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A COST-EFFECTIVENESS ANALYSIS OF CARING IN CHAOS

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**Do volunteers reduce the costs of parent training programs?
A cost-effectiveness analysis of *Caring in Chaos***

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Abstract:

ADHD in children has considerable negative consequences for both affected individuals and their families. One way to milden these negative consequences is by offering parents training in how to handle the child's difficulties. However, running parent training programs is associated with substantial costs. This study evaluates the cost-effectiveness of the volunteer-delivered parent training program *Caring in Chaos*. The analyses show that *Caring in Chaos* is as effective as similar programs while the recurrent costs associated with the program are substantially lower than that of (other) similar programs. Although direct comparison is difficult due to different outcome measures being used in comparable studies, our findings suggest that *Caring in Chaos* constitutes a commendable alternative to validated parent training programs such as *Triple P* and *The Incredible Years*.

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Introduction

ADHD and other similar disruptive behavior in children can, if left untreated, have considerable negative consequences in childhood, adolescence and adulthood. Children with disruptive behavior are more likely to experience conflict with their peers (Nijmeijer et al, 2008), have lower test scores and are more likely to repeat a grade than other children (Currie & Stabile, 2006). ADHD in childhood has also been found to have negative consequences for adult labor market attachment. Fletcher (2014) reports a 10-14 percentage point reduction in employment and a 33 percent reduction in earnings for individuals diagnosed with ADHD in childhood compared to their (undiagnosed) siblings. Moreover, adults with ADHD are more likely to use illegal substances and to be involved in criminal activity (Sonuga-Barke et al., 2013).

In addition to these negative consequences on the individual level, disruptive behavior in children also affects their family members negatively. Families with a child with ADHD experience more conflicts and have a more stressful life (DuPaul et al., 2001). Furthermore, ADHD in children is associated with increased disturbances in family and marital functioning, disrupted parent–child relationships and reduced parenting self-efficacy (Johnston & Mash, 2001).

It is therefore not surprising that ADHD incurs substantial economic costs for societies and individuals. Doshi et al. (2012) estimate that the annual incremental costs of ADHD in the US range from \$143 billion to \$266 billion, mainly stemming from productivity and income losses, but also from the health care and educational sectors. Chorooglou et al. (2015) show that preschoolers who were rated as hyperactive by their parents had 17.6 times higher service use costs per annum compared to non-hyperactive controls.

Parenting is a key determinant in child behavior and parent training programs, that teach parents to encourage positive and pro-social behavior, have been found to influence children with ADHD or similar disruptive behavior positively (see e.g. Charach et al., 2013; Chronis et al., 2004). These programs can incur considerable costs to societies, although they are, in general, found to be cost effective (see e.g. Edwards et al. 2007; Honeycutt et al, 2015; O’Neill, 2013; Stevens, 2014). Parent training programs are generally delivered by specially trained mental health care professionals— which there is currently a shortage of (see e.g. Thomas et al., 2009; Tolan & Dodge, 2005; Walker et al., 2015; Cunningham, 2009). This shortage is likely to become more pronounced in the coming years, as the number of children diagnosed with ADHD is increasing rapidly. For instance, the

number of children diagnosed with ADHD in Denmark increased by 800 percent from 2001 to 2011, and the situation is similar in many other developed countries (Due et al, 2014). One novel way to tackle the scarcity of mental health professionals, and to make sure that as many parents as possible receive treatment, is through the use of specially trained volunteers. The use of volunteers as a means to promote mental and emotional well-being has e.g. been encouraged by the US Surgeon General who emphasizes access to volunteer-based support groups as a measure to improve mental health in the US (Surgeon General, 2014). Christensen & Scavenius (2015) show that the Danish parent training program *Caring in Chaos*, delivered by volunteers, has significant positive effects on both parents' and children's outcomes. This study investigates the cost effectiveness of *Caring in Chaos* and compares it to that of similar programs. We conclude that the non-recurrent costs of delivering *Caring in Chaos* were significantly lower than the non-recurrent costs of delivering similar programs while the program was as efficient as comparable parent training programs as measured by the development in the *Parenting Sense of Competence Scale* (PSOC). The incremental cost effectiveness ratio for a one standard deviation increase in the PSOC score was 11,946 Danish kroner and the probability of *Caring in Chaos* being cost-effective (compared with no treatment) would exceed 90% provided the willingness to pay threshold for such an increase was at least 15,559 Danish kroner per treated family.

