

Relative Efficacy of Internet-based and Face-to-face Behavioural Parent Training for Parents of Children with Attention-deficit/hyperactivity disorder: a Non-randomised Controlled Trial

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Background/Objective: Behavioural Parent Training (BPT) is an evidence-based psychosocial intervention for attention-deficit/hyperactivity disorder (ADHD) in children. The use of online technologies significantly increases the accessibility of these interventions. This study aimed to assess the relative efficacy of face-to-face and online training in the use of parenting strategies taught. We also explored the impact of parental ADHD symptom levels. **Method:** A massive open online course (MOOC) version of a BPT program was designed and evaluated. A total of ninety parents of children diagnosed with ADHD were recruited. Randomisation was not employed; parents gave their preferences in choosing between face-to-face and online training formats. One month after the completion of the training and at a three-month follow-up, parents were queried regarding the implementation and frequency of use of the parenting strategies taught. The two groups were compared along these variables. The Adult ADHD Rating Scale (ASRS-A) was employed to screen parental ADHD symptoms, with the two groups (positively/negatively screened) subsequently compared in terms of their choice of training format and the use of the parenting strategies. The psychopathological symptoms of the child were evaluated using the Strengths and Difficulties Questionnaire (SDQ). **Results:** Thirty parents elected to participate in the face-to-face training, while sixty parents registered for the online programme. The drop-out rate was high, data from 21 and 39 parents was included in the analysis from the two groups, respectively. The two groups did not differ in the ASRS-A screening outcome. The only difference was the implementation of the reward system, which was reported by more parents in the face-to-face group than in the online group. The only difference between the groups that screened positive and negative in the ASRS-A was found in the use of proactive parenting strategies. We found no significant differences between the two time points in the use of most parenting strategies. **Discussion:** Our results suggest that the online format may be similarly effective in teaching parenting techniques as the face-to-face parenting training. The level of parental ADHD symptoms had little effect; the difficulties regarding proactive strategies may be due to deficits in executive functioning. Parent training delivered through telemedicine can significantly improve access and is cost-effective; therefore, we recommend its use in the treatment of ADHD in children. Nevertheless, this necessitates appropriate regulation and funding of telemedicine.

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Keywords: attention-deficit/hyperactivity disorder, ADHD, psychosocial interventions, parent training, internet, telemedicine

INTRODUCTION

The most prevalent neurodevelopmental disorder is attention-deficit/hyperactivity disorder (ADHD, Diagnostic and Statistical Manual of Mental Disorders, fifth edition, DSM-5, American Psychiatric Association, 2013). According to a recent meta-analysis, the prevalence of ADHD is 7.6% in children and 5.6% in adolescents (Salari et al., 2023). In adults, the estimated prevalence is 2.6% (Song et al., 2022). The importance of the recognition and treatment of ADHD is underscored by its high comorbidity with several other psychiatric disorders (Biederman, 2004, Katzman et al., 2017, Keresztény et al., 2012, Tung et al., 2016), and its significant impact on quality of life throughout the life-span (Goh et al., 2023, Y. Lee et al., 2016, Quintero et al., 2019). Although ADHD is a neurodevelopmental disorder, it has multiple developmental outcomes; the developmental pathways are influenced by the interplay of biological and environmental factors (Beauchaine et al., 2010, Franke et al., 2018, Hamza et al., 2019). A number of environmental factors shaping developmental pathways are related to the family (Claussen et al., 2022).

ADHD AND PARENTING

Considering the heritability of 70-80% (Brikell et al., 2015, Faraone & Larsson, 2019), it is not surprising that parents of children with ADHD are often also affected by the disorder. Parental ADHD was shown to be related to more severe symptoms and poorer quality of life in the child (Ahmad & Hinshaw, 2017, Efron et al., 2018, Sellers et al., 2021). Parental ADHD affects the child's psychopathology in multiple ways. In addition to purely biological mechanisms, passive and evocative gene-environmental correlations also play an important role (see Miklósi et al., (2020), for a review). In gene-environmental correlations, environmental factors, such as parental behaviour, mediate the relationship between parental ADHD and child psychopathology (Sellers et al., 2020). In our previous meta-analysis, parental ADHD symptoms were associated with more negative and less positive parenting behaviours, although the effect sizes were small (Miklósi et al., 2023). This may be due to a deficit in self-regulation or executive functioning associated with ADHD symptoms (Johnston et al., 2012).

Parental behaviour is a modifiable environmental factor (Claussen et al., 2022); therefore, parenting interventions, particularly Behavioural Parent

Training (BPT), are first-line psychosocial treatments for children with ADHD under 11 years of age (Egészügyi Szakmai Kollégium (EMMI) 2020, National Institute for Health and Care Excellence (NICE) 2018). However, studies revealed that parental ADHD undermines the effectiveness of BPT and may impact parental compliance to child's treatment (Chronis-Tuscano et al., 2011, Wang et al., 2014). Parental psychopathology is therefore important to consider when designing and implementing psychosocial interventions.

