



A QUASI-EXPERIMENTAL PILOT STUDY OF THE EFFECTS OF A STRESS MANAGEMENT & HEALTH PROMOTION PROGRAM IN CHILDREN WITH ADHD

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Abstract:

Objective: The purpose of the present study was to investigate the effects of a stress management and health promotion program on the primary and secondary symptoms of Attention Deficit/Hyperactivity Disorder (ADHD) as well as on other variables concerning the daily routine and lifestyle of children with ADHD. Furthermore, the effects on the levels of perceived stress and the quality of life of parents of children with ADHD were investigated.

Method: The research type was quasi-experimental. Two groups were created (intervention and control group) with a total of 50 participants. Each participant in the intervention group engaged in 8 meetings over a period of two months. The intervention program included information relevant to stress and lifestyle (daily and eating habits, routine, exercise, sleep) as well as the application of cognitive behavioral therapy and stress management techniques.

Results: The results are summarized as follows: significant decrease in anxiety and symptoms of ADHD, and improvement in sleep conditions, eating habits and frequency of physical exercise of the children were noted. Furthermore, a positive effect on perceived stress and quality of life of the parents of children with ADHD was observed.

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Conclusions: The results of the present study show that the stress management and health promotion program significantly improves both the symptoms of the disorder and the emotional state of children with ADHD, as well as their general lifestyle.

Keywords: ADHD, stress management, anxiety, health promotion

1. Introduction

ADHD is among the most common developmental disorders of childhood. Research data both in Greece (Palili, Kolaitis, Vassi, Veltsista, Bakoula, & Gika, 2011) and abroad (Barkley, 2006) show that around 7-12% of children who are referred to child guidance and mental health centers experience symptoms related to ADHD. According to a recent meta-analysis of 102 research studies with a total sample of 171,756 children from all over the world, the ADHD percentage at a world-wide scale was recorded at 5.2% (Polanczyk, Caspi, Houts, Kollins, Rohde, & Moffitt, 2010). The disorder is multifactorial and is connected to genetic, environmental and neuropsychological factors (Nigg, 2006) while the intensity and the severity of the symptoms vary depending on the case.

In addition to the dominant symptoms of the disorder, children with ADHD often face secondary symptoms such as: stress, anxiety, low self-esteem, and school failure, as well as various behavioral problems (Becker, Roessner, Breuer, Dopfner, & Rothenberger, 2011; Edbom, 2006; Tarver, Daley, & Sayal, 2014). Anxiety disorders and ADHD are two of the most frequent childhood disorders that co-exist in about 25% of the cases (Tannock, 2000). Furthermore, sleep disorders have been observed in children with ADHD, both in terms of quality and duration at a percentage of 56%, in contrast to the 23% in typically developing children (Andreou, Karapetsas, Agapitou, & Gourgoulianis, 2003). Overall, ADHD is linked to impaired quality of life (Danckaerts et al., 2010) and obesity in children (Kim, Mutyala, Agiovlasis, & Fernhall, 2011) while parents of children with ADHD report higher rates of parental stress (Deault, 2010).

1.1 Aim of the Present Study

The primary aim of the present study was to investigate the effect of a stress management and health promotion program in relation to the primary and secondary symptoms (stress, anxiety) of the disorder as well as on the general lifestyle (daily habits, routine, exercise, diet, sleep) of children with ADHD. Furthermore, the effect of the program concerning the levels of perceived stress and quality of life in parents of children with ADHD was investigated.

2. Method

The study design was quasi experimental and took place from October 2014 until June 2015 in the Child Psychiatry Department of the General Children's Hospital of Athens

“Panagioti and Aglaia Kyriakou”. The study received Ethical Approval from the hospital's scientific committee while the children participated only after their parents had given their informed written consent.

2.1 Participants

The final research sample consisted of fifty (N=50) children with ADHD, who were divided into two groups: the intervention group (24 individuals) and the control group (26 individuals). All participants resided permanently in Athens, had been diagnosed with ADHD based on the DSM-IV diagnostic criterion, were 7 to 14 years old and demonstrated good understanding of the Greek language.