Methods

The intervention

Caring in Chaos (*Kærlighed i Kaos*) is a manual based parent training program developed by the Danish ADHD-Association (*ADHD-foreningen*) in 2011, directed at parents of children between three and nine years of age who have either been diagnosed with ADHD or have similar difficulties, according to the parents, but have not been diagnosed.

Caring in Chaos is structured around a schedule with 12 weekly sessions on workday evenings, for small groups of parents. Parents are taught various parenting skills designed to tackle the child's difficulties. The program schedule and manual build on research in parent training and the Danish ADHD-association's experience with these families' problems, focusing on three core elements: psychoeducation, positive behavior, and tools for conflict prevention. During the first 1-2 sessions, parents learn about the ADHD diagnosis and how ADHD affects child development. The ensuing 3-4 sessions teach parents to notice and praise the child's positive behavior rather than correcting

antisocial, aggressive or bad behavior. Scaffolded by these first elements, parents use the final 5-6 sessions to learn and practice rearing tools for preventing and handling conflicts; for example, explicit communication, visual planning, predictable daily routines, firm rearing, and use of mild to moderate consequences (time-outs) or rewards (contingency management). Each session lasts 2 ½ hours, except the first and the final session, which last an additional hour each to allow for greetings and farewells. Participants participate as a couple—typically both biological parents, or a parent and a step-parent, but e.g. grandparents, aunts and uncles and friends of the parent(s) can also participate, as long as both participants are involved in the upbringing of the child, thereby enabling participants to discuss the course material and to encourage each other to use the exercises and tools at home (see Christensen & Scavenius, 2015 for details).

The overall elements of *Caring in Chaos* thus resemble evidence-based parent training programs, such as *Triple P (Positive Parenting Program)* and *The Incredible Years*, but one novelty of *Caring in Chaos* is that all trainers are volunteers. By using volunteers, the previously mentioned shortage of educated staff is avoided as more trainers can easily be recruited and educated if there is demand. In addition, we show that by using volunteers, the costs of running *Caring in Chaos* is significantly lower than the costs of running similar programs delivered by professionals.

Study design

This economic evaluation is based on a randomized controlled trial with a waiting list design. The volunteers that functioned as trainers in the randomized controlled trial of *Caring in Chaos* were recruited via the Danish ADHD-association's network and through advertisements in Danish national newspapers. Aspiring volunteers were required to have experience, via education or work, within a field relevant to the core elements of *Caring in Chaos*, such as pedagogy, social work or health (also retirees with relevant previous experience were considered eligible). It was emphasized in the recruitment advertisements that teaching experience and previous knowledge of ADHD was an advantage. It was necessary to recruit and educate 48 volunteer trainers to carry out the course and 260 volunteers applied. Most of the selected volunteers were teachers or psychologists, but also e.g. ADHD-coaches, pedagogues and nurses were recruited. The trainers were educated during three consecutive weekends, and the education focused on general knowledge about ADHD (taught by an MD), the content of the manual and the role as trainer (taught by a psychologist, consultants from the ADHD-association and from a trainer from the *Caring in Chaos* pilot project). In addition to these professional educators, group leaders from the ADHD-association helped with the training

of the volunteers. Towards the end of the education, the volunteer-trainers were required to deliver parts of the course to their peers, the educators and the group leaders and were evaluated on their performance.

