

Cost-effectiveness of a parenting program to reduce children's behavioral problems among families receiving child protection services and other family support services – A randomized controlled trial

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ABSTRACT

Background: Children's behavioral problems have high prevalence among families in the child welfare system, raising the need for cost-effective ways to diminish the problems. **Objective:** We evaluated the cost-effectiveness of the Incredible Years® (IY) Parenting Program for children's behavioral problems compared with a treatment-as-usual (TAU) in families receiving child protection services (CPS) and other family support services in Finland, from the health and social care payer's perspective at the intervention end (post-assessment) and with a 12-month follow-up. **Participants and setting:** The randomized controlled trial included 102 families of 3–7-year-olds with behavioral problems. Families were recruited from CPS and other family support services in Finland. **Methods:** Incremental net monetary benefit analysis combined the costs and effects of IY intervention and TAU groups. Costs included intervention costs and register-based children's and mothers' health and social care costs. Effectiveness measures were the Eyberg Child Behavior Inventory and the Child Behavior Checklist. **Results:** In the post-assessment, the cost-effectiveness results varied according to the effectiveness measures. Compared to TAU, the IY intervention was either not cost-effective or the cost-effectiveness depended on the decision-makers' willingness to pay. In the 12-month follow-up, IY and TAU did not differ in costs or effects. **Conclusions:** The cost-effectiveness estimates from previously studied populations may not generalize to families receiving CPS. Families receiving CPS are in urgent need of cost-effective support to reduce the high prevalence of children's behavioral problems. **Keywords:** cost-effectiveness, parenting program, behavioral problems, child protection services, social services.

1. Introduction

In a meta-analysis by Bronsard et al. (2016), the prevalence of children's disruptive disorders was 27 % among children and adolescents in the child welfare system. More specifically, the prevalence of conduct disorder and oppositional defiant disorder were high, at 20 % and 12 %, respectively (Bronsard et al., 2016). In comparison, the prevalence of children's disruptive disorders has been 5.7 % in a meta-analysis of community samples (2.1 % for conduct disorder and 3.6 % for oppositional defiant disorder) (Polanczyk et al., 2015). Behavioral

problems associate with a wide range of adverse events, diminished well-being of individuals, and high use of public services in the long term. For example, childhood conduct problems are associated with psychosocial outcomes in adulthood such as crime, substance use, mental health, and sexual/partner relationships (Fergusson et al., 2005). Children with impulsive or disruptive behavior are more likely to be targets of psychological or physical abuse than other children (Lep-päkoski et al., 2021). About half (54 %) of Finnish children diagnosed with conduct disorder or oppositional defiant disorder experience out-of-home care (Kääriälä et al., 2021).

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The long-term costs are estimated to be 5–10-fold higher for children with childhood conduct disorder, two-fold higher for children with oppositional defiant disorder, and 3–4-fold higher for children with conduct problems without diagnosis, compared to children without behavioral problems. The costs have included the use of health and social services, prescription medicines, injury claims, special education in schools, and services offered to persons committing crimes (Rissanen et al., 2021; Foster & Jones, 2005; Scott et al., 2001).

All these aspects raise the need for evidence-based and cost-effective interventions to reduce behavioral problems and prevent out-of-home placements by timely support for the child and parents among families in the child welfare system. The Finnish child welfare system includes all child protection services (CPS) provided to protect children from abuse and neglect, based on legislation, and all services and benefits that exist for children's and families' benefit (Pösö, 2014). Finnish child protection can be characterized as a family-service oriented model (Pösö et al., 2014; Berrick et al., 2017). The services are available step-by-step, based on the needs of the families. Finnish municipalities, from start of 2023, Wellbeing service counties, organize in-home CPS, out-of-home care of CPS, and preventive CPS (Child Welfare Act 13.4.2007/417), and social services indicated to support parenting (Social Welfare Act 30.12.2014/1301). Majority of child protection services are in-home supportive services, for example intensive family support, counselling and guidance, family work or support person. Services are planned and organized in collaboration and with the consent of the family (Pösö et al., 2014). In 2021, 2.8 % (10,100 children out of 355,169) of Finnish 0–6-year-olds were clients of in-home CPS, and 0.9 % (3,033 children) of the same age group were in out-of-home care with CPS (Sotkanet.fi). Families receiving CPS face diverse and complex needs (Heino, 2007).

The Incredible Years® (IY) Parenting Program has been widely studied in reducing child behavioral problems (Mingebach et al., 2018; Menting et al., 2013), but only a few studies have examined the effectiveness of the IY Parenting Program in reducing child behavioral problems among families receiving CPS (Arruabarrena et al. 2022; Karjalainen et al., 2019, 2021; Letarte et al., 2010). Arruabarrena et al. (2022) compared in RCT-setting IY and Small Group Dinosaur Program together to standard services for families receiving CPS in Spain. They found IY intervention effective in increasing parents' use of praise and reducing use of inconsistent discipline, parenting stress, depressive symptomatology, and child behavior problems in the post-assessment at 6-months. From post-assessment to 12-month follow-up, there were no statistically significant differences between the groups. Karjalainen et al. (2019; 2021) used the same RCT data as our cost-effectiveness analysis, described in this paper. In the post-assessment, the IY intervention improved positive parenting and reduced child behavioral problems in families receiving CPS and other family support services, compared to treatment-as-usual (TAU) (Karjalainen et al., 2019). Nevertheless, in the longer 12-month follow-up, the IY intervention showed statistically insignificant effectiveness compared to TAU (Karjalainen et al., 2021). A small observational study by Letarte et al. (2010) used post-assessment and found that the IY intervention reduced children's behavioral problems in the CPS compared to the waiting list. Among families with a self-reported history of maltreatment, Hurlburt et al. (2013) found that IY intervention improved multiple parenting dimensions but resulted in statistically insignificant differences in child behavior compared to a control group in site-RCT design with a 12–18-month follow-up. Leclair Mallette et al. (2021) used a quasi-experimental study design and found IY participation increasing families receiving CPS probability of CPS case closure in Canada.

Health and social care professionals need research evidence to support decision-making regarding different interventions in this important child population with a high prevalence of disruptive disorders. Economic evaluation aim to support decision-makers by comparing both the costs and the consequences of alternative courses of action. (Drummond et al. 2015).

To the best of our knowledge, economic evaluations of the IY

intervention in families receiving CPS are missing. Previous economic evaluations of IY intervention have focused on more general populations (Sampaio et al., 2022; Nystrand et al. 2019; Gardner et al., 2017; Edwards et al., 2016, 2007; Sampaio et al., 2016; O'Neill et al., 2013; Cox et al. 2022). The 4-month and 6-month economic evaluation of IY found the cost-effectiveness of IY depending on the decision-makers' willingness to pay for an extra unit of effectiveness (Sampaio et al. 2016; Gardner et al., 2017; Edwards et al., 2007, 2016; O'Neill et al., 2013). The 18-month economic evaluation comparing three consecutive IY programmes (Incredible Babies book, the IY Infant and IY Toddler parenting programmes) to services as usual and found the cost-effectiveness of the IY intervention combination depended on the analysis unit (child, primary caregiver or dyad) and decision-makers willingness to pay (Cox et al. 2022). The long-term economic evaluation of IY used decision-analytic modelling and found IY cost-effective compared to no intervention in preventing conduct problems (Nystrand et al. 2019).