EFFICACY OF BPT

Behavioural Parent Training aims to support positive parent-child relationship and teach effective parenting strategies (Barkley, 2013). Several protocols have been developed, e.g. the *Incredible Years* (Webster-Stratton, 2001), the *Triple-P* (Sanders, 2012), the *Oregon Parent Management Training* (Forgatch & Gewirtz, 2017), the *Defiant Children* (Barkley, 2013) and *Defiant Teens* (Barkley & Robin, 2014). All of these are evidence-based interventions in improving parenting skills and reducing behavioural problems; in meta-analyses, effect sizes were found to be medium in ADHD (Daley et al., 2014, P. Lee et al., 2012) and in disruptive disorders (Kaminski & Claussen, 2017).

Meta-analyses were also conducted to ascertain which components of parent training programmes were associated with effectiveness. A meta-analysis summarizing 77 early studies (Wyatt Kaminski et al., 2008) found that methods that promoted positive parent-child relationship and parental consistency, as well as timeout, were associated with greater effect sizes in reducing externalizing problems. A more recent meta-analysis by Leijten and colleagues (2019) summarised the results of 154 randomised controlled trials on the prevention and treatment of disruptive disorders. The analysis found that positive reinforcement as a general method, and praise as a specific form of positive reinforcement, as well as natural and logical consequences were associated with greater effectiveness. Furthermore, in indicated prevention and treatment (but not in universal and selective prevention), methods that strengthen the parent-child relationship, specifically special playtime and active listening, parental self-regulation, and timeout were also related to larger effect sizes. Dekkers and colleagues (2022) presented a synthesis of the findings from 39 randomized controlled trials involving parents of children diagnosed with ADHD. The findings

indicated that proactive parenting strategies, such as anticipating critical situations, and differential reinforcement were associated with larger effect sizes.

Nevertheless, low accessibility and high attrition rate are crucial aspects that require further consideration in relation to BPT, particularly in socioeconomically disadvantaged populations (Barkley et al., 2000, Chacko et al., 2017, Weisenmuller & Hilton, 2020). The National Institute for Health and Care Excellence (NICE, 2018) therefore calls for further research to address these issues.

TECHNOLOGY-BASED INTERVENTIONS (TBI)

The utilisation of telemedicine represents an evident solution to the issues of accessibility (Hansen, Broomfield, & Yap, 2019). Modern technologies have the capacity to eliminate many of the barriers to training attendance, including distance, absence from work, and childcare, and to provide access in areas that under-served by trained professionals (MacDonell & Prinz, 2015).

Meta-analyses demonstrated the effectiveness of technology-based BPI (Hansen et al., 2019, Thongseiratch et al., 2020). Specifically, in reducing externalizing symptoms, Bausback and Bunge (2021) found that, based on 19 studies, when compared with wait-list controls, the average effect size for fully automated TBIs was medium ($g = 0,73$), while for human-supported programmes large ($g = 0,92$). However, the difference between the two was not significant. In comparison with the active control, the average effect size was not significant ($g = 0,14$), indicating that TBIs are as effective as other evidence-based interventions. Nevertheless, only nine studies could be included in the latter analysis, of which only three compared a TBI with a face-to-face program. Consequently, further studies are required to assess the relative efficacy of these two delivery formats (Bausback & Bunge, 2021).

AIMS AND HYPOTHESES

At the Heim Pál National Paediatric Institute (HOGYI) Centre of Mental Health, we have been offering parent training programs for many years, primarily for parents of children diagnosed with ADHD, using the Defiant Children protocol (Barkley, 2013). Nevertheless, a considerable proportion of families in our service area were unable to participate in a seven-week face-to-face training programme. In light of the challenges posed by accessibility,

we have developed a massive open online course (MOOC) in collaboration with Eötvös Loránd University, utilising the university's e-learning (Canvas) system and the support of the National Research, Development and Innovation Office (NKFI) (OTKA-PD: 134849). The online format that follows the themes of Barkley's protocol, comprises a set of flexible modules that include short tutorial videos, written materials, related exercises and quizzes. The seven-week online course is accompanied by a weekly telemedicine consultation. The acceptability and applicability of the MOOC were previously investigated (Miklósi, Sulyok, & Gallai, 2022). The present study aimed to examine the relative effectiveness of face-to-face and online training in the implementation and use of parenting strategies taught. Furthermore, the association of parental ADHD symptoms and the use of parenting strategies was investigated. In light of the existing literature, two hypotheses were formulated.

Firstly, it was assumed that face-to-face and online training would be equally effective in teaching parenting strategies. Consequently, it was anticipated that the two groups would not differ in the introduction and frequency of use of the parenting strategies taught in the training, one month after the training was completed, and at a three-month follow-up.

Secondly, it was hypothesised that parental ADHD symptoms would impair the effectiveness of learning and using parenting strategies. It was hypothesised that parents who screened positive for ADHD would be less likely to utilize the parenting strategies taught in the training than parents who screened negative.