The participating parents were recruited to *Caring in Chaos* via advertisements in Danish local and national newspapers, via the Danish ADHD-association's web-page and the association's newsletter and via banners on all Danish elementary schools' internal web-pages. Parents signed up for the course by submitting an on-line questionnaire. To avoid distractions during training, couples participated without their children, and to avoid cancellations and dropouts, they were offered practical and economic support to find and hire a child minder. Participation was free of charge and parents were offered a snack or light meal during the training schedule. The course was offered in twelve Danish cities throughout the country and between three and seven couples participated at each location. 160 participants (and 80 target children¹) were randomized to the treatment, and 162 participants (and 81 target children), to the waiting list. Baseline data was collected in November 2013. The treatment group received the intervention between January and March 2014 and the first follow-up took place in April 2014 (81% of the sample, 121 treated and 141 controls, responded). The second follow-up took place in August 2014 (70.8% of the sample, 100 treated and 126 controls, responded). Thereafter, the control group received the intervention (in October to December 2014) and the third follow-up took place in January 2015 (50%, 81 treated and 80 controls participated). In this cost-analysis, we focus on the development that occurred from baseline to second follow-up.

Outcome measures and characteristics of the study families

The effects of *Caring in Chaos* were measured on various validated psychometric instruments that were translated into Danish. In this cost analysis, we focus on the *Parenting Sense of Competence Scale* (PSOC). The PSOC scale is a validated measure of parental competence and focuses on two dimensions: Satisfaction and Efficacy. It is a 16 item Likert-scale questionnaire (on a six point scale ranging from *strongly agree* [1] to *strongly disagree* [6]), with nine questions under satisfaction and seven under efficacy. The satisfaction section examines the parent's anxiety, motivation and frustration, while the efficacy section looks at the parent's competence, capability levels, and

¹ The target child is defined by the parents at registration and is between 3-9 years old and has, according to the parents, ADHD or similar behavioral difficulties.

problem-solving abilities in their parental role. The total score over the 16 items, which we focus on here, gives the parent's total value of his or her parenting competences.

Table 1 presents summary statistics by treatment status for the participants and the target children at baseline. As expected, given randomized allocation, there are few significant differences in the demographic characteristics of the families across groups. Importantly, the pre-intervention PSOC score is balanced.

Table 1. Demographic characteristics of the participants and target children by treatment group status. Unless stated otherwise, figures are numbers (percentages) of participants.

| | Treatment | | Control | | P-value for equality across groups |
|---|-----------|------------|---------|------------|------------------------------------|
| Participants | | | | | |
| Woman | 85 | (53) | 87 | (54) | 0.92 |
| Age | | 42.2 years | | 41.9 years | 0.72 |
| Biological parent | 130 | (81) | 131 | (81) | 0.93 |
| More than one child | 136 | (85) | 140 | (86) | 0.72 |
| Other children with a diagnosis | 34 | (21) | 20 | (12) | 0.03* |
| Parent has ADHD ¹ | 42 | (26) | 42 | (26) | 0.95 |
| In education | 6 | (4) | 6 | (4) | 0.98 |
| Employed | 86 | (54) | 98 | (60) | 0.22 |
| Unemployed | 16 | (10) | 28 | (17) | 0.07 |
| 9-10 years of schooling | 0 | (0) | 4 | (2) | 0.05* |
| 10-12 years of schooling | 38 | (24) | 48 | (30) | 0.23 |
| 13-15 years of schooling | 68 | (43) | 68 | (42) | 0.92 |
| 15-17 years of schooling | 18 | (11) | 18 | (11) | 0.97 |
| 18-20 years of schooling | 6 | (4) | 2 | (1) | 0.15 |
| <i>Parent sense of competence scale²</i> | | | | | |
| Satisfaction | 32.8 | 6.0 | 33.4 | 7.3 | 0.40 |
| Efficacy | 22.9 | 5.1 | 23.4 | 4.7 | 0.36 |
| Competences | 55.6 | 9.5 | 56.78 | 10.0 | 0.30 |
| Number of participants | 160 | | 162 | | |
| Children | | | | | |
| Boy | 66 | (83) | 61 | (75) | 0.65 |
| Age | | 7.1 years | | 7.0 years | 0.79 |
| ADHD diagnosis | 57 | (71) | 55 | (68) | 0.65 |
| Age when diagnosed with ADHD | | 6.1 years | | 6.2 years | 0.80 |
| Other diagnosis | 23 | (29) | 23 | (28) | 0.96 |
| Child's behavior indicator ³ | 2.2 | 0.5 | 2.2 | 0.5 | 0.97 |
| Number of target children | 80 | | 81 | | |

* $p < 0.05$.