To overcome this shortage, we evaluated the short-term cost-effectiveness of a 19-week IY intervention with the supportive IY Home Coaching (HC) program (Webster-Stratton, 2016) compared to treatment-as-usual (TAU) in Finnish families receiving CPS and other family support services, from the health and social care payer's perspective at the intervention end (post-assessment) and with a 12-month follow-up. The cost-effectiveness estimates are based on an RCT conducted among families receiving CPS and other family support services (mostly family social work, family counselling, primary care psychologist, family center services) in Finland ([Blinded for peer review]; Karjalainen et al., 2019, 2021). In addition to the RCT data, we have register-based health and social care service use data of children and mothers to evaluate how the IY intervention might affect service use and the computational costs of the services.

2. Methods

2.1. Population and study design

In 2016, seven Finnish municipalities out of 313 participated in the trial. Each municipality had previous experience of delivering IY interventions and was committed to recruiting one IY intervention and TAU group (Fig. 1).

Municipal workers from CPS, preventive CPS, and social services recruited eligible families from their clients. Eligible families had a 3–7-year-old child with behavioral problems who lived at home. Municipalities' social or family workers evaluated that the parents may benefit from parenting support and that they were motivated and able to attend the intervention. The study excluded families with an acute unsolved child protection issue, parents with mental health or substance abuse problems that prevented them from participating in the trial, and children in out-of-home care with CPS.

From each participating municipality, workers recruited 8–18 families, altogether 122 parents and 102 children. The families of 72 children were clients of in-home CPS, and the families of 30 children were clients of social services parenting support. Children were randomized to the IY intervention (n = 50) and TAU (n = 52) groups. In total, 6–9 families (average 7.7) with 7–11 parents (average 9.3) started the IY intervention in each municipality. One municipality had only four children with six parents randomized to the intervention group. In that group, families outside the trial also attended without data collection. The protocol [Blinded for peer review] and the effectiveness studies (Karjalainen et al., 2019, 2021) describe the open-label 2-arm parallel trial with 1:1 ratio in detail including sample size calculation and methods for randomization.

At the baseline, families and children in the intervention and TAU groups were similar in socio-demographic characteristics (Karjalainen et al., 2019). Briefly, the children's average age was 5.3 (SD 1.2) years, 64 % were boys, and 97 % had Finnish as mother tongue. In total, 46 %

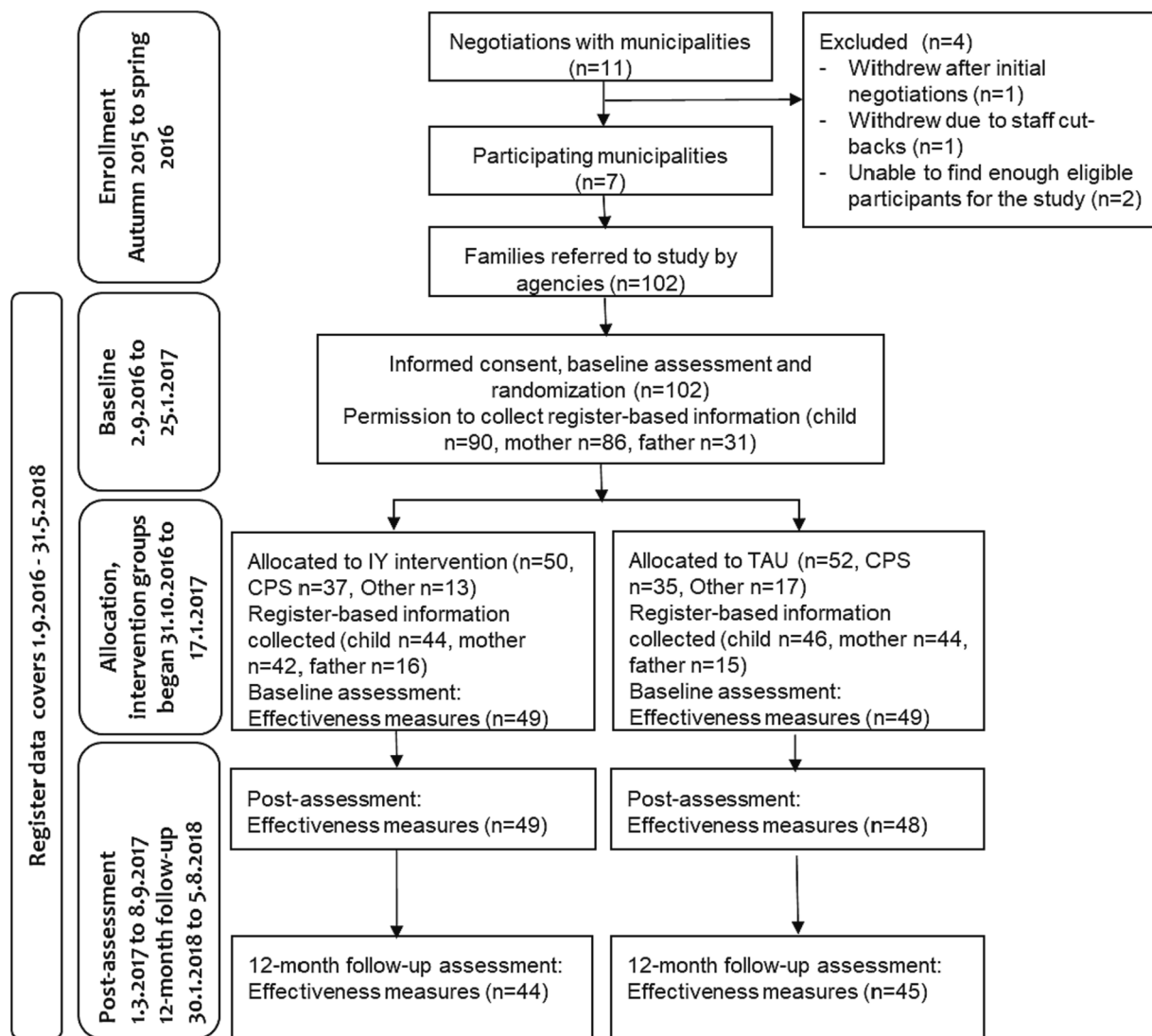


Fig. 1. Consort flow diagram.

of the children lived with a single parent and 30 % had more than two major life events (i.e., changes in family relations, income, or health). On average, 21 % of families assessed their ability to cover expenses with current income as difficult. Most parents were at least 30 years old (73 % of mothers and 88 % of fathers), had intermediate vocational or higher education (83 % of mothers and 92 % of fathers), and were employed (50 % of mothers and 79 % of fathers).

