in the public domain. Therefore, there may be pressure to give socially desirable answers, especially considering the reliance on self-reports. Additionally, given the relatively low response rate for participation in this study, it's plausible that parents who are more interested in the subject being investigated are also more knowledgeable about this issue, potentially skewing the self-reported rates.

Several limitations should be considered when interpreting these findings. The response rate for participation in the study was rather low, and this means that some groups of parents and children might be underrepresented (e.g., parents and children from lower socio-economic families). Second, all the data obtained was based on self-reported measures, which are prone to both memory bias (e.g., Scharkow, 2019) and a tendency to underreport socially undesirable smartphone use. Third, the measures used in the study are newly developed measures, created for the study to measure a rather new concept of technoference and parent-adolescent conflict over smartphones, and therefore might not cover all possible aspects of these constructs. Finally, the findings lack the adolescent's perspective of technoference due to parents' device use which might provide a better understanding of the relationships explored in the study. Future studies should focus on larger, more representative samples and possibly more objective measures, such as direct observation of child-parent dyads, for example.

Conclusion

Regarding the first hypothesis, the results showed higher technoference, meaning assumed interruptions due to parents' smartphone use during face-to-face parent-adolescent interactions, are significantly and positively associated with parents', but not adolescents', ratings of more parent-adolescent conflict over the time adolescents spend using a smartphone. Regarding the second hypothesis, only more parent-adolescent conflicts about the time of adolescents' smartphone use from adolescents' perspective contributed significantly to lower life satisfaction and more negative affect in adolescents. Technoference reported by parents did not show a significant contribution to adolescent's well-being. These findings mainly apply to adolescents and parents from families with relatively good socio-economic status where technoference and conflicts occur on average rarely.

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