METHODS

Sample and Procedure

A total of 90 participants were recruited from among the parents of children diagnosed with ADHD and receiving care at the Centre of Mental Health. The inclusion criteria were a clinical diagnosis of ADHD and the child's age between four and 12 years. Parents of children with comorbid autism spectrum disorder or intellectual disability were excluded from the study. The other clinical diagnoses were not considered in this study due to their unreliability for research purposes. Instead, a questionnaire was utilised to assess the current levels of comorbid emotional and behavioural symptoms in the child. The child's treatment was not influenced by their participation

Table 1. Demographic characteristics of the sample

Demographic variable	Total (N = 60)	Training formats	
		Face-to-face (N = 21)	Online (N = 39)
Caregiver N (%)			
mother	54 (90)	19 (90)	35 (90)
father	5 (8)	1 (5)	4 (10)
stepmother	0 (0)	0 (0)	0 (0)
stepfather	1 (2)	1 (5)	0 (0)
other	0 (0)	0 (0)	0 (0)
Parent' gender N (%)			
male	6 (10)	2 (10)	4 (10)
female	54 (90)	19 (90)	35 (90)
Parent's age N (%)			
< 30 years	0 (0)	0 (0)	0 (0)
30 – 40 years	23 (38)	10 (48)	13 (33)
40 – 50 years	29 (48)	10 (48)	19 (49)
> 50 years	8 (14)	1 (4)	7 (18)
Parent's highest level of education N (%)			
low level (\leq 8 years of education)	1 (2)	0 (0)	1 (3)
medium level (8 – 12 years of education)	27 (45)	10 (48)	17 (44)
high level (\geq 12 years of education)	32 (53)	11 (52)	21 (53)
Parent's economic activity N (%)			
active	52 (86)	19 (90)	33 (85)
other	8 (14)	2 (10)	6 (15)
Family structure N (%)			
original full family	44 (73)	12 (57)	32 (82)
other	16 (27)	9 (43)	7 (18)
Number of siblings N (%)			
0	27 (45)	8 (38)	19 (49)
1	16 (26)	8 (38)	8 (20)
2	13 (22)	4 (19)	9 (23)
3 or more	4 (7)	1 (5)	3 (8)
Location of residence N (%)			
capital	38 (64)	18 (86)	20 (51)
urban	17 (28)	3 (14)	14 (36)
rural	5 (8)	0 (0)	5 (13)
Child's gender N (%)			
male	46 (77)	18 (86)	28 (72)
female	14 (23)	3 (14)	11 (28)

in the study. The use of pharmacological therapy was not an exclusion criterion. Data from parents whose child's medication was changed during the study were excluded from the analysis. Exclusion criteria included current severe stressful situations (e.g. ongoing conflictual divorce) and inadequate knowledge of the Hungarian language on the part of the parent. The study was approved by the Research Ethics Committee of the Heim Pál National Paediatric Institute.

To enhance ecological validity, randomisation was not employed, and parents were permitted to select whether they wished to participate in the face-to-face or online group. Following the provision of information and the obtaining of consent, parents participated in one of the training programs for a period of seven weeks. One month following the completion of the programme, participants were surveyed to assess the use of the parenting strategies taught. In addition, the questionnaire package also

inquired about demographic data, the parents' ADHD symptoms, and the child's current emotional and behavioural symptoms. The use of parenting strategies was also assessed at a three-month follow-up.

The face-to-face training sessions were conducted weekly for 90 minutes with two professionals (a child psychiatrist and a clinical psychologist) leading the sessions. Additionally, parents were provided with a concise written summary of the session materials at the end of each session. Parents who chose the online training were registered on the online platform. In addition to the self-paced progress, one consultation per week was made available through telemedicine, during which parents were able to share their experiences and ask questions. The consultation was conducted by two professionals (a child psychiatrist and a clinical psychologist). In both cases, the themes were aligned with the Defiant Children (Barkley, 2013) protocol which addresses several parenting strategies, including special playtime, differential reinforcement, effective instructions, token economy, time-out, and proactive parenting strategies.

The face-to-face group was selected by 30 parents, 21 of whom completed the follow-up questionnaire. A total of 60 parents were registered for the online training programme. Twenty-one parents dropped out from the study (5 did not log in to the online system, 13 did not complete the training or did not fill in the survey, 3 for other reasons), resulting in the inclusion of data from 39 parents from this group in the analysis. Thus, data from 60 parents were analysed. The mean age of the children in the total sample was 9.10 years ($SD = 1.36$, range: 6–12 years). Further demographic characteristics of the sample are presented in Table 1.

At the three-month follow-up, only 24 parents completed the questionnaire, 3 participants from the face-to-face group and 21 parents from the online group.

Materials

The demographic questionnaire included questions regarding the caregiver's relation to the child, caregiver's age, gender, highest level of education, economic activity, location of residence, family structure, number of siblings, child's gender and age. The implementation and frequency of use of parenting strategies taught by the training was quantified by a set of self-reported questions pertaining to the preceding week. On an ordinal scale, respondents were asked to indicate the frequency of which they

had introduced special playtime (with responses ranging from "0" (never) to "5" (five or more times)). They were also asked to indicate the frequency of which they had used differential reinforcement. This was measured by asking how often praise was given to the child, with the options being "less," "the same," "slightly more," or "much more" than before. The use of effective communication in giving instructions was also measured. This was assessed by asking how often instructions were given effectively, with the options being "never," "sometimes," "often," or "always." We also asked whether a reward system has been implemented ("not," "thought about it," "I put it together, but have not yet introduced it," "I have introduced it"). The use of the time-out was also assessed with the answer options "not needed," "it is needed but I have not yet introduced it," "I have introduced it," "I might introduce it in the future". Furthermore, a dichotomous scale was employed to assess the extent to which parents utilize proactive parenting strategies. These included anticipation of challenging parenting situations, planning parenting strategies that will be used in the challenging situation, communication of expectations and rules in advance, the application of learned parenting strategies in anticipated difficult situations, anticipation and avoidance of difficult situations.

