Stress Management in Elementary School Students: a Pilot Randomised Controlled Trial

Katerina Sofianopoulou1, Flora Bacopoulou2, Dimitrios Vlachakis2,3,4, Ioulia Kokka1, Evaggelos Alexopoulos1, Liza Varvogli1, George P. Chrousos2, Christina Darviri1

1Postgraduate Course of Science of Stress and Health Promotion, School of Medicine, National and Kapodistrian University of Athens, Athens, Greece
2University Research Institute of Maternal and Child Health & Precision Medicine and UNESCO Chair on Adolescent Health Care, National and Kapodistrian University of Athens, Aghia Sophia Children’s Hospital, Athens, Greece
3Laboratory of Genetics, Department of Biotechnology, School of Applied Biology and Biotechnology, Agricultural University of Athens, Athens, Greece
4Lab of Molecular Endocrinology, Center of Clinical, Experimental Surgery and Translational Research, Biomedical Research Foundation of the Academy of Athens, Athens, Greece

Abstract

Research has shown that stress experiences begin in early stages of life. Stress management techniques have appeared to be beneficial for the development or enhancement of stress coping skills. The aim of this pilot randomised controlled trial was to assess the effect of a 12-week intervention, comprising training in diaphragmatic breathing and progressive muscular relaxation, on elementary school students’ stress levels. Outcomes on the quality of life and behavioural aspects of the students were also assessed. Standardised questionnaires were administered at baseline and after the 12-week intervention program. Fifty-two children aged 10 to 11 years were randomly assigned to intervention (n=24) and control groups (n=28). Children of the intervention group demonstrated lower levels of stress (in all three subscales of lack of well-being, distress, and lack of social support) and improved aspects of quality of life (physical, emotional, and school functioning). No significant differences were observed regarding the examined behavioural dimensions, in the intervention group. Larger randomised controlled trials with follow-up evaluations are needed to ascertain the positive outcomes of such programs on elementary school children.

Introduction

Health-related habits start to form in early life stages, even before children can realise the impact of their choices on their health and quality of life (Petosa & Oldfield, 1985).
Research shows that school children experience stress frequently and the main source are daily hassles (Bridley and Jordan, 2014). Researchers have noted that multiple daily hassles interact with one another and can have cumulative effects (Stansbury and Harris, 2000). These daily stressors emerge into a non-specific risk factor for a wide range of psychosomatic and behavioural problems, such as headaches, stomach aches, sleep difficulties (Berntsson et al., 2001), anxiety, depression, aggression, substance abuse, allergic or asthmatic attacks, withdrawal or outbursts, antisocial or disruptive behaviours (Van Praag and De Kloet, 2005).

Elevated stress levels can affect children’s mental and physical health (Garmezy and Rutter 1983). Child development and function i.e. academic performance (Blashill, 2016) can be affected by stressful family issues such as divorce (Amato, 2000). These observations reinforce the notion that educational efforts regarding coping strategies to relieve stress should begin in elementary school. Early stress coping education can help children experience less stress (Petosa and Oldfield, 1985) and maintain their coping skills in adulthood.

Stress management programs have positive health outcomes, such as reduced waking and evening cortisol, fasting blood sugar and resting heart rate (Pascoe et al., 2017) and beneficial effects on depression (Abbasian et al., 2014), social support (Baquetayan, 2011) and academic performance (Rentala et al, 2019). Several stress management programs have been implemented in healthy and non-healthy children populations; individual psychotherapy (March, 1998), family therapy (Bernardon, 2010), specific cognitive and behavioural strategies such as empowerment techniques (Carlier, 2020), all with positive effects on stress levels. Two of the techniques commonly taught in stress management educational programs are diaphragmatic breathing and progressive muscular relaxation (PMR). Diaphragmatic breathing is an efficient body-mind stress reduction method. It is considered to help in emotional regulation and social adaptation (Porges, 2001). Regarding PMR, it is a deep relaxation technique which is based on the simple practice of tensing one muscle group at a time followed by a relaxation phase with release of the tension (Jacobson, 1987). So far, health psychology and clinical studies have used these techniques in a complementary way (Chen et al., 2017; Tsang et al., 2006) and not independently from other stress management techniques.