Parents signed a written informed consent before their participation, and they completed the baseline assessments. In the informed consent, parents also gave permission to collect the register-based health and social care visit data for themselves and their child. Participation in the trial was voluntary, and families could withdraw from the trial at any time. Participants provided information on outcome measures at baseline, at the intervention end (post-assessment was average of 216 days (SD 39) from baseline assessment), and in a 12-month follow-up from the post-assessment (average of 348 days (SD 25) from post-assessment). Participants received a gift certificate to a swimming pool, cinema, or activity park after each assessment. The Hospital District of Helsinki-Uusimaa Ethics Committee approved the research. We used the CONSORT and CHEERS checklists when writing our report (Schulz et al. 2010; Husereau et al. 2022).

2.2. Description of the intervention

Families in the IY group received the intervention in addition to the usual health and social services already offered to families i.e., in addition to treatment as usual described in Section 2.3. The IY intervention included the 19-week version of the structured and manualized IY Preschool BASIC parenting program (Webster-Stratton, 2011) and the supportive IY Home Coaching (HC) program (Webster-Stratton, 2016), following Webster-Stratton and Reid's (2010) recommendation for families receiving the CPS. The IY intervention is mainly based on social learning theory and aims to increase developmentally age-appropriate parenting skills and thus promote children's social competence and emotional regulation, and reduce behavior problems (Webster-Stratton, 2011). Instead of the standard 14–16 meetings, our IY intervention contained nineteen parent group meetings, as suggested by Hurlburt et al. (2013). Additional group meetings concentrated on building positive relationships between children and parents. The IY HC intervention (Webster-Stratton, 2016) aims to enhance parenting skills and provide individual practical consultation. In this study, the supportive IY HC contained only four home visits instead of the standard ten visits. Hereafter, the description of the IY intervention includes both programs jointly.

In six municipalities, three trained group leaders organized the IY

intervention instead of the usual two. Two were from family counseling services and one from CPS. The group leader from CPS also delivered the supportive IY HC intervention. In one municipality, two trained group leaders organized the IY intervention: one from family counseling services and one from CPS. All leaders had completed the IY BASIC Group Leader training, and the leaders from CPS had completed the IY Home Coach training. The IY BASIC Group Leader training took three days (seven hours a day), and the IY Home Coach training took two days (seven hours a day). In addition, one leader was a certified IY BASIC Group Leader with an additional certification process of five hours of work.

The IY intervention consisted of a one-hour interview meeting, 17–19 parent group meetings (2.25 h each), 18–20 weekly phone calls (12–30-minutes each), one ‘reunion’ meeting (1.5–3 h) and four structured IY HC home visits (1–2 h each). Depending on the municipality, families participating in the IY intervention received their own or borrowed IY books. In addition, parents completed their own workbooks in the IY intervention. All municipalities organized childcare for the participating families for the IY group meetings and for the reunion, if needed. On average, 3.7 (SD 1.7) childcare workers per meeting were booked. The childcare workers were either personnel from Finnish NGOs offering short-term childcare services, practical nurse students, or personnel from families’ home help services. The group meetings and most childcare used the facilities of the family counseling services. Some municipalities provided childcare at home. The municipalities provided refreshments for parents and children.

For group leaders, the IY intervention included supervision and consultation. On average, every three weeks throughout the intervention, a certified IY peer coach supervised and reviewed the video recordings of the group meetings together with the group leaders, either face-to-face or via video conferencing. In each municipality, two leaders attended a seven-hour consultation day, and a leader with IY HC training attended another seven-hour consultation day organized by a certified IY trainer.

2.3. Description of treatment-as-usual (TAU)

The control group families received TAU, meaning the services to which they were entitled and receiving. In Finland, TAU is a diverse group of services provided in primary and specialized health care and social services, depending on the municipality. The researchers contacted the parents and reminded them of their right to access all other services and support if needed. Families were also able to participate in the next available IY intervention group in the community after the 12-month follow-up. The service use of TAU and other service use of IY group was based on Finnish health and social care registers described in the following section (Appendix Table 1).

2.4. The cost analysis

In the cost analysis, we applied the health and social care payer’s perspective to identify and value resource use. Our cost estimates included health and social care payers’ intervention costs and costs of using health and social services for children and their mothers. In addition, we estimated parents’ time use and travel costs for participating in the IY intervention. These costs are important because a high cost of participation can negatively influence families’ chances of participating (Foster et al., 2007).

The cost analysis was done at the most precise level, meaning that it was based on the micro-costing method. In micro-costing, all resource use components are valued with unit costs. Accurate cost analysis enables accurate cost-effectiveness estimation, and it is especially important for implementation as decision-makers can accurately estimate the costs of IY intervention (Drummond et al., 2015; Charles et al., 2013). The conversion of the unit costs (OSF: Price index of public expenditure) to 2021 values used the price index of health care expenditures in

Finnish municipalities and the CCEMG-EPPI-Centre Cost Converter if the original cost currency was US dollars (Shemilt et al., 2010).

IY intervention costs to the health and social care payer. The research team collected the resource use data for costing the IY intervention retrospectively between June and October 2020 from the municipalities, invoices, and other relevant sources. In the collection of resource use data, municipal workers evaluated their use of time, travel kilometers, and other resources. The recruitment of families was done as part of normal services and was not valued.

In the costing of the IY intervention, we divided the costs into non-recurrent set-up and recurrent delivery costs (Charles et al., 2013). The set-up costs included the training and certification fees of the leaders, including preschool manuals and leaders’ time use, and travel and accommodation during the training days. We divided the total set-up costs of the IY intervention for five years, used a 3 % discount rate (Finnish Medicines Agency, 2012), and assumed two groups annually to represent the training costs for one IY intervention group (Edwards et al., 2016). The delivery costs of the IY intervention included leaders’ time and travel costs, and costs of peer coaching and consultation, materials, childcare, and premises. The categorization of parents’ books as either set-up (if borrowed) or delivery (if given) costs depended on municipal policies. For one municipality, the intervention costs also took into account the families participating outside the trial.

The personnel unit cost valuation used Finnish government sector salaries based on the job title (Local government employers, 2022) including labor costs (+24 %), which are namely direct earnings, one-off items, personnel funds, remuneration for days off, benefits in kind, social security costs, in-service training, and other labor costs (OSF: Labour cost survey). Childcare provided by personnel from a Finnish NGO or practical nurse students was valued using the Mannerheim League for Child Welfare (2022) unit cost. Childcare provided by personnel from families’ home help service was valued using Finnish government sector salaries (Local government employers, 2022) including labor costs (+24 %) (OSF: Labour cost survey). Travel costs were valued using Finnish kilometer allowances in 2021 (Kilometer allowances in 2021). Other costs were from invoices, relevant websites, or assumptions made by municipality workers. The unit costs used for valuation of resources and their sources are in Appendix Table 2.