Children with other mental disorders, taking any drugs, experiencing major stressful events, already using relaxation techniques or participating in other psychological or psychotherapeutic interventions were excluded. The children who were considered eligible after being evaluated were divided into the intervention and control groups according to their preference, and following permission from their parents,

2.2 Measures

The following measurements were performed twice, once at the beginning of the program and again at the end of the eight-week intervention:

A. ADHD Rating Scale

Rating Scale of Attention Deficit/Hyperactivity Disorder – IV (ADHD) validated in the Greek language (Kalantzi-Azizi, Aggeli, & Efstathiou, 2012). The ADHD Rating scale is an 18-item scale corresponding to the 18 items in the DSM criteria and is divided into 2 subscales: hyperactivity/impulsivity and inattentiveness. The items are scored on a 4-point frequency scale ranging from 0 = never/rarely to 3 = very often. The scale is available in a form for parents/caregivers (Home Version) and for teachers (School Version) and can be administered to children aged 5-18 years. For this study, we used the Home Version of the ADHD rating scale. Good psychometric properties of this measure within the Greek population have been recorded (Kalantzi-Azizi, Aggeli, & Efstathiou, 2012).

B. Evaluation of Stress Levels

Stress in Children (SiC). The Stress in Children Questionnaire (SiC) is a short, 21-item questionnaire that uses Likert-scale type response categories with four alternatives. The categories are (1) never, (2) sometimes, (3) often, and (4) very often. Children are asked to choose the responses that best apply to them. The questionnaire was developed for children aged 9-12, and the items were selected by schoolteachers and psychologists familiar with stress and children. The questionnaire consists of 3 subscales, which measure the following categories: lack of well-being, distress, and lack of social support. Studies using the Beck Youth Inventories of Emotional and Social Impairment, saliva,

and urine samples have shown that the SiC is a valid and reliable self-report for children's perceived stress level (Osika, Friberg, & Wahrborg, 2007).

C. Evaluation of Anxiety Levels

State -Trait Anxiety Inventory for children (STAIC). State-Trait Anxiety Inventory for Children (STAIC) scale is a 40-item self-administered scale, which is composed of two subscales: 20 items measuring situational or state anxiety (STAIC A-State) and 20 items for underlying or trait anxiety (STAIC A-Trait) (Psychountaki, Zervas, Karteroliotis, & Spielberger, 2003). The STAIC scale measures anxiety symptoms in children aged 9-12 years. Good psychometric properties of this measure within the Greek population have been recorded (Psychountaki, Zervas, Karteroliotis, & Spielberger, 2003).

D. Evaluation of stress levels in parents of children with ADHD

Perceived Stress Scale. The Perceived Stress Scale (PSS) is a self-reported 14-item measure of the degree to which situations in an individual's life are appraised as stressful (Cohen, Mermelstein, & Kamarck 1983). For this purpose, respondents rated the frequency of their feelings and thoughts over the previous month on a 5-point Likert-type scale (from 0=never to 4=very often). Higher scores indicate the higher level of perceived stress by the individual during the last month. Good psychometric properties of this measure within the Greek population have been recorded (Andreou et al. 2011).

E. Evaluation of the level of quality of life in parents of children with ADHD

The WHO (Five) Well-Being Index (WHO-5) is a short self-report questionnaire that measures the quality of life in the adult population (Bech, 2004). The respondent is asked to rate how well each of the 5 statements applies to him or her when considering the last 14 days. Each of the 5 items is scored from 5 (all of the time) to 0 (none of the time). The raw score therefore theoretically ranges from 0 (absence of well-being) to 25 (maximal well-being). Because scales measuring health-related quality of life are conventionally translated to a percentage scale from 0 (absent) to 100 (maximal), multiplication of the raw score by 4 is recommended (Topp, Ostergaard, Sondergaard, & Bech, 2015).

F. Evaluation of general lifestyle (daily habits, routine, exercise, diet, sleep) was measured with a self-report questionnaire and was also reported through diaries.

2.3 Procedures

The intervention consisted of eight weekly individualized sessions consisting of consultation on a healthy lifestyle (physical exercise, diet, adherence to a structured daily program) and stress, along with education on stress management techniques (i.e. biofeedback-assisted breathing relaxation, progressive muscle relaxation, guided imagery) psycho-education and cognitive behavioural therapy techniques (i.e. targeting

maladaptive thoughts and encouraging positive emotions) as summarized in Table 1. Usual care was administered in the control group.