The aim of this study was to investigate the effect of a twelve-week intervention program of diaphragmatic breathing and progressive muscle relaxation on the subjective stress levels of elementary school children. Secondary aims were to investigate the effect of the program on the children’s quality of life and behavioural aspects.

**Materials, Methodologies and Techniques**

**Study design and participant recruitment**

This randomised, two-armed, pilot study was conducted in children of the 5th grade of a private elementary school in Athens, Greece over a three-month period. Eligible students should be able to write and read in Greek, not have any chronic medical condition or receive systematic medication or any type of psychological support. Study participants
were randomised into two groups; the intervention group which received diaphragmatic breathing and progressive muscular relaxation training and the control group. Assignment of children to either the intervention group or the control group was based on random numbers generated by an online random number generator\(^1\).

**Ethical considerations**

The study protocol was consistent with the Declaration of Helsinki and was approved by the ethics committee of the Medical School of the National and Kapodistrian University of Athens in Greece. All children and their parents or guardians were informed about the study’s procedure and goals. Parental/guardian signed consent was mandatory for a child to participate in the study. All participants had the right to interrupt their participation at any step of the study, without any consequences for them.

**Measurements**

**Stress in Children Questionnaire (SiC):** This is a 21-item self-report questionnaire measuring subjective stress levels in childhood. It measures three subscales: lack of well-being, distress and lack of social support. The instrument demonstrates good psychometric properties and high internal consistence, with a Cronbach’s \(\alpha\) coefficient of 0.86 (Osika et al., 2007).

**Strengths and Difficulties Questionnaire (SDQ):** This is a 25-item behavioural instrument, measuring 5 different dimensions; emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and pro-social behaviour. In community samples, the SDQ can predict the presence of a psychiatric disorder with good specificity and moderate sensitivity (Goodman, 1997; Giannalopoulos et al., 2009).

**Pediatric Quality of Life (PedsQL) Inventory:** The 23-item Peds QL was designed to measure the core dimensions of health as delineated by the World Health Organization (physical, emotional, social, and school functioning). It measures health-related quality of life in children and adolescents either healthy or with acute and chronic health conditions (Papaevangelou et al., 2007; Varni et al., 1999).

**Intervention:** A total of 12 weekly sessions were delivered by KS (MSc in stress management) and CD (Professor of stress management and health promotion) to the intervention group. During the first session, participants of both groups completed the questionnaires and received the same information about stress and its effects on health. They were also informed about the importance of a healthy lifestyle (healthy diet, regular physical activity and sleeping routine). In the following 10 sessions participants of the intervention group were trained on and practiced diaphragmatic breathing and progressive muscular relaxation and received stress-related psycho-education. At the same time the control group, located in a different classroom, had leisure activities under their teachers’ supervision. During the last session, final assessments were made for both groups by re-administering the questionnaires.
Statistical analysis

The baseline group characteristics are presented as means, standard deviations (SD), absolute and proportion values. Pearson’s chi square and Fisher’s exact tests were performed for frequency group comparisons; the independent two-sample Student’s t-test for means differences between the groups and the paired Student’s t-test for means differences within the groups. Their equivalent non-parametric tests (Mann–Whitney U test and Wilcoxon signed-rank test) were implemented in case the hypothesis of normality was violated. The normality of data was assessed with the Shapiro-Wilk test and the normal probability plots (Q-Q plots, P-P plots). All statistical tests applied were two-tailed using the <0.05 level of statistical significance. All statistical analyses were conducted using the statistical software package StataSE (V. 10, Data Analysis and Statistical Software, Stata Corp LP, Texas, USA; 2009).