Parents’ time use and travel costs. Parents’ costs included time used for the IY intervention and travel time and costs for the meetings. For all parents, time use for the interview and home visits was based on the municipality workers’ estimates. For parents with documented attendance at the group meetings, time used in the group meetings, weekly phone calls, and travel to the meetings was based on the municipality workers’ estimates. On average, parents attended 11.8 group meetings (SD 5.6) out of 19.6. We assumed that parents who missed the last three group meetings missed the reunion meeting. For others, we assumed participation in the reunion. Most of the meetings were held during regular leisure time, or parents were able to organize time off work to participate in the meetings. Parents’ time use valuation was a weighted average based on trial parents’ work status (60 % employed, 40 % other). We used Finnish average hourly total earnings (OSF: Structure of Earnings) after an assumption of 25 % taxes and earnings-related unemployment benefit (Unemployment funds, 2022) after taxes (assumed 25 %). Travel costs were valued using Finnish kilometer allowances in 2021 (Kilometer allowances in 2021). The unit costs are shown in Appendix Table 2.

Health and social care service costs. The costs of health and social care services are calculated based on service use and Finnish national unit costs (Mäklin & Kokko, 2021; Appendix Tables 3–6). For service use, this study used four Finnish nationwide registers: (1) Care Register for Health Care, (2) Register of Primary Health Care visits, (3) Care Register for Social Welfare, and (4) Register of Child Welfare (Care Register for Health Care; Register of Primary Health Care Visits; Care Register for Social Welfare; Register of Child Welfare). Register-based data consisted of a 21-month period from the beginning of the trial,

that is, from September 1, 2016 to May 31, 2018. In the post-assessment analysis, we used data from baseline to 216 days (approximately 7-months) which was the average period for post-assessment. In the 12-month follow-up analysis, we used data from baseline to 564 days (approximately 19-months). We used only register-based data for children and mothers, as only 30 % of the fathers gave permission to use their register-based data.

From the Care Register for Health Care, we received information about inpatient periods and outpatient specialized health care visits provided in hospitals (Finnish Institute for Health & Welfare: Care Register for Health Care). From the Register of Primary Health Care, we collected outpatient primary health care visits (Finnish Institute for Health & Welfare: Register of Primary Health Care visits). Two municipalities had registered the IY intervention visits in the Register of Primary Health Care, which we excluded to avoid double counting these costs.

From the Care Register for Social Welfare, we received information about institutional and round-the-clock housing service periods provided by social care (Finnish Institute for Health & Welfare: Care Register for Social Welfare). The Register of Child Welfare provided information about children's out-of-home care with CPS periods, namely periods in outpatient support, emergency placement, custody, or aftercare (Finnish Institute for Health & Welfare: Register of Child Welfare).

2.5. Outcome measures

This cost-effectiveness analysis uses three reliable and good validity outcome measures: the Eyberg Child Behavior Inventory's (ECBI) intensity and problem scales, and the Child Behavior Checklist (CBCL/1.5-5) externalizing subscale (Eyberg & Pincus, 1999; Achenbach & Rescorla, 2000), as they measure a child's behavioral problems differently. For cost-effectiveness analysis, the interpretation and valuation of a one-point change in ECBI or CBCL outcomes is difficult for a decision-maker. Therefore, we also used the clinical cut-offs of three outcome measures to calculate the number of children with clinically significant level behavioral problems.

The **ECBI measure** is a parent rating scale with thirty-six statements of child behavioral problems applicable to children and young people aged 2–16 (Eyberg & Pincus, 1999). The Intensity scale measures the frequency of the behavioral problems and consists of a seven-point Likert-scale (ranging from 'never' to 'always') with a maximum score of 252. The Problem scale measures whether the parent considers the behavioral problems to be problematic, with 'yes' or 'no' response options and a maximum score of 36. The clinical cut-off for the intensity score is 131 points, and for the problem score it is 15 points (Eyberg & Pincus, 1999).

The **CBCL externalizing subscale** is an age-normalized measure for children's disruptive behavior, which has twenty-four statements about the child's behavior (Achenbach & Rescorla, 2000). Statements are related to attention problems and aggressive behavior. Parents rate each statement using a three-point Likert-type scale: 'not true', 'somewhat or sometimes true', and 'very true or often true'. The CBCL externalizing subscale has a maximum score of 48. The clinical cut-off for the CBCL externalizing score was 32 points (Achenbach & Rescorla, 2000). In all outcome measures, the higher scores indicate more behavioral problems. We used mother-reported outcome measures, as they were most often available. If these were unavailable, we used the father's answers.

2.6. Statistical analyses

To follow the intention-to-treat principle, we used two imputation methods to replace missing values of outcome measures and health and social care costs. We first used the ECBI manual recommendation to impute the missing items of ECBI outcomes (Eyberg & Pincus, 1999). Then we used multiple imputations by chained equations (MICE) for

outcome scale scores and health and social care costs (Faria et al., 2014). The predictors were outcome measures at the three points of measurement, the health and social care costs of child and mother, and the variables predicting missingness of outcome or costs (discontinuation of the IY intervention, municipality, parent's education, and father's employment status). For 47 % of the observations, outcome measures were reported and included information on the costs of health and social services. In the outcome measures and service use costs, missingness varied between 5 and 22 % among participants. We used Rubin's rules to combine results from fifty imputed datasets (Marshall et al., 2009).

To evaluate the differences between intervention and control groups in the costs of health and social care service use, we used the generalized linear models (GML) with gamma-distribution and log-link function (Deb et al., 2017). The binary intervention variable controlled for between-subjects variation. We report the cost analysis results based on predictions of the model. To estimate the effectiveness of the IY intervention compared to TAU, we used the linear mixed-effect models for repeated measurements with the restricted maximum likelihood (REML). The child indicator was a within-subjects factor. Variables controlling for between-subjects variation were the binary intervention variable, the three points of measurement, and the interaction term for the intervention and the point of measurement. Logistic regressions tested the group differences when the number of children above the cut-off was used as an outcome variable. The independent variables were the binary intervention variable, the three points of measurement, and the interaction term for the intervention and the measurement point. We report the effectiveness results based on adjusted predictions of the models. Cohen's *d* measured the standard effect size (Cohen, 1988, 20–21).

In the cost-effectiveness analysis, first we assessed whether IY intervention or TAU dominated, meaning which was more effective or had similar effects with lower costs. In a case without dominance, we evaluated incremental net monetary benefit (NMB) in comparing the alternatives. NMB is calculated by multiplying the observed effects by the decision-makers' willingness to pay, λ , for an extra unit of effectiveness, and then subtracting the observed cost (Hoch et al., 2002). As the willingness to pay for one extra unit of effectiveness is unstated, we used a range of values. The analysis used a health and social care perspective, and therefore all register-based costs of children and mothers and intervention costs were included in the analysis. The estimating equation for net monetary benefit of individual *i* in the data set is:

$$NMB_i = \lambda * \text{observed effect}_i - \text{observed cost}_i.$$

To compare the IY intervention and TAU, we estimate incremental net monetary benefit, which measures additional expected monetary benefit from IY intervention compared to TAU (Hoch et al., 2002). The estimation of the incremental NMB between the IY intervention and TAU groups used ordinary least squares (OLS) regressions with the group indicator as the independent variable (Hoch et al., 2002).