¹Parents are defined as having ADHD based on their answers to the ASRS-questionnaire.

²These figures are the average score and standard deviation for the participants' answers to the Parent sense of competence (PSOC) questionnaire at baseline.

³These figures are the average score and standard deviation for the parents' evaluation of the child's behavior

Impact of program on the parents' sense of competence scale

Table 2 shows the development in the total PSOC score and in its two subscales for the treatment and control group from November 2013 (baseline) to August 2014 (second follow-up). The table shows that the PSOC score improves for both groups over all three items, but much more so for the treatment group than for the control group. The total parenting competences increase by 0.72 standard deviations more in the treatment than in the control group from baseline to second follow-up, which correspond to 8.42 points on the scale. The corresponding effect is 4.79 points on the satisfaction subscale and 3.43 points on the efficacy subscale (not shown in Table 2). These effects can be compared to those of similar parenting programs. Bor et al. (2002) report a 10.77 points improvement of the *Triple P* program on the competences scale,² whereas Gardner et al. (2006) report a 5.4 points improvement on the same scale for *The Incredible Years*. Trillingsgaard et al. (2014) report improvements of 5.40 points and 3.75 points respectively for the satisfaction and efficacy subscales for *the Incredible Years* program, and Pisterman et al. (1992) report improvements of 4.3 for both scales. We therefore conclude that *Caring in Chaos* is, by and large, as efficient as other similar programs evaluated in the literature.

Table 2. Development in the total PSOC score and in its two subscales (standard deviations).

| | At baseline | | 9 months follow-up | |
|---|-------------|---------|--------------------|---------|
| | Treatment | Control | Treatment | Control |
| Satisfaction subscale | 4.93 | 5.03 | 5.77 | 5.28 |
| Efficacy subscale | 6.04 | 6.15 | 6.70 | 6.17 |
| Parenting sense of competences scale (PSOC) | 6.57 | 6.45 | 6.76 | 7.36 |
| Change, PSOC (follow-up – baseline) | | | 0.91 | 0.19 |
| Difference-in-difference, PSOC | | | 0.72 | |

Standard deviations are clustered at the family-level.

Cost data

This study examines costs from the program provider's perspective, in this case the Danish ADHD association. Consequently, we do not include costs incurred by the children in e.g., the health, social care and special education sectors. Table 3 summarizes the costs associated with the program, as reported by the ADHD-association, divided by non-recurrent costs (such as program development costs), group set-up costs and recurrent group running costs. The recurrent group set-up costs are the costs associated with recruiting and educating volunteer trainers for the program and are probably higher here than would be the case if the program was to be repeated, as trained volunteers potentially could repeat the program several times (and many of them also expressed an interest in

² This figure is a simple difference-in-difference calculated by us based on Bor et al.'s (2002) descriptive data.

doing so). Advertising for recruiting volunteers would also not be necessary if the program was to be repeated, as there was a large surplus of potential volunteers that expressed an interest in the program after the first round of recruitment.

Table 3 shows that the mean cost per treated child, including non-recurrent and recurrent costs, is 16,992 Danish kroner, whereas the total non-recurrent cost per child is 8,601 Danish kroner. If we only include the recurrent group running costs (and assume that all volunteers are willing to participate as trainers for a second round of the program), the costs per child would be 6,175 Danish kroner per child. These costs can be compared to those reported in Edwards et al. (2007) who find that the recurrent costs of delivering *The Incredible Years* parent training program in the UK is £1,063.64 (2007), which is equivalent to approximately 13,460 Danish kroner (2015). Moreover, O’Neill et al (2013) find that the recurrent costs of delivering the same program in Ireland is €1,463 (2011), which is equivalent to approximately 11,390 Danish kroner (2015).³ Thus, as expected, *Caring in Chaos* has a lower non-recurrent cost than comparable programs that are not delivered by volunteers.