Results

A total of 52 students (31 females and 21 males) participated in the study. The flow diagram of the study is illustrated in Figure 1.

No dropouts occurred in either group. Given that participants of both groups were of the same school grade, their age was between 10 and 11 years. No significant difference was found between groups regarding the sex. The age and sex characteristics of each group are outlined in Table 1.

Baseline psychometric characteristics of the study groups are presented in Table 2.

As shown in Table 3, when the psychometric characteristics of the two groups after the intervention were compared, statistically significant differences were found in all three subscales of the SiC questionnaire in favor of the intervention group. There were no significant differences between the two groups after the intervention in the other quality of life and behavioural parameters.

Within group comparisons pre- and post-intervention are shown in Tables 4 and 5 for the intervention and control groups, respectively. Statistically significant increases of the PedsQL physical, emotional, and school functioning scores were found for the intervention group. Statistically significant lower scores were found for the same group in all subscales of the SiC questionnaire. Interestingly, for the control group, the score of the distress subscale of the SiC, the SDQ total score and conduct problems subscale score were significantly reduced, while the PedsQL social functioning score was significantly increased, at the end of the study.

Discussion

This pilot study examined the effects of a stress management interventional program, using the techniques of diaphragmatic breathing and PMR, to reduce stress in elementary students. Results showed a significant impact of the program on the subjective stress levels, with improvements in all three subscales i.e., lack of social support, distress, and lack of well-being.
Results of this study showed that diaphragmatic breathing and PMR can result in reduction of the children’s distress levels. This finding is in line with the study of Ma et al., who measured saliva levels of the stress hormone cortisol, after the implementation of an 8-week diaphragmatic breathing program on healthy individuals (Ma et al., 2017). Even when referring to non-healthy population, these techniques have been proven beneficial regarding stress reduction. A systematic review of the influence of PMR on patients with schizophrenia showed that the technique can reduce psychological distress and anxiety (Vancampfort et al., 2013). Wilk and Turkoski (2001) reported the same positive results on cardiac patients. The researchers implemented a stress management program based on PMR in a cardiac rehabilitation facility and outcomes included lower heart rate, improved sleep quality and lower levels of anxiety, all characteristics of low stress levels (Wilk and Turkoski, 2001). Although the aforementioned studies concerned adults, positive outcomes have been reported in studies of minor subjects as well. A meta-analysis of school stress management programs that included diaphragmatic breathing and PMR, demonstrated significantly positive results in stress reduction (Kraag et al., 2006).

This study examined the effect of the implemented program on the students’ perception of social support and well-being, which are stress-related dimensions. Results showed that students improved their perception of social support and their sense of well-being. High social support seems to facilitate stress coping and enhances well-being (Charney and Southwick, 2007). Numerous studies have shown that long term stress and lack of social support and well-being go hand in hand with poor mental health (Mohr and Classen, 2004; Michalak et al., 1999; Paykel, 1994; Toussaint et al., 2016).

This study confirmed the beneficial effects of diaphragmatic breathing and PMR on students’ emotional functioning. According to the American Psychological Association the average stress level of the U.S. population in 2015 was 5.1 in a scale of 1 to 10 (APA, 2015). Stress is related to discomforting emotional symptoms such as feelings of depression, anxiety, irritability, and low self-efficacy. The significant improvement in emotional functioning in this pediatric study is in line with previous research concerning the effects of stress management programs on the psychological symptoms of stress (Chiesa and Serretti, 2009).

The implemented program resulted in a significant improvement in the school functioning level of the students. These results contradict recent findings on the relation of cortisol to school functioning of children, where no correlation was demonstrated between cortisol levels and school behaviour (Simons et al., 2017). This disagreement could be explained by the ongoing development of the cortisol circadian rhythm in childhood.