The decision rules for incremental net monetary benefit are as follows: (1) if the chosen willingness to pay produces a positive incremental net monetary benefit, the IY intervention is cost-effective in comparison to the TAU; (2) if the chosen willingness to pay produces a negative incremental net monetary benefit, the TAU is cost-effective in comparison to the IY intervention (Hoch et al., 2002). We performed the analyses using Stata statistical software (SE17.0). The discounting rate was 0 % as the time horizon was short.

2.7. Sensitivity analyses

We performed multiple one-way sensitivity analyses to test the results for changes in cost perspective and study population. The first four analyses tested the impact of the cost perspective on the results, as it is important to recognize whom the incremental costs will target. The first sensitivity analysis used wider perspective than the base case but still a

limited societal perspective for costs by adding parents' time use and travel. The second used the same health and social care service payer perspective but included only IY intervention costs and children's health and social care service use costs and excluded the mothers use of health and social care. The third analysis used the families' perspective in costs by including only parents' time use and travel costs. Originally, the trial targeted only families receiving CPS but extension to families with other family support services was done due to recruitment difficulties. Therefore, we performed sensitivity analysis using only data from families receiving CPS (IY $n = 37$; TAU $n = 35$) to evaluate how the cost-effectiveness result would change if the target group had been as originally planned.

3. Results

3.1. Cost of IY intervention

Average IY intervention costs were €23,949 (SD 4,804) per group with an average of eight families and €3,155 (SD 712) per child. Table 1 presents the non-recurrent set-up costs and recurrent delivery costs of the intervention. Details of the division of non-recurrent set-up and recurrent delivery costs of IY intervention are presented in Appendix Table 7. Most of the IY intervention costs accumulated from delivery of the 19-week IY intervention, and 10 % came from the supportive HC intervention.

Parents' time and travel costs in the IY intervention were, on average, €854 (SD 602) per child. About half (48 %) of the costs accumulated from group meetings and reunion meetings, one third (33 %) accumulated from the travel time and costs for the meetings, and one fifth (19 %) of the costs accumulated from the starting interview, weekly phone calls, and home visits. For an IY intervention with an average of eight families, parents' time and travel costs were €6,101 (SD 2,702). Appendix Table 7 shows detailed parents' time use and travel costs in IY intervention.

3.2. Health and social care service use and costs in families

The health and social service use of children ($n = 90$) and mothers ($n = 86$) did not differ between IY intervention and control groups during the period from baseline to 12-month follow-up (Appendix Table 1). Children spent an average of 16.2 (SD 70.0) days in out-of-home care with CPS. In families receiving CPS, 14 % of children (6 % in IY; 22 % in TAU) were in out-of-home care with CPS, and the average number of days spent in out-of-home care was 162 (SD 167, 349 days in IY, 108 days in TAU). None of the children in families with other family support services were in out-of-home care during the study period.

In primary care, children had 12.3 (SD 12.9, mothers 15.8, SD 16.2) visits to outpatient care units, 4.1 (SD 5.4, mothers 5.8, SD 8.8) visits to maternity and child counseling units, 2.6 (SD 5.4, mothers 0.4, SD 2.1) visits to school and student health care units, 0.2 (SD 1.8, mothers 2.0,

Table 1

Average non-recurrent set-up and recurrent delivery costs of IY intervention in 2021, in euros.

	Cost (SD)
Set-up costs of IY intervention group	€9,575 (1,089)
Set-up costs of one IY intervention group divided over five years, two groups per year with 3 % discount rate, to represent costs for one IY intervention group	€903 (103)
Delivery costs of one IY intervention group	€23,046 (4,762)
Delivery costs of one IY intervention group per child	€3,036 (700)
Total IY intervention costs (including both set-up and delivery costs) per group	€23,949 (4,804)
Total IY intervention costs (including both set-up and delivery costs) per child	€3,155 (712)

SD 6.9) visits to mental health units, and 0.1 (SD 0.6, mothers 0.3, SD 1.1) visits to physiotherapy units. In specialized psychiatry, children had 5.5 (SD 12.0, mothers 5.0, SD 15.8) visits to outpatient psychiatry, 0 (mothers 0.1, SD 0.3) visits to emergency care, and 0.8 (SD 5.6, mothers 0.2, SD 2.2) days in inpatient care. In specialized somatic health care services, children had 2.3 (SD 5.1, mothers 2.6, SD 4.6) visits to outpatient care, 0.5 (SD 1.2, mothers 1.2, SD 2.7) visits to emergency care, and 0.5 (SD 1.9, mothers 0.7, SD 1.9) days in inpatient care. Children had an average of 0.2 (SD 1.1) days in enhanced service housing for people with developmental disabilities.

There were no statistically significant differences between the costs of health and social services in the IY and TAU groups during the study period from baseline to 12-month follow-up (Table 2). About two thirds (66 %) of the average total health and social care costs were children's use of services. Children's service use costs consisted of specialized health care (47 %), out-of-home care with CPS (39 %), primary health care (14 %), and institutional and round-the-clock housing services (0.3 %) costs. The mothers' service use costs accumulated from specialized health care (66 %) and primary health care (34 %) costs.

3.3. Effectiveness results

The effectiveness results based on imputed data (shown in Appendix Table 8) are similar to those previously reported in effectiveness studies on the same RCT data (cf. Karjalainen et al., 2019, 2021). At the baseline, ECBI intensity scores ($p = 0.312$), ECBI problem scores ($p = 0.581$), and CBCL externalizing scores ($p = 0.658$) were similar in the groups. In addition, the intervention and control groups were similar in the number of children above the ECBI intensity score cut-off ($p = 0.486$), ECBI problem score cut-off ($p = 0.362$), and CBCL externalizing score cut-off ($p = 0.569$) points. Based on cut-off results, every three out of five children had behavioral problems above clinical cut-off of ECBI and every one out of six children had behavioral problems above clinical cut-off of CBCL externalizing at the baseline.

The change from the baseline to the post-assessment (approximately 7 months from baseline) in the ECBI problem score was statistically significantly lower in the IY intervention group (difference -4.8 , $p = 0.010$) than in the TAU group. Furthermore, statistically significantly fewer children were above the ECBI problem score cut-off (cut-off value ≥ 15 ; 40 %-point difference, $p = 0.010$) and the CBCL externalizing score cut-off (cut-off value ≥ 32 ; 17 %-point difference, $p = 0.046$) from the baseline to the post-assessment in the IY intervention group than in the TAU group. At the 12-month follow-up (approximately 19 months from baseline), none of the differences in outcome estimates were statistically significant.