Table 3. Total costs and costs per child of running the program for the treatment group (2015 Danish kroner).

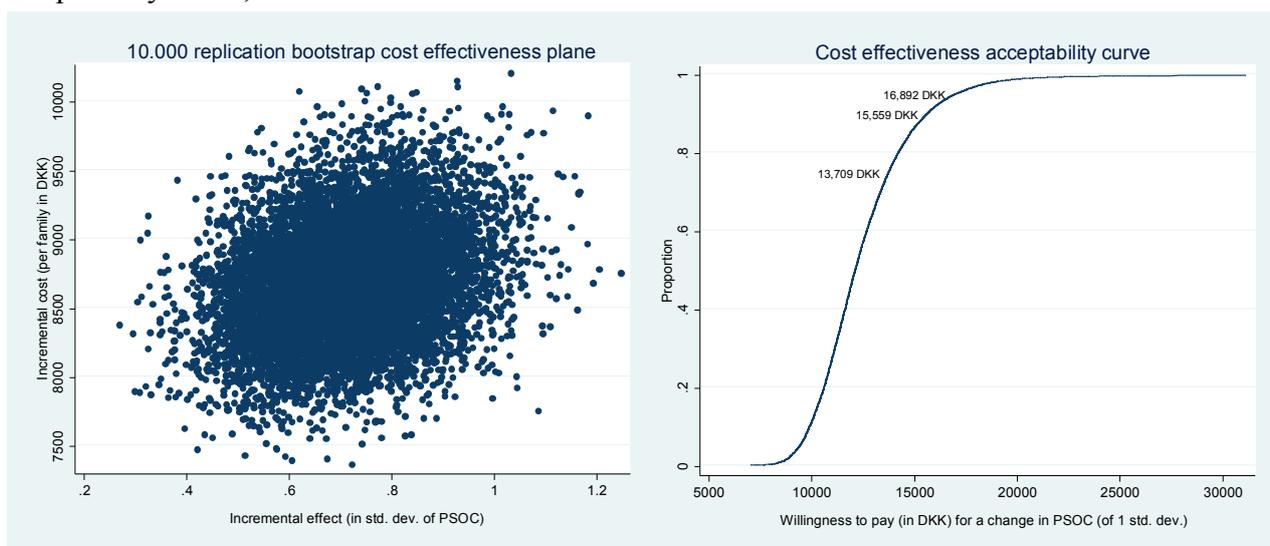
| | |
|--|------------------|
| Non-recurrent initial costs | |
| Program development | 414,114 |
| Meetings and administration | 257,152 |
| Subtotal | 671,266 |
| Recurrent group setup costs | |
| Advertisements for recruitment of volunteers | 15,853 |
| Expert educators’ salaries | 60,146 |
| Expert educators’ mileage | 19,600 |
| Volunteers’ mileage | 3,250 |
| Venue rental and refreshments | 95,187 |
| Subtotal | 194,034 |
| Recurrent group running costs | |
| Advertisements for recruitment of parents | 15,853 |
| Volunteers’ mileage | 60,642 |
| Child minding service | 166,397 |
| Supervision | 61,142 |
| Venue rental and refreshments | 190,000 |
| Subtotal | 496,141 |
| Total | 1,359,334 |
| Total cost per child | 16,992 |
| Total recurrent cost per child | 8,601 |

³ It is unclear which year’s prices the costs in Edwards et al. (2007) and O’Neill et al. (2013) are calculated in. We have assumed that the prices are from the year that the respective study was first published (online).