This study has some limitations. The main limitation is the lack of biological measurements for stress i.e., in blood, urine or saliva (Dhama et al., 2019) and the use of solely self-report questionnaires. Nevertheless, this was a low-cost intervention, easy to implement in a school setting. The lack of long-term follow-up, the small sample size and the limited age range of the participants do not allow generalization of the results. More complex, longitudinal interventions are required for children to adopt new, healthier behavioural patterns with
strong stress coping skills (Baranowski et al., 2003) and to attain concrete results regarding the effect of diaphragmatic breathing and PMR on children’s stress levels.

**Acknowledgements**

Authors would like to thank everyone who voluntarily participated in this study.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**References**

Abbasian F, Najimi A, Meftagh SD, Ghasemi G, Afshar H (2014) The effect of stress management training on stress and depression in women with depression disorders: Using cognitive-behavioral techniques. Journal of Education and Health Promotion 3(70). 10.4103/2277-9531.134819.

Amato PR (2000) The Consequences of Divorce for Adults and Children. Journal of Marriage and the Family 62, 1269–1287. 10.1111/j.1741-3737.2000.01269.x.

American Psychological Association (2015) Emotional signs of too much stress. Retrieved from https://www.healthline.com/health/emotional-symptoms-of-stress.

Amato PR (2000) The Consequences of Divorce for Adults and Children. Journal of Marriage and the Family 62, 1269–1287. 10.1111/j.1741-3737.2000.01269.x.

American Psychological Association (2015) Emotional signs of too much stress. Retrieved from https://www.healthline.com/health/emotional-symptoms-of-stress.

Baquatany S (2011) Stress and social support. Indian Journal of Psychological Medicine 33(1), 29–34. 10.4103/0253-7176.85392. [PubMed: 22021950]

Baranowski T, Cullen KW, Nicklas T, Thompson D, Baranowski J et al. (2003) Are Current Health Behavioral Change Models Helpful in Guiding Prevention of Weight Gain Efforts ?Obes Res Suppl:23S–43S. 10.1038/oby.2003.222. [PubMed: 14569036]

Bernardon S (2010) A Family Systems Perspective to Recovery From Posttraumatic Stress in Children. The Family Journal 18(4), 349–357. 10.1177/1066480710376618.

Bertssson LT, Ko L, Gustafsson J (2001) Psychosomatic complaints in schoolchildren: a Nordic comparison.Scand J Public Health 29(1), 44–54. [PubMed: 11355716]

Blashill MM (2016) Academic Stress and Working Memory in Elementary School Students. Dissertations 370. University of Northern Colorado.

Bridley A, Jordan SS (2014. Children’s Health Care Child Routines Moderate Daily Hassles and Children ‘ s Psychological Adjustment. Children’s Health Care 41, 129–144. 10.1080/02739615.2012.657040.

Carlier S, Van der Paelt S, Ongenae F, De Backere F, De Turck F (2020) Empowering Children with ASD and Their Parents Design of a Serious Game for Anxiety and Stress Reduction. Sensors 20(4): 966: 10.3390/s20040966.

Chen YF, Huang XY, Chien CH, Cheng JF (2017) The Effectiveness of Diaphragmatic Breathing Relaxation Training for Reducing Anxiety. Perspectives in Psychiatric Care 53(4), 329–336. 10.1111/ppc.12184. [PubMed: 27553981]

Chiesa A, Serretti A (2009) Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. Journal of Alternative and Complementary Medicine 15(5), 593–600. 10.1089/acm.2008.0495. [PubMed: 19432513]

Dhama K, Latheef SK, Dada M, Samad HA, Munjal A et al. (2019) Biomarkers in stress related diseases/disorders: Diagnostic, prognostic, and therapeutic values. Front Mol Biosci 6(91). 10.3389/fmolb.2019.00091.

Garmez N, Rutter M (1983) Stress, coping, and development in children. Johns Hopkins University Press.