3.4. Cost-effectiveness of IY intervention

In the post-assessment, TAU dominated the IY intervention when effectiveness was measured using the ECBI intensity score, CBCL externalizing score, or ECBI intensity score cut-off. The domination is due to the no difference in effectiveness between IY and TAU and higher IY costs compared to TAU. The incremental costs of the IY intervention group were €4,293 (SE 1,042, coef. 0.84, p -value ≤ 0.001) compared to the TAU group.

We performed incremental NMB analysis using only statistically significant outcome measures: the change from the baseline to the post-assessment in the ECBI problem score (-4.8 , $p = 0.010$), ECBI problem score cut-off (cut-off value ≥ 15 ; 40 %-point difference, $p = 0.010$), and CBCL externalizing score cut-off (cut-off value ≥ 32 ; 17 %-point difference, $p = 0.046$) between the IY intervention group and the TAU group. The cost-effectiveness analysis used the health and social care decision-makers' perspective by including the costs of the intervention and the costs of using health and social care services for children and mothers.

In the cost-effectiveness analysis using the ECBI problem score in the post-assessment, the health and social care decision-makers' willingness

Table 2
Model-based average cost of children’s and mothers’ service use.

	From baseline to post-assessment				From baseline to 12-month follow-up			
	IY (n = 50)	TAU (n = 52)	Incremental (SE)	P-value	IY (n = 50)	TAU (n = 52)	Incremental (SE)	P-value
Child								
Primary health care services	€551 (101)	€470 (86)	€81 (133)	0.540	€1,230 (167)	€1,180 (168)	€50 (234)	0.830
Specialized health care services	€1,122 (348)	€976 (294)	€146 (456)	0.749	€3,662 (963)	€4,642 (1,195)	-€980 (1,537)	0.524
Institutional and round-the-clock housing services	0	€32 (32)	NA	NA	0	€46 (34)	NA	NA
Out-of-home care with CPS	€218 (192)	€295 (254)	-77 (318)	0.808	€3,595 (2,190)	€3,291 (1,886)	€305 (2,893)	0.916
Total costs	€1,891 (411)	€1,773 (377)	€118 (561)	0.834	€8,488 (2,406)	€9,159 (2,449)	-€671 (3,454)	0.846
Mother								
Primary health care services	€857 (157)	€757 (135)	€100 (205)	0.624	€1,649 (270)	€1,473 (236)	€176 (363)	0.627
Specialized health care services	€1,658 (481)	€757 (206)	€901 (520)	0.084	€3,580 (891)	€2,491 (558)	€1,089 (1,055)	0.302
Total costs	€2,515 (505)	€1,514 (280)	€1,001 (574)	0.081	€5,229 (960)	€3,964 (660)	€1,266 (1,172)	0.280
Total cost of both children and mothers	€4,406 (678)	€3,287 (481)	€1,119 (831)	0.178	€13,717 (2,759)	€13,122 (2,482)	€594 (3,739)	0.874
Total cost of both children and mothers including IY costs	€7,580 (957)	€3,287 (412)	€4,293 (1,042)	≤0.001	€16,892 (3,011)	€13,122 (2,246)	€3,769 (3,784)	0.319

to pay for a one-point reduction in the ECBI problem score needs to be €893 to obtain zero incremental net monetary benefit (95 % confidence interval: €-3,641 to €3,649). The one-point reduction in ECBI problem score is relevant to parent as it means that parent considers one less statement of child behavioral problems as problematic. To illustrate the importance of the decision-makers’ willingness to pay, Fig. 2 presents incremental net monetary benefit by willingness to pay value. For example, if the decision-makers’ willingness to pay was in the range of zero to €892 for a one-point reduction in the ECBI problem score, then the incremental NMB would be negative and IY intervention would not

be cost-effective compared to TAU. If the health and social care decision-maker has a willingness to pay more than €893, the incremental net monetary benefit would be positive and the IY intervention would be cost-effective compared to TAU. For example, with a willingness to pay of €2000, the incremental net monetary benefit is €5,331 (95 % CI €-2,148 to €12,811). Fig. 2 and Table 9 in the Appendix present the cost-effectiveness acceptability curve for the ECBI problem score and its calculation (Hoch et al., 2006). With a €2,400 willingness to pay for a one-point reduction in the ECBI problem score, the IY intervention had a 95 % probability of being cost-effective.

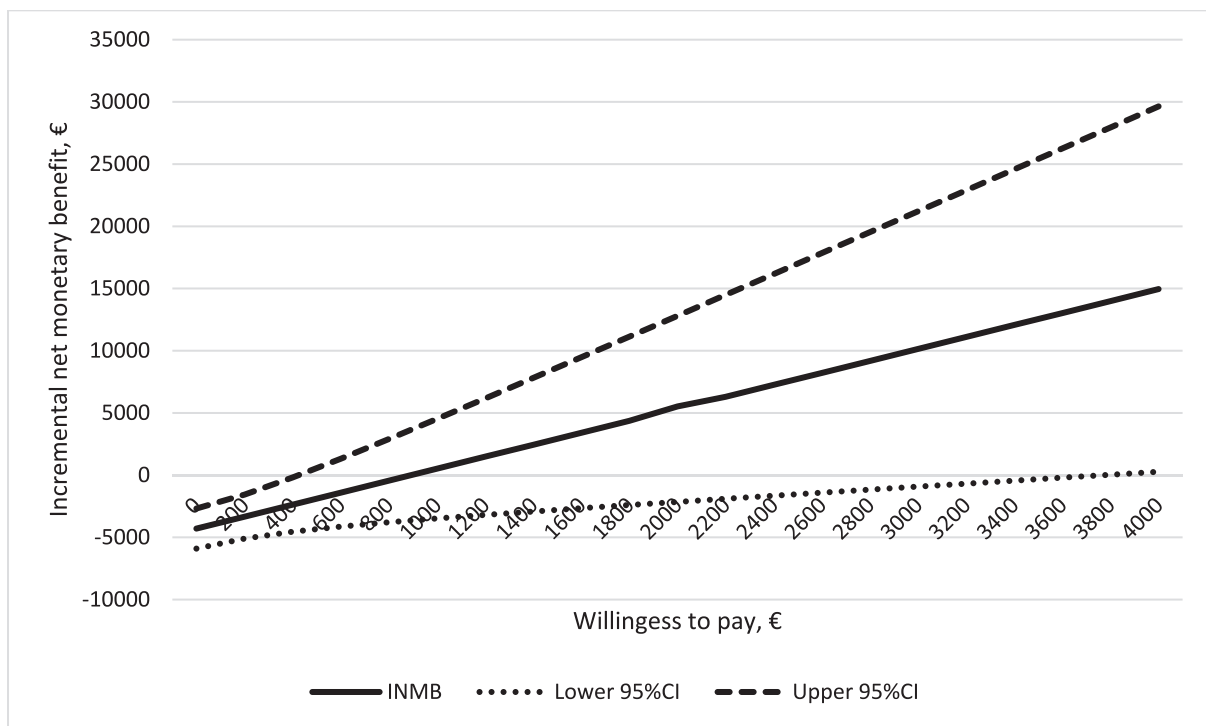


Fig. 2. Incremental net monetary benefit and 95% confidence intervals (CI) with the range of the decision-makers’ willingness to pay values for the ECBI problem score at the post-assessment.