Parental ADHD symptoms were evaluated using the screening version of the Adult ADHD Rating Scale (Kessler et al., 2005, Hungarian version: Bitter et al., 2010). The ASRS-A assesses symptoms of inattention, hyperactivity, and impulsivity with six Likert-type items. The coding procedure was conducted in accordance with the methodology outlined by the original authors (Kessler et al., 2005). The items were dichotomised with the presence of four or more of the six symptoms defined as positive. The internal reliability of the scale in the present sample was good ($\alpha = 0.774$).

The child's current symptoms were evaluated using the Strengths and Difficulties Questionnaire (SDQ, Goodman, 2001, Hungarian version: Birkás et al., 2008). The SDQ is the most widely used brief instrument for assessing emotional and behavioural symptoms in childhood. Both the original and the Hungarian versions have satisfactory psychometric properties. The questionnaire assesses emotional, conduct and peer problems, as well as ADHD symptoms with twenty Likert-type items. Furthermore, it has a five-item prosocial behaviours subscale. The internal consistencies of the problem scales were acceptable in our data (Table 2).

Table 2. Descriptive statistics, reliabilities of the scales, and group comparisons

Scale	α	Mean (SD)			t(df), p
		Total	Face-to-face	Online	
SDQ ADHD	0.63	7.42 (1.72)	7.25 (1.83)	7.53 (1.66)	t(50) = 0.570, p = 0.571
SDQ EMO	0.60	4.23 (2.17)	4.05 (2.24)	4.34 (2.15)	t(50) = 0.472, p = 0.639
SDQ CD	0.63	3.88 (1.97)	3.15 (1.26)	4.34 (2.21)	t(50) = 2.474, p = 0.017
SDQ PEER	0.63	2.94 (2.06)	2.50 (2.33)	3.22 (1.86)	t(50) = 1.229, p = 0.225
ASRS-A	0.77	15.93 (4.84)	15.83 (5.16)	15.97 (4.75)	t(53) = 0.100, p = 0.921

Notes. SDQ ADHD: Strengths and Difficulties Questionnaire Hyperactivity scale (N = 52). SDQ EMO: Strengths and Difficulties Questionnaire Emotional Problems scale (N = 52). SDQ CD: Strengths and Difficulties Questionnaire Conduct Problems scale (N = 52). SDQ PEER: Strengths and Difficulties Questionnaire Peer Problems scale (N = 52). ASRS-A: Adult ADHD Rating Scale, screening version (N = 55). ADHD: attention-deficit/hyperactivity disorder. SD: standard deviation

Data analytic plan

Rates of drop-out have been registered. Descriptive statistics and reliabilities of the scales are presented. Comparison was made between the two study groups (face-to-face/online training formats) in terms of demographic data, children's emotional and behavioural symptoms (SDQ) and parental ADHD symptoms (ASRS-A). For this purpose, χ^2 tests and independent samples t-tests were employed. Frequency tables were constructed from data on the use of parenting methods, and the two groups (face-to-face/online) were compared using χ^2 tests, merging groups where necessary. Similarly, the two groups formed on the basis of ASRS-A screening (positive/negative) were compared with regard to the preference of the training format and the application of parenting strategies. Due to the low completion rate of the follow-up questionnaire, we were unable to employ group comparisons. We conducted a series of McNemar's tests to assess whether there had been a statistically significant change in proportions in the use of parenting strategies at two time points. Variables were therefore dichotomised.

RESULTS

Preliminary analyses

We compared the two study groups according to demographic characteristics. They did not differ in children's mean age ($M_{\text{ff}} = 9.10$, $SD_{\text{ff}} = 1.89$, range: 6 – 12 years, $M_{\text{o}} = 9.10$, $SD_{\text{o}} = 1.02$, range 7 – 11 years, $t(58) = 0.017$, $p = 0.987$) and gender ($\chi^2(1) = 1.478$, $p = 0.224$) (Table 1). We did not find any differences in parents' gender ($\chi^2(1) = 0.008$, $p = 0.928$).

No difference was found in the proportion of parents aged under and over 40 years ($\chi^2(1) = 1.178$, $p = 0.278$), and the proportion of parents with low/medium levels of education vs. high levels of education was the same in the two groups ($\chi^2(1) = 0.012$, $p = 0.914$). There was no difference in economic activity between the two groups ($\chi^2(1) = 0.406$, $p = 0.524$). However, in the online training group, a higher proportion of children lived in their original family ($\chi^2(1) = 4.331$, $p = 0.037$) and a lower proportion lived in the capital ($\chi^2(1) = 6.969$, $p = 0.008$) than in the face-to-face training group. There was no difference in the number of siblings between the two groups ($\chi^2(3) = 2.203$, $p = 0.531$) (Table 1).