Giannakopoulos G, Tzavara C, Dimitrakaki C, Kolaitis G, Rotsika V et al. (2009) The factor structure of the Strengths and Difficulties Questionnaire (SDQ) in Greek adolescents. Annals of General Psychiatry 8(20) 10.1186/1744-859X-8-20.
Goodman R (1997) The strengths and difficulties questionnaire: A research note. Journal of Child Psychology and Psychiatry and Allied Disciplines 38(5), 581–586. 10.1111/j.1469-7610.1997.tb01545.x.

Jacobson E (1987) Progressive Relaxation. The American Journal of Psychology 100(3/4), 522–537. 10.2307/1422693.

Kraag G, Zeegers MP, Kok G, Hosman C, Abu-Saad HH (2006) School programs targeting stress management in children and adolescents: A meta-analysis. Journal of School Psychology 44(6), 449–472. 10.1016/j.jsp.2006.07.001.

Ma X, Yue ZQ, Gong ZQ, Zhang H, Duan NY et al. (2017) The effect of diaphragmatic breathing on attention, negative affect and stress in healthy adults. Frontiers in Psychology 8, 1–12. 10.3389/fpsyg.2017.00874. [PubMed: 28197108]

March JS, Amaya-Jackson L, Murray MC, Schulte A (1998) Cognitive-behavioral psychotherapy for children and adolescents with posttraumatic stress disorder after a single-incident stressor. Journal of the American Academy of Child and Adolescent Psychiatry 37(6), 585–593. 10.1097/00004583-199806000-00008. [PubMed: 9628078]

Michalak EE, Wilkinson C, Hood K, Dowrick C, Wilkinson G (1999) Seasonality, negative life events and social support in a community sample. British Journal of Psychiatry 182, 434–438. 10.1192/bjp182.5.434.

Mohr DC, Classen C (2004) The relationship between social support, depression and treatment for depression in people with multiple sclerosis. Psychological medicine 34(3), 533–541. 10.1017/s0033291703001235. [PubMed: 15259838]

Ozbay F, Johnson DC, Dimoulas E, Morgan CA, Charney D et al. (2007) Social support and resilience to stress: from neurobiology to clinical practice. Psychiatry 4(5), 35–40.

Osika W, Friberg P, Wahrborg P (2007) A new short self-rating questionnaire to assess stress in children. International Journal of Behavioral Medicine 14(2), 108–117. 10.1007/BF03004176. [PubMed: 17926439]

Gkoltsiou K, Dimitrakaki C, Tzavara C, Papaevangelou V, Varni JW et al. (2007) Measuring health-related quality of life in Greek children: psychometric properties of the Greek version of the Pediatric Quality of Life Inventory(TM)4.0 Generic Core Scales. Quality of Life Research 17(2), 299–305 10.1007/s11136-007-9294-1. [PubMed: 18080786]

Pascoe MC, Thompson DR, Ski CF (2017) Psychoneuroendocrinology Yoga, mindfulness-based stress reduction and stress-related physiological measures: A meta-analysis. Psychoneuroendocrinology 86, 152–168. 10.1016/j.psyneuen.2017.08.008. [PubMed: 28963884]

Paykel ES (1994) Life events, social support and depression. Acta Psychiatr Scand Suppl 377, 50–58. 10.1111/j.1600-0447.1994.tb05803.x.

Petosa R, Oldfield D (1985) A Pilot Study of the Impact of Stress Management Techniques on the Classroom Behavior of Elementary School Students. Journal of School Health 55(2), 69–71. 10.1111/j.1746-1561.1985.tb04082.x.