Table 1: Process of Intervention

1st Meeting	<ul style="list-style-type: none"> • Information about the Intervention Program • Distribution and Completion of Initial Questionnaires • Introduction to the meaning of Stress and Connection between Stress and ADHD • Instructions and Information related to Physical Exercise and the Importance of Routine in Everyday Life • Distribution of Pedometers, Record Sheet of Steps and Useful Guide to the Program
2nd Meeting	<ul style="list-style-type: none"> • Learning and Applying the Diaphragmatic Breathing Technique using Biofeedback. Distribution of Diary for Recording the Application of the Technique.
3rd Meeting	<ul style="list-style-type: none"> • Learning and Applying the Progressive Muscle Relaxation Technique by means of instructions on a CD. Distribution of Diary for Recording the Application of the Technique.
4th Meeting	<ul style="list-style-type: none"> • Introduction and Presentation of the meaning of the Cognitive Reconstruction Technique, Positive Thoughts and Self-Perception.
5th Meeting	<ul style="list-style-type: none"> • Testing the Application of the Relaxation Techniques • Recording Quality Characteristics • Information and Presentation of the Nutrition topic area.
6th Meeting	<ul style="list-style-type: none"> • Learning and Applying the Guided Imagery Technique by means of a CD. Distribution of Diary for Recording the Application of the Technique.
7th Meeting	<ul style="list-style-type: none"> • Re-testing the Relaxation Techniques, Encouragement of Continuation of Healthy Behaviours • Discussion and Recording of Experiences related to process of intervention.
8th Meeting	<ul style="list-style-type: none"> • Completion of Program • Completion of Final Questionnaires

2.4 Statistical Analyses

From the initial evaluation of the sample (N=76), ten children did not meet the admission criteria for participation in the research project, while out of the remaining 66 children, 6 of them refused to participate, mainly because of lack of free time or lack of interest. Consequently, the initial sample consisted of 60 patients, 10 of which (6 from the intervention group and 4 from the control group) withdrew from the research process at a later date. The main reasons for their withdrawal concerned the following: appearance of a serious health problem, lack of time, dissatisfaction with the program, occurrence of a major stressful event and moving to another city.

The sample was described by the use of descriptive statistical measures (averages, minimum, maximum values and frequencies). The initial differentiation of the groups was controlled by using the chi-square test for the categorical variables and the nonparametric Mann–Whitney *U* test for the quantitative variables. The validation of the hypotheses was achieved by first measuring the categorical variables (difference = final value – starting value). Then, the nonparametric test was used for comparing the differences. The magnitude of the effect of the program on the variables was controlled by the variable of effect size rho ($Z/N^{0.5}$), where 0.1, 0.3 and 0.5 correspond to a small, medium and large effect size, respectively. The responses to open questions were

evaluated regarding their degree of change (e.g. no change, improvement or deterioration of satisfaction) by using the chi-square method. The threshold was maintained at 0.05. All the tests were conducted with the statistical program SPSS 20.1 (Chicago, IL).

3. Results

Regarding the sociodemographic variables, as described in Table 2, our sample consisted mainly of boys, at a percentage of 70.8%, thus 17 out of the 24 children in the intervention sample were male, whereas in the control group the ratio between boys and girls was 1 to 1 (13 boys, 13 girls). The average age of the total number of the children in the intervention group was 10.8 years, while in the control group it was 10. Most children attended elementary school in both groups, with a percentage of 66.7% and 76.9%, respectively. Furthermore, 99.7% of parents of children in the intervention group and 80.8% of parents of children in the control group were married. Additionally, 23 out of 24 children in the intervention group and 23 out of 26 in the control group had siblings, with the average number of siblings being 1.83 for the intervention group and 1.54 for the control group. Finally, the average number of family members was 4.83 for the children in the intervention group and 4.35 for the children in the control group. There were now statistically significant differences for the sociodemographic characteristics between the 2 study groups.