In the incremental net monetary benefit analysis using cut-offs of outcome measure at the post-assessment, the health and social care decision-makers' willingness to pay needs to be above €10,733 (ECBI problem score cut-off) or €25,253 (CBCL externalizing score cut-off) for one extra recovered child, to consider IY intervention cost-effective compared to TAU.

In the 12-month follow-up, IY and TAU did not differ in effectiveness with all effectiveness outcomes nor in costs. Although, the costs of the IY intervention group were €3,769 (SE 3,784, coef. 0.25, p-value 0.319) higher than in the TAU group, the difference was not statistically significant.

3.5. Sensitivity of cost-effectiveness results

In the sensitivity analyses of the post-assessment, there were some differences from the original cost-effectiveness estimates (Table 10 in the Appendix). From all cost perspectives, TAU still dominated IY intervention if the outcome measure was either ECBI intensity score or CBCL externalizing score. In analyses using the ECBI problem score as the outcome measure, the decision-makers' willingness to pay for extra effectiveness varied according to the cost perspective. From a limited societal perspective, the decision-makers' willingness to pay would need to be above €1,070 for a one-point reduction in the ECBI problem score, to consider the IY intervention cost-effective.

For health and social care decision-makers who are interested only in IY intervention costs and children's health and social care service use, the willingness to pay in terms of IY intervention cost-effectiveness needs to be above €685 for a one-point reduction in the ECBI problem score. From the parents' perspective, the willingness to pay needs to be above €178 to consider the IY intervention cost-effective. The post-assessment sensitivity analyses of only families receiving CPS showed similar results to the original analysis.

The sensitivity analyses of the 12-month follow-up results did not differ from the base case.

4. Discussion

We evaluated the cost-effectiveness of the structured, group-based parenting program (IY) compared to TAU in families receiving CPS and other family support services from the health and social care service payer's perspective. In the post-assessment, the IY intervention was cost-effective if the decision-makers were willing to pay at least €893 [0€ INMB with 95 % confidence interval of €-3,641 to €3,649] for a unit reduction in the ECBI problem score. For other outcomes, namely ECBI intensity or CBCL externalizing score, the cost-effectiveness analysis showed that the IY intervention was not a cost-effective use of resources compared to TAU, as the IY intervention had similar effects and higher costs than TAU.

The cut-off analyses of recovered children at the post-assessment showed similar results. We found a statistically significant difference between groups in using ECBI problem and CBCL externalizing cut-offs. The decision-makers' willingness to pay for one extra recovered case, measured by the ECBI problem score, needs to be €10,733 and for the CBCL externalizing score, it needs to be €25,253 to consider IY intervention cost-effective in the post-assessment.

At the 12-month follow-up, the IY intervention and TAU did not differ in effects nor costs in all outcome measures. We do not know if the better outcome at post estimation is important for the children and the families. Especially given that the differences diminished by the time of 12-month follow-up and there is no difference in costs of service use. Usually, from economic evaluation perspective, we are interested about longest possible follow-ups and the long-term success of the investments.

The costs (€3,155 per child) of longer IY intervention with additional supportive HC meetings and a third leader were similar to IY interventions presented in British studies, ranging from €3,485 to €3,795

per child (Gardner et al., 2017; Edwards et al., 2016, 2007, in 2021 euros). Studies from Sweden (€1,482 per child, in 2021 euros) and Ireland (€1,871 per child, in 2021 euros) have reported the usual IY intervention, which has lower costs than our intervention (Sampaio et al., 2016; O'Neill et al., 2013). The Swedish study (Sampaio et al., 2016) showed the usual IY intervention having higher costs than other parent training interventions such as Comet (€959, in 2021 euros), Connect (€369, in 2021 euros), and Cope (€443, in 2021 euros), which may be caused by the IY intervention's lower number of participating families, compared to the other interventions.

Our study showed statistically insignificant differences between groups in costs of health and social care services used by both children and mothers from baseline to 12-month follow-up (total of 19-month study period). In addition, previous studies focusing on the general population have shown similar results in other service use costs (Gardner et al., 2017; Edwards et al., 2007, 2016; O'Neill et al., 2013). Gardner et al. (2017) collected service use information from previous economic evaluations of IY intervention (including O'Neill et al. 2013; Edwards et al. 2007) and reanalyzed the results with appropriate unit costs. The evaluated costs included hospital, community health care, mental health, social worker and other social care, child placement, voluntary sector, and self-help service costs in IY and control families. The only statistically significant but irrelevant difference of €26 (in 2021 euros) was in costs for use of mental health services. A study by Edwards et al. (2016) evaluated children's and parents' use of health, social and special educational services costs in IY and control groups and found no differences.

The main reason for our cost-effectiveness findings is the ineffectiveness of the IY intervention at the 12-month follow-up, where the effect size ranged from -0.01 to 0.05 (in Cohen's d). The post-assessment showed higher effectiveness, as the effect sizes ranged from 0.31 to 0.52 . This is in line with other IY intervention studies of families receiving CPS. Previously, Letarte et al. (2010) found smaller effect sizes (0.21 for ECBI intensity and 0.18 for ECBI problem scores) of IY intervention ($n = 26$) compared to waiting lists ($n = 9$) in the post-assessment for families receiving CPS. Hurlburt et al. (2013) found that IY intervention ($n = 335$) had statistically insignificant effectiveness in the ECBI problem score compared to a control group ($n = 146$), regardless of the families' self-reported history of maltreatment, in a 12–18-month follow-up. In general, the effect sizes have been small. In a meta-analysis by Menting et al. (2013), the overall weighted effect size of 43 studies was 0.31 (95 % CI = 0.24 – 0.38 , $p < 0.001$) for IY intervention compared to "no treatment" or attention placebo in disruptive behavior.

We believe that our sample of families receiving CPS and other family support services explains the weak effectiveness result. The families receiving CPS are facing difficult conditions in their everyday life. In our sample, every seventh child living in a family receiving CPS was in out-of-home care in the period from baseline to 12-month follow-up. This is a high proportion, considering that out-of-home placements are rare and are put into action only as the last resort in safeguarding a child's growth and development in Finnish CPS. CPS offer a high level of help and individual support as part of their usual services for families. Previously, Drugli et al. (2010) also found that family involvement with the CPS has been a strong predictor of non-response to IY intervention. There are a couple of ways to interpret this finding. First, these families need stronger or continuous services to be integrated into their current service use to reduce behavioral problems. Second, the families are facing hard life situations that need to be solved before lessons from parenting intervention could be adopted in the families' daily lives. Third, the needs of parenting support in CPS might appear quite diverse and complex, and therefore, it is sometimes unclear what kind of parenting support the child and family need. In that situation, more specific segmentation of families is needed for effective and cost-effective intervention targeting.