Porges SW (2001) The polyvagal theory: Phylogenetic substrates of a social nervous system. International Journal of Psychophysiology 42(2), 123–146. 10.1016/S0167-8760(01)00162-3. [PubMed: 11587772]

Rentala S, Thimmajia SG, Tileka SD, Nayak RB, Aladakatti R (2019) Impact of holistic stress management program on academic stress and well-being of Indian adolescent girls: A randomized controlled trial. Journal of Education and Health Promotion 8, 253. 10.4103/jehp.jehp_233_19. [PubMed: 32002425]

Simons SSH, Cillessen AHN, de Weerth C (2017) Cortisol stress responses and children’s behavioral functioning at school. Developmental Psychobiology 59(2), 217–224. 10.1002/dev.21484. [PubMed: 27774583]

Stansbury K, Harris ML (2000) Individual Differences in Stress Reactions during a Peer Entry Episode : Effects of Age, Temperament, Approach Behavior, and Self-Perceived Peer Competence 63, 50–63. 10.1006/jecp.1999.2541.

Toussaint L, Shields GS, Dorn G, Slavich GM (2016) Effects of lifetime stress exposure on mental and physical health in young adulthood; How stress degrades and forgiveness protects health. Journal of Health Psychology 21(6), 1004–1014. 10.1177/1359105314544132. [PubMed: 25139892]
Tsang HWH Fung KMT, Chan ASM, Lee G, Chan F (2006) Effect of a qigong exercise programme on elderly with depression. International Journal of Geriatric Psychiatry 21(9), 890–897. 10.1002/gps.1582. [PubMed: 16955451]

Van Praag HM, De Kloet R (2005) Stress, the brain and depression. Cambridge University Press.

Vancampfort D, Correll CU, Scheewe TW, Probst M, De Herdt A et al. (2013) Progressive muscle relaxation in persons with schizophrenia: A systematic review of randomized controlled trials. Clinical Rehabilitation 27(4), 291–298. 10.1177/0269215512455531. [PubMed: 22843353]

Varni JW, Seid M, Rode CA (1999) The PedsQL: measurement model for the pediatric quality of life inventory. Medical Care 37(2), 126–139. 10.1097/00005650-199902000-00003. [PubMed: 10024117]

Wilk C, Turkoski B (2001) Progressive muscle relaxation in cardiac rehabilitation: a pilot study. Rehabilitation Nursing 26(6), 238–242. 10.1002/j.2048-7940.2001.tb01963.x. [PubMed: 12035725]
Key Points

• Stress experiences begin in early stages of life.
• An elementary school program on stress coping skills was implemented for 12 weeks.
• Diaphragmatic breathing and progressive muscular relaxation reduced students’ subjective stress levels.
Figure 1.
Participants’ flow diagram.
Table 1.

Study groups’ characteristics.

|        | Intervention group N=24 (%) | Control group N=28 (%) | p-value |
|--------|----------------------------|------------------------|---------|
| Sex    |                            |                        |         |
| Female | 16 (66.67)                 | 15 (53.57)             | 0.337   |
| Male   | 8 (33.33)                  | 13 (46.43)             |         |
Table 2.
Baseline psychometric characteristics of study groups.

|                      | Intervention Group Mean ± SD | Control group Mean ± SD | p-value * |
|----------------------|-----------------------------|-------------------------|-----------|
| **SDQ score**        |                             |                         |           |
| Total                | 18.11 ± 7.37                | 18 ± 6.47               | 0.952     |
| Emotional symptoms   | 3.26 ± 2.60                 | 2.92 ± 2.72             | 0.574     |
| Conduct problems     | 1.48 ± 1.80                 | 1.40 ± 1.83             | 0.852     |
| Hyperactivity score  | 4.25 ± 2.90                 | 3.82 ± 3.37             | 0.460     |
| Peer problem         | 3.30 ± 2.81                 | 2.5 ± 2.08              | 0.361     |
| Prosocial behaviour  | 6.37 ±2.13                  | 7.35 ± 2.45             | 0.117     |
| **PedsQL score**     |                             |                         |           |
| Physical functioning  | 66.20 ± 28.10               | 70.75 ± 23.07           | 0.560     |
| Emotional functioning | 56.30 ± 30.21               | 56.96 ± 26.46           | 0.773     |
| Social functioning    | 67.03 ± 33.63               | 67.50 ± 28.90           | 0.530     |
| School functioning    | 66.30 ± 34.57               | 69.46 ± 26.60           | 0.852     |
| **SiC score**        |                             |                         |           |
| Total                | 46.57 ± 5.86                | 43.85 ± 8.82            | 0.247     |
| Lack of well-being   | 15.17 ± 4.00                | 14.08 ± 3.91            | 0.344     |
| Distress             | 17.70 ± 3.36                | 18.20 ± 2.87            | 0.584     |
| Lack of social support | 14.34 ± 2.44              | 13.11 ± 2.98            | 0.123     |