Table 2: Reference values and comparisons of sociodemographic variables in the study groups

	Intervention group (N=24)	Control group (N=26)	P value
Average Age (±SD)	10.8 (2.36)	10.0 (2.39)	0.256
Male (%)	17 (70.8)	13 (50)	0.225
Elementary school (%)	16 (66.7)	20 (76.9)	0.623
Married parents (%)	22 (99.7)	21 (80.8)	0.483
Siblings (%)	23 (95.8)	23 (88.5)	0.661
Average Number of Siblings Mean(Min-Max)	1.83 (0-4)	1.54 (0-3)	0.459
Average Number of Family Members Mean(Min-Max)	4.83 (3-7)	4.35 (3-5)	0.199

Furthermore, in addition to the comparison in the reference values of the sociodemographic characteristics, there was also a comparison concerning the starting values of the variables between the two study groups. As shown in this comparison, there were no statistically significant differences in the starting values of the variables of the two study groups, apart from 4 variables. These 4 variables, as shown in Table 3,

were: The STAIC Trait Total Variable ($p=0.021$), the Sic Total Variable ($p=0.001$), the ADHD Hyperactivity Variable ($p=0.006$), and finally the ADHD Total Variable ($p=0.007$).

This result is due to the type of research which was Quasi-Experimental. For this type of research, individuals -after being informed by the researchers about the study groups- choose, according to their preference, in which study group (intervention-control) they wish to participate. This may lead to some differences in the starting values of some variables between the two groups, but it does not affect our final findings, since they result from and can be explained from the difference between the final value and the starting value of each study group.

Table 3: Differences in the comparison of starting values of the variables between the two study groups

	Intervention Group (N=24)	Control Group (N=26)	P value
Staic Trait Mean (\pm SD)	39.3 (8.07)	34.08 (6.90)	0.021
Sic Mean (\pm SD)	48 (7.26)	41.15 (5.88)	0.001
ADHD Hyperactivity Mean (\pm SD)	12.5 (6.19)	7.88 (5.53)	0.006
ADHD Mean (\pm SD)	28 (10.2)	21 (6.91)	0.007

The comparisons between the two groups are described in Table 4. Generally, the Stress Management Program (compared to the control group) seemed to have significantly improved the following variables: *the Perceived Stress and the Quality of Life of the Parents of children with ADHD, the Anxiety State Scale and the Anxiety Trait Scale, the Attention Deficiency Scale, the Hyperactivity Scale and the ADHD Scale as a total. Finally, there was a great improvement in the time needed in minutes for the children to fall asleep at night (great effect) while some effect was observed in the time in hours of the children's actual sleep at night.*

Table 4: The comparisons between the two groups as they were described in the section of the statistical analysis

	Intervention Group (N=24)	Control Group (N=26)	P Value	R effect size¹
Mean D PSS (\pm SE)	-6.25 (\pm 0.56)	-0.31 (\pm 0.33)	<0.001	0.86
Mean D STAIC State (\pm SE)	-6.25 (\pm 0.76)	-0.15 (\pm 0.70)	<0.001	0.69
Mean D STAIC Trait (\pm SE)	-8.54 (\pm 0.74)	0.31 (\pm 0.23)	<0.001	0.86
Mean D WHO (\pm SE)	7.17 (\pm 1.25)	0.62 (\pm 0.62)	<0.001	0.55

Mean D SIC (±SE)	-8.50 (±0.71)	0.00 (±0.23)	<0.001	0.14
Mean D ADHD_ ATTENTIONDEFICIENCY (±SE)	-0.83 (±0.13)	0.08 (±0.05)	<0.001	0.73
Mean D ADHD_HYPERACTIVITY (±SE)	-0.58 (±0.12)	0.00 (±0.08)	<0.001	0.52
Mean D ADHD (±SE)	-1.42 (±0.12)	0.08 (±0.09)	<0.001	0.86
Mean D TIME IN MINUTES TO FALL ASLEEP EVERY NIGHT (±SE)	-14.88 (±2.33)	0.58 (±0.42)	<0.001	0.91
Mean D TIME IN HOURS REAL SLEEP AT NIGHT (±SE)	0.38 (±0.13)	0.02 (±0.59)	0.026	0.32

¹($R=\sqrt{|Z/N|}$, 0.1=small, 0.3=medium, >0.5=large effect size). Significance Level<0.05

The comparisons between the two study groups regarding the general lifestyle (daily habits, routine, exercise, diet, sleep) of children with ADHD, as measured with a self-report questionnaire and diaries, is described in Table 5. More specifically, regarding the mid-day snack consumption, following completion of the intervention program 37.5% (9 individuals) of the intervention group reported that they had a mid-day snack more often, in comparison to the beginning of the research, whereas in the control group no change was noted during the period of the study ($p=0.001$).