To the best of our knowledge, this was the first economic evaluation

of the 19-week IY intervention with supportive IY HC intervention among families receiving CPS. Therefore, we can compare our results only with short-term economic evaluations targeting general populations (Gardner et al., 2017; Edwards et al., 2007, 2016; O'Neill et al., 2013). At the 6-month follow-up, the willingness to pay values above which the incremental net monetary benefit turns positive have ranged from €111 to €372 (both in 2021 euros) per one-point improvement in the ECBI intensity score (Gardner et al., 2017; Edwards et al., 2007, 2016; O'Neill et al., 2013; Shemilt et al., 2010). These estimates are lower than ours: at the post-assessment, the estimate of statistically insignificant ECBI intensity score was €551 to obtain zero incremental net monetary benefit [95 % confidence interval: €−5,914 to €5,916]. At the 12-month follow-up, IY and TAU did not differ in effects nor costs.

Our study had multiple strengths to note. The study design was RCT for families receiving CPS and other family support services in a real-life setting. Our trial had a longer follow-up period compared to previous studies of the general population (Gardner et al., 2017; Edwards et al., 2007, 2016; O'Neill et al., 2013). Another notable element is the use of Finnish nationwide registers to collect information on the use of health and social care service. The register-based service use information was especially useful to describe the usual health and social services provided to Finnish families receiving CPS and other family support services. Previous economic evaluations have used the Client Service Receipt Inventory (CSRI) to collect the information (Edwards et al., 2007, 2016; O'Neill et al., 2013). The register-based service use data is a potentially cheap and reliable way to collect the data without recall problems. On the other hand, instruments like CSRI are able to collect many types of services and indirect costs such as travel costs all at once (Woolderink et al., 2015).

Our cost estimates of IY intervention are calculated at the most precise level, which means using micro-costing to inform the social and health care decision-makers about the accurate costs related to intervention. However, some imprecision might arise from the collection of data, as it was done three years after the intervention. Our analyses included all randomized children and used proper methods to impute missing values, combine costs and effectiveness with willingness-to-pay values, and evaluate uncertainty in the results.

The limitations of our study should be considered when interpreting the results. The main limitation is the possible contamination of the TAU group. The same CPS workers delivered the IY intervention and worked with some of the TAU group families (Karjalainen et al., 2021), in which case the CPS workers might have used IY intervention techniques with the TAU group families. Unfortunately, we are unable to assess if the same techniques were used or not. The possible use of the same techniques could have affected our effectiveness results. Because of recruitment problems in RCT, our sample was small and included clients of both CPS and other family support services, which caused some heterogeneity in the sample and reduced the statistical power of the analyses. In addition, some children already at the baseline scored below the cut-offs of the outcome measures, indicating that their behavior was within the normal range in that outcome measure. This again brings into question the need for segmentation and whether all the families needed intervention for behavioral problems. The study might have benefited from using a screening instrument to better target families in need of behavioral problem intervention. Families with low baseline outcome scores influence the results, as they have lower potential for improvement in the outcome measure. All these limitations might explain our effectiveness results to some degree. Our result is generalizable only to families with similar characteristics as the trial population.

Regarding the cost analyses, the most challenging limitation was the lack of comprehensive information about families' use of social services, enhanced and special support provided in day-care centers or schools, and services provided in the private sector. We know from the inclusion criteria that families received at least some CPS, preventive CPS, or social services. In the cost analysis, we were able to cover health care services comprehensively. For social services, we were able to include

only out-of-home care placements with CPS, and institutional and round-the-clock housing services. Even though the placements are costly, they are relatively rare. In Finland, CPS, preventive CPS, and social services for families include multiple services that are not available from nationwide registers. Therefore, this data should be collected from the parents.

Another limitation, especially in the interpretation of the results, is that we lack stated decision-makers' willingness to pay for an extra unit of effectiveness in the used outcome measures. The use of quality-adjusted life years (QALYs) would allow the valuation of health gains and improve comparison across interventions and health states. QALYs combine both quality and quantity of life into one figure. Unfortunately, many QALY instruments lack externalizing and social competence dimensions, which are important in mental health interventions. These instruments also often lack child-based weights and instead use adult-based weights, which hampers their use in the evaluation of interventions targeting childhood behavioral problems (van Ijzendoorn & Bakermans-Kranenburg, 2020). Still, future studies should include health related quality of life measures (QALY instruments) like EQ-5D-Y or CHU9D (Wille et al. 2010; Stevens 2012). Nevertheless, our effectiveness measures were reliable, validated, and widely used in the child mental health field.

5. Conclusion

Families receiving CPS have complex needs and are already receiving multiple services. The cost-effectiveness estimates from previously studied populations may not readily generalize to families receiving CPS. Our results showed that the cost-effectiveness of the 19-week IY intervention with supportive HC intervention varies according to the effectiveness measures and the length of the follow-up; the IY and TAU did not differ in effects and costs, the IY intervention was not cost-effective, or the cost-effectiveness depended on the decision-makers' willingness to pay. These results suggest that it is not cost-effective to implement the preventive parenting program for children's behavior problems into CPS or other social services compared to treatment as usual. The families receiving CPS and other family support services need to be more specifically segmented, and the service supply should be more targeted to the individual families' needs. The families receiving CPS and other family support services with an evaluated possibility to benefit from the parenting program could possibly participate in the usual IY interventions.

Nevertheless, families receiving CPS are in need of cost-effective services to reduce the high prevalence of children's behavioral problems. So far, only limited evidence on effectiveness and cost-effectiveness in this population has been available for health and social care decision-makers. The research gap remains with regard to high-quality and comprehensive effectiveness and cost-effectiveness evaluations of multiple interventions aiming to decrease behavioral problems.

CRedit authorship contribution statement

Elisa Rissanen: Writing – original draft, Formal analysis, Investigation, Visualization, Funding acquisition. **Piia Karjalainen:** Conceptualization, Methodology, Project administration, Investigation, Writing – review & editing. **Olli Kiviruusu:** Methodology, Data curation, Writing – review & editing. **Eila Kankaanpää:** Writing – review & editing, Supervision. **Eeva T. Aronen:** Methodology, Writing – review & editing. **Taru Haula:** Writing – review & editing. **Lauri Sääksvuori:** Conceptualization, Investigation, Writing – review & editing. **Riitta Vornanen:** Writing – review & editing. **Ismo Linnosmaa:** Conceptualization, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare the following financial interests/personal

relationships which may be considered as potential competing interests: 'Author Piia Karjalainen has received payment for occasional training of daycare and school personnel in the Incredible Years Teacher Classroom Management Program. The other authors have no conflicts to be declared.'

Data availability

The data that has been used is confidential.

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Data availability statement

Data are available upon request due to legal restrictions and their confidential nature. The Finnish Institute for Health and Welfare is the controller of the data. For more information about data access, please see <https://thl.fi/en/web/thlfi-en/statistics/information-for-researchers>.

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Appendix A. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.chil dyouth.2024.107491>.

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