Bootstrapping and cost effectiveness acceptability curve

We now move on to an analysis of the cost effectiveness of the program. When the data on outcomes and costs are combined, we estimate an incremental cost effectiveness ratio for the PSOC score of 11,946 Danish kroner.⁴ The bootstrap yielded a mean estimate of 12,489 Danish kroner (95% confidence interval [7,806; 17,171]), which is close to our basic calculation figure. The figures are calculated with a 10,000 replication bootstrap (Drummond et al., 2005). Figure 1 shows the cost effectiveness plane for the 10,000 replication bootstrap. As both costs and effects are positive for all observations, the points of the cost-effectiveness plane all fall within the north-east quadrant of the cost-effectiveness plane. Figure 2 shows the corresponding cost effectiveness acceptability curve for the PSOC score. The cost effectiveness acceptability curve illustrates the uncertainty surrounding the point estimate of cost-effectiveness.

Figures 1 and 2. 10,000 replication bootstrap cost effectiveness plane and cost effectiveness acceptability curve, PSOC score.



From Figure 2, we infer that the probability of *Caring in Chaos* being cost-effective compared with no treatment would exceed 90% provided the willingness to pay threshold for a one standard deviation increase in the PSOC score was at least 15,559 Danish kroner per family. This probability falls to 75% if the threshold is reduced to 13,709 Danish kroner per family and rises to 95% if the threshold increases to 16,892 Danish kroner per family.

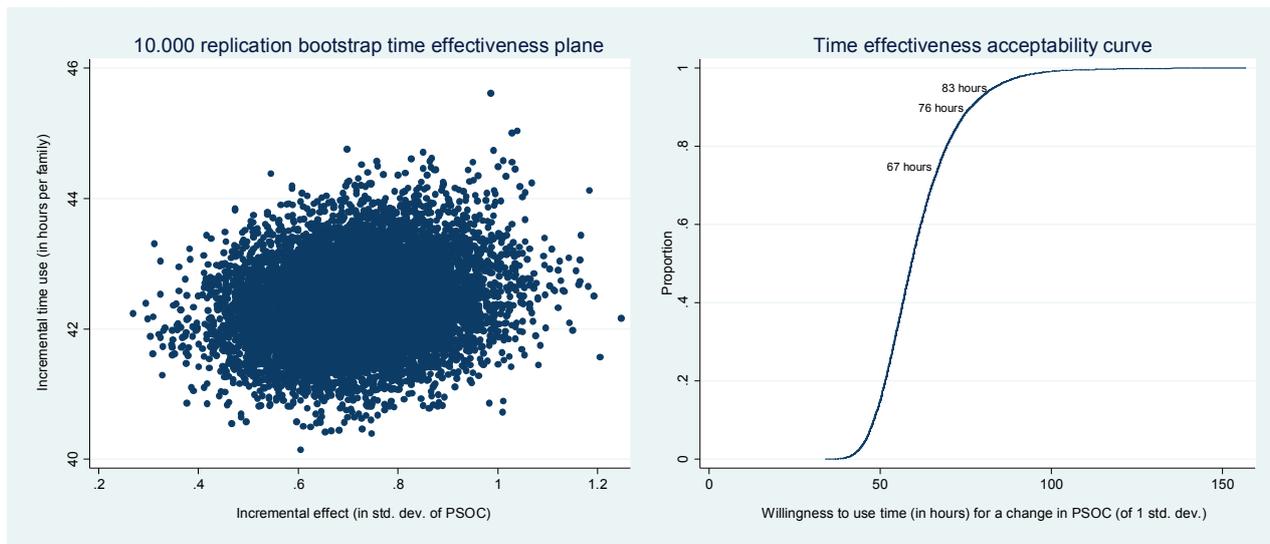
⁴ In this case, the control group received no treatment. To calculate the incremental cost effectiveness ratio of *Caring in Chaos*, we use the control group's development from baseline to the August follow-up (presented in Table 2), which is assumed to have occurred at zero cost, and compare it to the treatment group's development, which occurred at the recurrent cost per child shown in Table 3.