Regarding the avoidance of sweets, following completion of the intervention, 50% (12 individuals) of the intervention group mentioned that they avoided eating sweets more often than at the beginning of the study, whereas in the control group a similar change was noted in only one person during the period of study ($p<0.001$).

As far as the consumption of wholegrain products is concerned, after the completion of the intervention program, 29.2% (7 individuals) of the intervention group reported eating wholegrain products more often, in comparison to the beginning of the study, whereas in the control group no change was noted during the period of study ($p=0.006$). Regarding aerobic exercise (for 20 minutes or more at least 3 times a week) following completion of the intervention program, 45.8% (11 individuals) of the intervention group mentioned exercising more often, in comparison to the beginning of the study, whereas in the control group a similar change was noted in only one person during the period of research ($p=0.001$).

Regarding participation in sports activities with friends, after the end of the program, 29.2% (7 individuals) of the intervention group reported participating in sports activities with friends more often in comparison to the beginning of the study, whereas in the control group no change was noted during the period of the intervention program ($p=0.001$). As far as support from others is concerned, following the intervention program 25% (6 individuals) of the intervention group reported looking for support from others when dealing with difficulties more often in comparison to the

beginning of the study, whereas in the control group a similar change was noted in only one person during the period of study ($p=0.045$).

Finally, regarding sleep satisfaction, after the intervention program 83.3% (20 individuals) of the intervention group mentioned feeling more satisfied from their sleep than at the beginning of the study, whereas in the control group no change was noted during the period of study ($p<0.001$).

Table 5: Comparisons between the two groups regarding the general lifestyle of children with ADHD, as they were described in the part of the statistical analysis

	Intervention group (N=24)			Control Group (N=26)			P
	No Change	Improve- ment	Deterioration	No Change	Improve- ment	Deterioration	
Mid-Day Snack N (%)	15 (62.5)	9 (37.5)	0 (0)	26 (100)	0 (0)	0 (0)	0.001
Avoiding Eating Sweets N (%)	11 (45.8)	12 (50)	1 (4.2)	25 (96.2)	1 (3.8)	0 (0)	<0.001
Eating Wholegrain Products N (%)	16 (66.7)	7 (29.2)	1 (4.2)	26 (100)	0 (0)	0 (0)	0.006
Aerobic Exercise(for 20 min.at least 3 times a week) N (%)	12 (50)	11 (45.8)	1 (4.2)	25 (96.2)	1 (3.8)	0 (0)	0.001
Participation in Sports Activities with Friends N (%)	14 (58.3)	7 (29.2)	3 (12.5)	26 (100)	0 (0)	0 (0)	0.001
Looking for Support from Others N (%)	18 (75)	6 (25)	0 (0)	25 (96.2)	1 (3.8)	0 (0)	0.045
Satisfaction from Sleep N (%)	4 (16.7)	20 (83.3)	0 (0)	26 (100)	0 (0)	0 (0)	<0.001

4. Discussion

In the process of reviewing the international literature regarding the subject of stress management and ADHD, it was easily perceptible that the greater part of research concerns stress management in parents of children with ADHD. Furthermore, most research that exists in relation to children with ADHD is limited either to the use of individual stress management techniques (Grosswald, Stixrud, Travis, & Bateh, 2008) or to the use of individual techniques, but with the children's and parents' parallel

participation in the program (Harrison, Manocha, & Rubia, 2004). In addition, most research studies that are conducted worldwide with regards to ADHD concern the effects of pharmacotherapy, of psychotherapy or/and a combination of these two treatments on the outcome of the disorder. It is therefore clear that research projects involving children with ADHD, and focusing on stress management with no pharmaceutical methods are very limited.

Regarding the combination of different techniques for stress management in children with ADHD there appears to be one main study available (Gonzalez & Sellers, 2002). This study was similar to our intervention, mainly in the use of various stress management techniques, but this study did not include Cognitive Reconstruction or sections about nutrition and exercise. Finally, this study differed greatly from our study due to the fact that this research used a randomized sample, as well as the fact that there were 3 study groups: a control group, a therapist-led group and a group in which the stress management techniques were taught by the parents. At the end of the study, the three groups were compared regarding their effectiveness. The variables that were investigated in this research study were very different from the ones in our study and the results were not statistically significant.