A comparison was made between the two groups regarding children's psychopathological symptoms and the parents' ADHD symptoms. The descriptive data and reliabilities of the scales are presented in Table 2. The groups did not differ in the children's current level of ADHD symptoms, with the mean of the SDQ ADHD scale falling within the clinical range in both groups. Furthermore, the two groups did not differ in children's emotional and peer problems, with the mean of the SDQ Emotional Problems scale being elevated in both groups and the mean of the SDQ Peer Problems scale being elevated only in the online group. The level of conduct problems was found to be significantly higher in the online group than in the face-to-face training group (Table 2). The mean scores of SDQ Conduct Problems were elevated in the face-to-face group and reached a clinical level in the online group.

No differences were found in parental ADHD symptom levels in the two study groups (Table 2). According to the ASRS-A, screening was positive for 8 (44%) parents in the face-to-face group and 18

Table 3. The implementation and the frequency of use of parenting strategies in the previous week one month after the completion of the training and at three-month follow-up

Parenting strategy	Total (N = 60)	Training format		ASRS-A screen		Three-month follow-up (N = 24)
		Face-to-face (N = 21)	Online (N = 39)	Negative (N = 29)	Positive (N = 26)	
Special playtime N (%)						
0 day/week	2 (3)	0 (0)	2 (5)	0 (0)	2 (8)	3 (12)
1-2 days/week	20 (33)	5 (24)	15 (39)	10 (34)	8 (30)	9 (38)
3-4 days/week	32 (53)	14 (67)	18 (46)	15 (52)	14 (54)	12 (50)
5 or more days/week	6 (10)	2 (9)	4 (10)	4 (14)	2 (8)	0 (0)
Praise N (%)						
less than before	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)
same as before	11 (18)	5 (24)	6 (15)	5 (17)	4 (15)	8 (33)
slightly more than before	28 (47)	9 (43)	19 (49)	14 (48)	12 (46)	8 (33)
much more than before	21 (35)	7 (33)	14 (36)	10 (35)	10 (39)	7 (30)
Use of effective instructions N (%)						
never	2 (3)	0 (0)	2 (5)	1 (3)	1 (4)	2 (8)
sometimes	10 (17)	3 (14)	7 (18)	4 (14)	5 (19)	2 (8)
often	47 (78)	18 (86)	29 (74)	24 (83)	19 (73)	19 (80)
always	1 (2)	0 (0)	1 (3)	0 (0)	1 (4)	1 (4)
Reward system N (%)						
not thought about it	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
thought about it	5 (8)	0 (0)	5 (13)	2 (7)	3 (12)	4 (16)
put it together	10 (17)	2 (9)	8 (20)	6 (21)	4 (15)	5 (21)
implemented	45 (75)	19 (91)	26 (67)	21 (72)	19 (73)	15 (63)
Time-out N (%)						
not needed	25 (42)	7 (33)	18 (46)	11 (38)	11 (43)	12 (50)
needed but has not implemented yet	9 (15)	3 (14)	6 (15)	4 (14)	4 (15)	4 (16)
implemented	19 (32)	9 (43)	10 (26)	11 (38)	7 (27)	5 (21)
plan to implement in the future	7 (11)	2 (9)	5 (13)	3 (10)	4 (15)	2 (8)
missing	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)
Proactive strategies N (%)						
anticipating	33 (55)	12 (57)	21 (54)	18 (62)	13 (50)	14 (58)
planning	7 (12)	3 (14)	4 (10)	1 (3)	6 (23)	5 (20)
communicating with the child	42 (70)	15 (71)	27 (69)	24 (83)	15 (58)	19 (79)
using strategies practiced in the training	24 (40)	6 (29)	18 (46)	9 (31)	13 (50)	6 (25)
avoiding	10 (17)	3 (14)	7 (18)	4 (14)	6 (23)	2 (8)

Notes. ASRS-A: Adult ADHD Rating Scale, screening version

(49%) parents in the online group, with no difference in frequency between the two groups ($\chi^2(1) = 0.086$, $p = 0.769$).

The utilization of parenting strategies in the two training formats

Table 3 presents the frequency of use of parenting strategies taught in the BPT. The majority of parents have implemented special playtime, with nearly two-thirds utilising it at least half of the days per week. The proportion of parents who introduced special playtime in at least half of the days per week was almost identical in both groups ($\chi^2(1) = 2.300$,