Parents' time-use and "time effectiveness" acceptability curve

While the previous section evaluated the ADHD-associations expenses for offering the program to parents, and for which level of costs the program was considered cost effective, we now analyze the time effectiveness of the program from the parents' perspective. The motivation for this analysis is straightforward: for the program to be successful, parents must consider it worthwhile to participate in it. Parents who, potentially, have the most to gain from participating are therefore likely to be willing to supply more time than parents who do not expect the program to have substantial effects. The program was offered on weekday evenings and child minding services were paid for by the ADHD-association. Thus, the only relevant costs inflicted by participation were time related. Under the assumption that all parents have the same alternative cost of time, we here estimate the "time effectiveness" of the program. Actual participation time (2 ½ hours per session, except the first and the final session, which were 3 ½ hours each) was 32 hours for all parents, whereas commuting time to and from the program venues was calculating using address information. Average commuting time was 25.47 minutes (one way), which means that average total time spent on participation and commuting for all 12 sessions was 42.19 hours per family. We combine this time use information with data on outcomes and calculate an incremental time effectiveness ratio of 58.59 hours for a one standard deviation improvement in the PSOC score. The bootstrap yielded a mean estimate of 60.79 hours (95% confidence interval [37.44; 84.50]), which is close to our basic calculation figure. The bootstrapped mean and confidence intervals were, as previously, calculated with a 10,000 replication bootstrap (Drummond et al., 2005). Figures 3 and 4 show the time effectiveness plane for the 10,000 replication bootstrap and the corresponding time effectiveness acceptability curve for the PSOC score.

From Figure 4 we infer that the probability of *Caring in Chaos* being time-effective compared to no treatment would exceed 90% provided that parents were willing to spend at least 76 hours (including commuting back and forth to the program venue) to obtain a one standard deviation increase in the PSOC score. This probability falls to 75% if the threshold is reduced to 67 hours and rises to 95% if the threshold increases to 83 hours. In other words: if parents spend 67 hours per family, there is a 75% probability of *Caring in Chaos* being time-effective, i.e. of the program producing a higher effect on the PSOC score per unit of time than the alternative (no treatment).

Figures 3 and 4. 10,000 replication bootstrap time effectiveness plane and effectiveness acceptability curve, PSOC score.



Summary and conclusion

The number of children diagnosed with ADHD is increasing rapidly in many developed countries. ADHD has been shown to have considerable negative consequences for affected individuals, their families and society. Parent training programs that teach parents of children with ADHD how to handle their child’s difficulties have been shown to influence both the affected children and their parents positively. However, running such programs is costly, and in view of the large increase in number of diagnosed children, there may (soon) be a shortage of staff with the required competences. One way to overcome this excess demand and to reduce the costs of providing the program is to use volunteers as trainers. This cost-effectiveness analysis evaluates the volunteer delivered parent training program *Caring in Chaos*. The analyses show that *Caring in Chaos* is as effective as similar programs as regards the increase in the *Parents Sense of Competence* scale, in spite of the recurrent costs associated with the program being substantially lower than that of similar programs. Unfortunately, the few previous cost-analyses of parent training programs that exist do not use the same outcome measures that we have access to. Therefore, we cannot compare the cost-effectiveness of *Caring in Chaos* to that of similar programs. Nevertheless, our analysis shows that the incremental cost-effectiveness ratio when we compare the program to not offering any program at all (i.e. being on the waiting list) for a one standard deviation increase in the PSOC score was 11,946 Danish kroner. The probability of *Caring in Chaos* being cost-effective

(compared with no treatment) would exceed 90% provided the willingness to pay threshold for a one standard deviation increase in the PSOC score was at least 15,559 Danish kroner per family.

In addition to the aforementioned cost-effectiveness analysis, we also investigate the program's time-effectiveness from the parents' perspective (again compared to no program). The time-effectiveness analysis shows that the incremental time-effectiveness ratio is 58.59 hours for a one standard deviation improvement in the PSOC score.

Although comparisons are difficult, *Caring in Chaos* have lower recurrent costs than similar programs while obtaining similar results. We therefore conclude that volunteer based programs like *Caring in Chaos* constitute commendable alternatives to validated parent training programs such as *Triple P* and *The Incredible Years* although more research and more comparable data are required to draw more definitive conclusions.

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