SDQ: Strengths and Difficulties Questionnaire, PedsQL: Pediatric Quality of Life, SiC: Stress in Children

* Difference of frequencies tested with Pearson’s chi square or Fisher’s exact test, difference of means with Student’s t-test and non-parametric Mann-Whitney U test (applied in mean weight, mean SDQ emotional symptoms, conduct problems, hyperactivity, peer problem scores, in all PedsQL scores and SiC distress sub-score).
Table 3.
Comparison of the psychometric characteristics of the two groups after the intervention.

|                      | Intervention Group Mean ± SD | Control group Mean ± SD | p-value* |
|----------------------|------------------------------|-------------------------|----------|
| **SDQ score**        |                              |                         |          |
| Total                | 15.74 ± 6.00                 | 14.35 ± 6.34            | 0.410    |
| Emotional symptoms   | 2.51 ± 2.27                  | 1.92 ± 1.70             | 0.387    |
| Conduct problems     | 1.30 ± 1.61                  | 0.82 ± 1.21             | 0.317    |
| Hyperactivity score  | 3.30 ± 2.78                  | 3.42 ± 3.24             | 0.878    |
| Peer problem         | 2.96 ± 2.54                  | 1.96 ± 1.55             | 0.225    |
| Prosocial behaviour  | 6.14 ± 2.20                  | 7.17 ± 2.31             | 0.096    |
| **PedsQL score**     |                              |                         |          |
| Physical functioning | 75.81 ± 25.40                | 76.00 ± 18.90           | 0.654    |
| Emotional functioning| 68.88 ± 25.00                | 65.00 ± 24.50           | 0.314    |
| Social functioning   | 73.15 ± 28.76                | 77.85 ± 16.75           | 0.986    |
| School functioning   | 77.22 ± 25.12                | 74.46 ± 23.50           | 0.401    |
| **SiC score**        |                              |                         |          |
| Total                | 37.64 ± 5.29                 | 42.26 ± 8.06            | 0.019    |
| Lack of well-being   | 11.28 ± 3.57                 | 13.53 ± 4.05            | 0.037    |
| Distress             | 14.52 ± 2.51                 | 16.11 ± 2.42            | 0.050    |
| Lack of social support| 11.24 ± 2.31                | 12.75 ± 2.68            | 0.034    |

SDQ: Strengths and Difficulties Questionnaire, PedsQL: Pediatric Quality of Life, SiC: Stress in Children

* Difference of means tested with Student’s t-test and non-parametric Mann-Whitney U test (applied in mean SDQ emotional symptoms, conduct problems, hyperactivity, peer problem scores, in all PedsQL scores and in SiC distress sub-score). Statistical significance at p<0.05.
### Table 4.
Comparisons of the psychometric characteristics of the intervention group pre- and post-intervention.