$p = 0.129$). Most parents increased the proportion of positive reinforcement, yet the two groups did not differ in the frequency of praise ($\chi^2(2) = 0.655$, $p = 0.721$). Eighty percent of parents reported that they were at least strongly committed to following the rules of effective communication. However, no significant difference was found between the two groups ($\chi^2(1) = 0.659$, $p = 0.417$). A reward system was implemented and used by three-quarters of parents. A greater proportion of parents in the face-to-face group reported using a reward system, than in the online group ($\chi^2(1) = 4.127$, $p = 0.042$). A minority of participants believed that the time-out method was not necessary in their child's education,

and approximately one-third of them reported using it. The two groups did not differ in the proportion of participants who believed that the time-out method was not necessary in their child's education, those who believed it was necessary but had not yet introduced it, and those who had introduced it and were using the method ($\chi^2(2) = 1.915, p = 0.384$). The use of proactive parenting strategies showed a more diverse picture. According to data from self-reports, more than half of the parents successfully identified potentially challenging situations with the child. Seventy percents of them communicated their expectations to the child; however, only 40% reported the use of the parenting strategies practiced in the training in anticipated challenging situations. Furthermore, only a small proportion of parents (12%) succeeded in planning for difficult situations. Nevertheless, it is not common for challenging situations to be consciously avoided. The two groups did not differ in their anticipation ($\chi^2(1) = 0.060, p = 0.807$), planning ($\chi^2(1) = 0.215, p = 0.643$), or communication of challenging situations ($\chi^2(1) = 0.031, p = 0.859$). The results indicated no significant differences between the two groups in terms of their use of parenting strategies learned in the training ($\chi^2(1) = 1.758, p = 0.185$), or avoidance of difficult situations ($\chi^2(1) = 0.132, p = 0.717$) (Table 3).

The utilization of parenting strategies in the two groups according to the ASRS-A

The frequency of the use of parenting strategies in the ASRS screening test groups (positive/negative) was evaluated. The two groups did not differ in the proportion of parents who included special playtime at least half of the days per week ($\chi^2(1) = 0.094, p = 0.759$), nor in the frequency of praise ($\chi^2(2) = 0.102, p = 0.950$). No significant differences were observed between the two groups concerning the proportion of parents who reported that they often/always use effective communication strategies when they give instructions to the child ($\chi^2(1) = 0.292, p = 0.589$). Additionally, parents employed a reward system at a comparable rate in the two groups ($\chi^2(1) = 0.003, p = 0.956$). The two groups did not differ in the proportion of parents who reported that time-out was not needed, those who reported it was necessary but did not implement it, and those who did implement it ($\chi^2(2) = 0.794, p = 0.672$).

However, interesting results were obtained in the field of proactive strategies. The two groups did not differ in the degree of anticipating challenging

situations ($\chi^2(1) = 0.812, p = 0.368$). However, they did differ in planning ahead: parents in the positively screened group reported doing this more often ($\chi^2(1) = 4.755, p = 0.029$). Nevertheless, the opposite result was obtained for communication of difficult situations with the child, which was more common in the negatively screened group ($\chi^2(1) = 4.176, p = 0.041$). There was no significant difference between the two groups regarding the use of parenting strategies learned in the training ($\chi^2(1) = 2.055, p = 0.152$) or concerning avoidance of difficult situations ($\chi^2(1) = 0.794, p = 0.373$).

The utilization of parenting strategies at three-month follow-up

The results of McNemar's tests indicated that there were no significant differences between the two time points in the proportion of parents who included special playtime at least half of the days per week ($\chi^2(1) = 0.308, p = 0.581$) or in the frequency of praise ($\chi^2(1) = 0.900, p = 0.433$). However, the proportion of parents who reported that they often or always use effective communication strategies when giving instructions to their child increased from 54% to 83% ($\chi^2(1) = 5.143, p = 0.016$). The two groups did not differ in the proportion of parents who employed a reward system ($\chi^2(1) = 0.000, p = 1.000$) or time-out ($\chi^2(1) = 1.125, p = 0.289$). The results indicated no significant differences between the two time points in the following areas of proactive parenting: anticipating challenging situations ($\chi^2(1) = 0.000, p = 1.000$), having an exact plan ($\chi^2(1) = 0.800, p = 1.000$), communication with the child ($\chi^2(1) = 0.571, p = 0.453$), the use of parenting strategies learned in the training in challenging situations ($\chi^2(1) = 0.643, p = 0.424$), or avoidance of difficult situations ($\chi^2(1) = 0.167, p = 0.688$).

DISCUSSION

Parents represent one of the most significant agents of socialization, and parenting behaviours have been demonstrated to exert a long-term impact on a child's development and mental health (Gimenez-Serrano et al., 2022). This is also the case for children with ADHD (Claussen et al., 2022). Due to the highly familiar nature of ADHD, it is common that not only the child but also the parent is affected by the disorder (Brikell et al., 2015, Faraone & Larsson, 2019). This can have an impact on parental functioning (Johnston et al., 2012, Miklosi et al.,

2023), and on the treatment of the child (Chronis-Tuscano et al., 2011, Wang et al., 2014).

BPT is the most important psychosocial intervention in the treatment of childhood ADHD (EMMI, 2020; NICE, 2018); it should be offered to all parents of children diagnosed with the disorder. Technology-based programmes play a pivotal role in enhancing accessibility (Hansen, Broomfield, & Yap, 2019, MacDonell & Prinz, 2017). However, there is a paucity of empirical evidence regarding their comparative efficacy with the face-to-face delivery format (Bausback & Bunge, 2021), and the impact of parental ADHD symptoms. The aim of our study was therefore to compare the effectiveness of on-line and face-to-face training formats concerning the introducing of parenting strategies taught and their frequency of use. The role of parental ADHD symptoms was also analysed.