We consider that the children's improvement that was observed regarding the Anxiety State and the Anxiety Trait Scale relates mainly to the application of the various stress management techniques which were used in the study. In addition, based on the international literature, there is evidence that these techniques reduce both stress and feelings of anxiety and apprehension (Varvogli & Darviri, 2011). Specifically, diaphragmatic breathing has been characterized as an antidote to stress for centuries (Forman & Myers, 1987), while it has been successfully applied to a plethora of studies which concern stress management in students (Paul, Elam, & Verhulst, 2007). Moreover, Progressive Muscle Relaxation (Varvogli & Darviri 2011) and Guided Imagery (Carter, 2006) have proved beneficial regarding anxiety relief.

A further factor which might have contributed to stress reduction in children with ADHD after the completion of the intervention program was the improvement of sleep. It is recognised that sleeping problems (difficulty in falling asleep, deficient sleep, anxiety, frequent interruption of sleep, etc.) in childhood are connected to anxiety in children (Alfano, Ginsburg, & Kingery, 2007) and also to anxiety disorders in adult life (Gregory, Caspi, Eley, Moffitt, O'Connor, & Poulton, 2005), while ADHD has repeatedly been connected to sleeping problems (Cortese, Faraone, Konofal, & Lecendreux, 2009). Consequently, the improvement of sleeping conditions through the intervention program could possibly reduce feelings of anxiety.

Finally, a further factor which could explain the considerable reduction both in the anxiety state and in the anxiety trait which was noted in our study is the increase of physical activity, which was observed in the children after completion of the intervention program. The above findings regarding athletic activities could document the reduction of anxiety which was recorded in our study, as similar findings have been

observed in other studies in which the active participation in athletic activities is also connected to lower levels of anxiety in children with ADHD (Kiluk, 2009).

Consequently, there seems to have been a great improvement regarding the primary symptoms of ADHD. As such,, we may deduce that the relaxation emerging from the use of management techniques and the control that the children started to have over their body (Kakouros & Maniadaki, 2012), in combination with the learning and practice in their daily routine and the cognitive reconstruction exercises, might have reduced some of the symptoms of the disorder. Furthermore, the increase in the uptake of physical exercise may have improved the primary symptoms of the disorder, which is in accordance with the results of relevant research studies that report an improvement in cognitive functions in children with ADHD after participating in athletic programs (Grassmann, Alves, Santos-Galduróz, & Fernandes-Galduróz, 2014; Verret, Guay, Berthiaume, Gardiner, & Béliveau, 2012; Pontifex, Saliba, Raine, Picchetti, & Hillman, 2013).

It is clear that the changes that occurred in various areas of these children's lives - in combination with the information and psychoeducation which was conducted among their parents regarding ADHD, and also the overall benefits of the stress management and health promotion program - succeeded in increasing the quality of life and decreasing the perceived stress of the parents during the intervention program.

5. Limitations and Conclusions

The general conclusion of this study is that the implementation of the interventional Stress Management and Health Promotion Program can benefit children with ADHD in many ways. Although the program was non pharmaceutical and lasted only eight weeks, the results are interesting and quite promising. More specifically, this program may positively affect the ADHD symptoms, stress, anxiety, as well as other variables which concern children's daily life, lifestyle and behavior.

However, this study has many limitations. Firstly, it is a non-blinded study, and as such the results cannot be considered fully reliable, since biased errors are not excluded, both on the subjects' and the researchers' part. Furthermore, the type of research that was used in this study allows for a substantial bias in our findings, since the sample was non-randomized. Another restriction lies in the fact that no biomarkers of stress were used in this study, which would potentially strengthen the value of the intervention further. Moreover, our sample was relatively small and the time of the intervention was limited. Finally, no follow-up meetings, which would verify the existing results over time, were programmed.

Despite this study's limitations, which should be addressed in future research, to our knowledge, this is the first study to utilise a multidisciplinary intervention to efficiently tackle, in the short period of only 8 weeks, the primary and secondary symptoms of ADHD, along with parental stress. Our results should encourage ADHD specialists to adopt stress management consultation in their everyday clinical practice.

5.1 Future Directions

Future studies should expand these early findings to a larger sample number, compare them to similar techniques and use more objective laboratory measurements, such as biomarkers of stress.

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