|                          | Before Intervention Mean ± SD | After Intervention Mean ± SD | p-value * |
|--------------------------|--------------------------------|-----------------------------|-----------|
| **SDQ score**            |                                |                             |           |
| Total                    | 18.11 ± 7.37                   | 15.74 ± 6.00                | 0.131     |
| Emotional symptoms       | 3.26 ± 2.60                    | 2.51 ± 2.27                 | 0.069     |
| Conduct problems         | 1.48 ± 1.80                    | 1.30 ± 1.61                 | 0.666     |
| Hyperactivity score      | 4.25 ± 2.90                    | 3.30 ± 2.78                 | 0.069     |
| Peer problem             | 3.30 ± 2.81                    | 2.96 ± 2.54                 | 0.402     |
| Prosocial behaviour      | 6.37 ± 2.13                    | 6.14 ± 2.20                 | 0.550     |
| **PedsQL score**         |                                |                             |           |
| Physical functioning     | 66.20 ± 28.10                  | 75.81 ± 25.40               | 0.001     |
| Emotional functioning    | 56.30 ± 30.21                  | 68.88 ± 25.00               | 0.003     |
| Social functioning       | 67.03 ± 33.63                  | 73.15 ± 28.76               | 0.226     |
| School functioning       | 66.30 ± 34.57                  | 77.22 ± 25.12               | 0.029     |
| **SiC score**            |                                |                             |           |
| Total                    | 46.57 ± 5.86                   | 37.64 ± 5.29                | < 0.001   |
| Lack of well-being       | 15.17 ± 4.00                   | 11.28 ± 3.57                | 0.001     |
| Distress                 | 17.70 ± 3.36                   | 14.52 ± 2.51                | < 0.001   |
| Lack of social support   | 14.34 ± 2.44                   | 11.24 ± 2.31                | < 0.001   |

SDQ: Strengths and Difficulties Questionnaire, PedsQL: Pediatric Quality of Life, SiC: Stress in Children

* Difference of means tested with two dependent samples Student’s t test or nonparametric Wilcoxon signed rank test (implemented in SDQ emotional symptoms, conduct problems, hyperactivity, peer problem scores, in all PedsQL scores and in SiC score). Statistical significance at p<0.05.
Table 5.
Comparison of the psychometric characteristics of the control group pre- and post- intervention.

|                      | Before Intervention Mean ± SD | After Intervention Mean ± SD | p-value* |
|----------------------|------------------------------|------------------------------|----------|
| **SDQ score**        |                              |                              |          |
| Total                | 18 ± 6.47                    | 14.35 ± 6.34                 | 0.007    |
| Emotional symptoms   | 2.92 ± 2.72                  | 1.92 ± 1.70                  | 0.062    |
| Conduct problems     | 1.40 ± 1.83                  | 0.82 ± 1.21                  | 0.013    |
| Hyperactivity score  | 3.82 ± 3.37                  | 3.42 ± 3.24                  | 0.498    |
| Peer problem         | 2.5 ± 2.08                   | 1.96 ± 1.55                  | 0.114    |
| Prosocial behaviour  | 7.35 ± 2.45                  | 7.17 ± 2.31                  | 0.672    |
| **PedsQL score**     |                              |                              |          |
| Physical functioning  | 70.75 ± 23.07                | 76.00 ± 18.90                | 0.212    |
| Emotional functioning | 56.96 ± 26.46                | 65.00 ± 24.50                | 0.121    |
| Social functioning   | 67.50 ± 28.90                | 77.85 ± 16.75                | 0.049    |
| School functioning   | 69.46 ± 26.60                | 74.46 ± 23.50                | 0.166    |
| **SiC score**        |                              |                              |          |
| Total                | 43.85 ± 8.82                 | 42.26 ± 8.06                 | 0.430    |
| Lack of well-being   | 14.08 ± 3.91                 | 13.53 ± 4.05                 | 0.830    |
| Distress             | 18.20 ± 2.87                 | 16.11 ± 2.42                 | 0.002    |
| Lack of social support | 13.11 ± 2.98               | 12.75 ± 2.68                 | 0.500    |

SDQ: Strengths and Difficulties Questionnaire, PedsQL: Pediatric Quality of Life, SiC: Stress in Children

* Difference of means tested with two dependent samples Student’s t test or nonparametric Wilcoxon signed rank test (implemented in SDQ emotional symptoms, conduct problems, hyperactivity, peer problem scores, in all PedsQL scores and in SiC score). Statistical significance at p<0.05.