In order to enhance ecological validity, randomisation was not employed, and parents were permitted to select between the two training formats. The results indicated that there was a demand for both forms of training. Parents demonstrated a clear preference for one training format over the other. While we did not conduct a systematic examination of the criteria underlying this choice, discussions with parents revealed concerns about distance, organisation, and the need for a more relaxed approach. It would be beneficial in the future to conduct a more comprehensive investigation of the factors influencing choice.

The two groups did not differ significantly in the majority of demographic variables. The online group included a greater proportion of caregivers of children living with their biological parents, whereas the face-to-face group included a greater proportion of caregivers residing in the capital, presumably reflecting the distance aspect. According to the results of the SDQ, children in the online group might exhibit somewhat more severe psychopathology. It is unclear how this may have influenced the choice. One potential explanation is that it may be more challenging to supervise children with more severe behavioural issues. Further research is required in this field.

Similar to previous research (Barkley et al., 2000, Chacko et al., 2017), we had a relatively high drop-out rate, part of which can be attributed to technical difficulties in the online group. As we have found in our preliminary study (Miklósi, Sulyok, & Gallai, 2022), the use of e-learning system is too difficult for a non-negligible proportion of parents, for example, it is not optimized for smartphones. As

others have argued, it is very important to find the simplest technical solution and a smartphone-friendly implementation is also essential (Hansen et al., 2019).

The relative efficacy of online and face-to-face training formats

The results demonstrated that a considerable number of parents who participated in the training have adopted and are utilising the parenting strategies taught in the training. Almost all parents spent special playtime with their child one month after completing the training, with varying frequency. The majority of parents reported a positive shift in the ratio of positive to negative feedback, four-fifth reported communicating more effectively with their child, and three-quarters had introduced a reward-based motivational system. These positive parenting strategies are essential for children with ADHD (Barkley, 2013). Furthermore, approximately half of the parents expressed the need for time-out and third of them had already implemented it. While 40-70% of parents employed some proactive strategies, few demonstrated the ability to systematically plan parenting solutions for a challenging situation. Previous research has indicated that planning ahead potentially challenging situations is a crucial parenting strategy for ADHD (Dekkers et al., 2022). Therefore, the review of the programme is necessary to be able to identify ways to enhance the development of these skills, particularly anticipatory planning. Although the low attendance rate at the three-month follow-up limits the interpretability of the results, the data suggest that the use of parenting strategies may be stable in the longer term. Overall, our results are in line with previous research showing that BPT is effective in teaching new parenting methods (Daley et al., 2014, Kaminski & Claussen, 2017, P. Lee et al., 2012).

The results demonstrated that the training format had a minimal impact on the frequency of introduction and utilisation of novel parenting strategies. The sole exception to this was the introduction of a reward system, which proved more successful in the face-to-face group than in the online group. The introduction of a complex reward system necessitates considerable effort and we often experienced in our face-to-face training groups that the initial attempt is not always successful. When designing a system that is effective, it is crucial to consider the individual characteristics of both the child and the parent. It is noteworthy that the original protocol of Barkley (Barkley, 2013)

dedicates a significant portion of its curriculum to the introduction of a reward system. This approach is also employed in our clinical practice. It is possible that parents in the face-to-face group may have received more support and encouragement than in the online group. It would be beneficial to review the online content from this perspective.

The impact of parental ADHD symptoms

The ASRS-A screening questionnaire indicated positivity in almost half (47%) of the parents. It should be noted that this does not imply an ADHD diagnosis (Kessler et al., 2005). Nevertheless, it indicates a non-negligible prevalence of elevated levels of ADHD symptoms in our sample. The results are consistent with those of previous studies that have highlighted the high familial cumulative prevalence of ADHD (Brikell et al., 2015, Faraone & Larsson, 2019). As parental ADHD can affect the child's mental well-being and quality of life in a number of ways (Sellers et al., 2021), it is of great importance for the clinician to be able to recognise these effects and to take parental psychopathology into account during case conceptualisation and treatment planning.

Our study is the first to investigate the relationship between parental ADHD and the face-to-face/online delivery formats of BPT. The analysis demonstrated that ADHD screening scores were not associated with the choice of training format, with parents who screened positive selecting online and face-to-face groups in equal proportions. The results indicate that the online format may be as acceptable to parents with ADHD symptoms as the face-to-face training format.

The two groups did not differ in the implementation of most parenting strategies or in the frequency of their use. Consequently, the face-to-face and the online training formats were equally effective regardless of the ADHD screening results. The sole exception to this was the group of proactive parenting strategies. An unexpected result was that the group with ADHD positivity reported a higher prevalence of planning, which, in general, was the least utilized strategy in our sample. Conversely, they were less likely to discuss a challenging situation with their child in advance, which is a fundamental aspect of the proactive strategy (Barkley, 2013). This discrepancy questions the reliability of the positive screening group's reporting. It is possible that the executive deficit associated with ADHD symptoms (Boonstra et al., 2005, Mowinckel et al., 2015) may have

influenced the insight on parenting strategies used. On the other hand, executive function deficits were shown to be associated with less adaptive parenting strategies (Crouch et al., 2018, Tomlinson et al., 2022, Zaidman-Zait & Shilo, 2021); which may be related to the difficulties in using proactive parenting strategies as well. Overall, our results may suggest that parents with ADHD symptoms may require more supervision in practicing proactive parenting strategies.

LIMITATIONS

It should be noted that the study is subject to several limitations. The sample comprised only parents from our service area, with the majority being mothers. Further studies are required in other regions, involving other caregivers. The clinical diagnosis of ADHD of the child was used as one of the inclusion criteria. It would have been beneficial to confirm this with a structured interview and to assess the range of comorbid disorders. Similar to that of previous studies, we experienced a high dropout rate, that might have an impact on the results (Bausback & Bunge, 2021). We used parent report, that might be biased by social desirability, insight, and the level of executive functioning. In future studies, it would be beneficial to employ a wider range of methodologies, such as behavioural observation. Although we deemed it crucial to ensure ecological validity by allowing parents to select freely between different training delivery formats, the absence of randomisation could have influenced the results in several ways. It would be favourable to test the hypotheses in a randomised controlled trial.

CONCLUSION

Despite these limitations, our results indicate that face-to-face and online training formats can be equally effective in teaching parenting strategies. Furthermore, the effect appears to depend little on the level of ADHD symptoms of the parent. Online interventions therefore have a rationale in the provision of care. Parent training programmes delivered through telemedicine can significantly improve access and are cost-effective. Our results suggest that the use of telemedicine does not reduce effectiveness. It is therefore recommended that this approach is ought to be employed in the treatment of ADHD in children. Nevertheless, this necessitates appropriate regulation and funding of telemedicine.

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Viselkedésterápiás szülőtréning figyelemhiányos hiperaktivitás zavarral küzdő gyerekek szülei számára: személyes és internet-alapú formák relatív hatékonyságának vizsgálata nem-randomizált kontrollált elrendezésben

Háttér/Célkitűzés: A viselkedésterápiás szemléletű szülőtréning-programok bizonyítottan hatékony eljárások a gyermekkori figyelemhiányos/hiperaktivitás zavar (ADHD) ellátásában. Az online technológiák alkalmazása jelentősen növeli a hozzáférhetőségét ezekhez az intervenciókhoz. Kutatásunkban a személyes jelenléten alapuló és az online tréning relatív hatékonyságát vizsgáltuk az oktatott nevelési módszerek elajátítására, figyelembe véve a szülői ADHD tünetek szintjét. **Módszer:** Elkészítettük egy viselkedésterápiás szülőtréning tömeges nyílt online kurzus (MOOC) változatát. Kilencven szülőt vontunk be a vizsgálatba, akiknek gyermekét intézményünkben ADHD diagnózissal gondozzuk. Randomizációt nem alkalmaztunk, a szülők választhattak a személyes jelenléti és az online forma között. A tréning befejezése után egy és három hónappal kérdeztük meg a szülőt az oktatott nevelési módszerek bevezetéséről, alkalmazásának gyakoriságáról. Összehasonlítottuk a két csoportot e változók mentén. A szülői ADHD tüneteket a Felnőtt ADHD Becslőskála szűrő változatával (ASRS-A) mértük, a szűrés eredménye alapján képzett két csoportot (pozitív/negatív) összehasonlítottuk a tréningforma választása és a nevelési módszerek alkalmazása mentén. A gyermek aktuális pszichopatológiai tüneteit a Képességek és Nehézségek Skálával (SDQ) mértük. **Eredmények:** A személyes jelenléti formát 30 szülő választotta, 60 szülőt regisztráltunk az online rendszerbe. A kiesés jelentős volt, rendre 21 és 39 szülő adatait vontuk be az elemzésbe. A két csoport nem különbözött az ASRS-A szűrés eredménye mentén. A nevelési stratégiák alkalmazásában egyedül a motivációs rendszer bevezetésében volt különbség, erről a személyes jelenléti csoportból többen számoltak be, mint az online csoportból. Az ASRS-A alapján képzett csoportok egyedül a proaktív szülői stratégiák alkalmazásában különböztek. A legtöbb szülői stratégia használatának gyakoriságában nem volt különbség a két mérés között. **Megvitatás:** Eredményeink arra utalnak, hogy az online forma hasonlóan hatékony lehet a nevelési módszerek elsajátításában, mint a személyes jelenléten alapuló szülőtréning. A szülői ADHD tünetek szintje kevésbé befolyásolja a hatást, a proaktív stratégiákkal kapcsolatos nehézségek hátterében a végrehajtó funkciók deficitje állhat. A telemedicinális ellátás keretében szolgáltatott szülőtréning jelentősen javíthatja a hozzáférést, költség-hatékony, alkalmazását tehát ajánljuk a gyermekkori ADHD kezelésében. Ehhez azonban szükség van a telemedicinális ellátás megfelelő szabályozására és finanszírozására.

Kulcsszavak: figyelemhiányos/hiperaktivitás zavar, ADHD, pszichoszociális intervenciók, szülőtréning, internet, telemedicina