



The Effect of Scalp Acupuncture on Emotional and Emotion Related Behavioral Problems in Children with Autism



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Abstract

Background: Children with Autistic Spectrum Disorder (ASD) often manifest various emotion and emotion related behavioral problems. They may exhibit externalizing difficulties such as temper tantrum, aggression, even self-injury, together with internalizing problems such as anxiety, fear, depression and impatience. Scalp acupuncture had been found to improve the cognitive, social, as well as behavioral problems. Our clinical observation noted a drastic change in emotional and emotion-related behavioral problems in children with ASD upon the therapy of scalp acupuncture.

Methods: Children with ASD aged 2 to 10 were assessed as a treatment group (n=45) and a comparison group (n=44). Data were analyzed by the paired sample t-test. The treatment group received scalp acupuncture therapy of a total of 30 sessions in about 6 months, while the comparison group received no acupuncture treatment. The differences in performance were compared between the two groups.

Results: There were significant improvements in performance of temper tantrum, aggression to others, impatience, fears and anxiety after scalp acupuncture. Scalp acupuncture had shown to exhibit prominent influence to items of temper tantrum and aggression take into account the natural course of the disorder.

Conclusion: Scalp acupuncture is effective in alleviating emotional and emotion-related behavioral problems especially temper tantrum and aggression problems in children with ASD.

Keywords: Autism spectrum disorder; Emotional problems; Scalp acupuncture

Abbreviations: ABA: Applied Behavior Analysis; ACC: Anterior Cingulate Cortex; ADHD: Attention-Deficit/ Hyperactivity Disorder; ASD: Autism Spectrum Disorders; fMRI: Functional Magnetic Resonance Imaging RRB: Restricted Repetitive Behavior

Introduction

Background

Autism Spectrum Disorder (ASD) is a pervasive developmental disorder characterized by delays or defects in social, communication, emotion, and cognition development. Among all the symptoms, specific behavioral manifestations might be the most noticeable hints for others to identify the autistics. Many distinctive behaviors involve psychological activities, especially cognitive and emotion function of an individual. Study by [1] had suggested that patients with ASD display more emotion deregulation when compared with normal children. Emotion disturbance always results in behavioral problems such as aggression, tantrums, self-injurious behavior; or co-morbid with other mental disorders like anxiety [2]. The behavioral problems

accompanied with affective symptoms make taking care of an ASD child a difficult task, causing great distress to the family [3].

At present, a number of randomized controlled trials had been carried out to investigate the use of acupuncture in treating autism [4]. Despite determining statistical evidence has yet to be drawn, review literatures concluded that the uses of acupuncture for improving communication, linguistic ability, cognitive function and global functioning of ASD patients were well-documented [5].

Our previous study cohered with the statement as we found scalp acupuncture effective in improving communication, social and behavioral problems in ASD patients [6]. We also noted a prominent improvement in emotion regulation and temperament in children with ASD receiving scalp acupuncture therapy. Parents

often report improvement in mood and affection of their children upon the introduction of the therapy. Significant alteration in behaviors and temperament were also noticed in schools and at home. We perceived scalp acupuncture effective in enhancing emotion regulation as well as improving behavioral manifestation of children with ASD. Behavioral problems prevailing in children with ASD includes temper tantrum, aggression to others, self-injury, impatience, fears and anxiety were inspected in the study.

Study Design

This is a study carried out under clinical outpatient setting. Participants were invited to join the study in the period of May 2011 to July 2018 at Hong Kong Baptist University Mr. & Mrs. Chan Hon Yin Chinese Medicine Specialty Clinic and Good Clinical Practice Centre. Institutional review and approval was secured by the Committee on the Use of Human and Animal Subjects in Teaching and Research, Hong Kong Baptist University (Approval number: HASC/Student/16-17/685). The Minimum Standards of Reporting Checklist contains details of the experimental design, and statistics, and resources used in this study.

Materials and Methods

Samples

The inclusion criteria included an age of 2 to 10 years old and with a principal diagnosis of ASD issued by qualified specialists such as pediatrics, psychiatrist and psychologist from public or

private medical service. Children with comorbid diagnosis of other developmental disorders were excluded from the study. Participants were invited to come voluntarily to Hong Kong Baptist University Mr. & Mrs. Chan Hon Yin Chinese Medicine Specialty Clinic and Good Clinical Practice Centre for assessment and treatment sessions during May 2011 to July 2018. A total of 89 children have participated the study and written consents were received from their parents. 45 patients including 35 males and 10 females with mean age of 3.8 years old were distributed to the treatment group, while 44 patients including 43 males and 1 female with mean age 3.68 were in the comparison group.

Measures

All participants of both comparison and treatment group received assessment sessions in the study. The sessions were arranged before and after the course of acupuncture treatment for participants in treatment group. For comparison group, the sessions were carried out at the beginning of the study and parents were advised recalled the performance of their children in the recent 6 months. The assessment session consist of a parent questionnaire and a semi-structured interview. A parent questionnaire which was established in reference to Autism Behavior Checklist (ABC) covered five items of behavioral problems commonly found in child with ASD, which are temper tantrum, aggression to others, self-injury, impatience, fears and anxiety (Table 1). Parents rated the respective items on a 5 point scale according to the frequency and intensity of behavioral problems of their children (Table 2).

Table 1: Selected items from Autism Behavior Checklist.

Category	Specific issues
Temper tantrum	Severe temper tantrums and/ or frequent minor tantrums
Aggression to others	Hurts others by biting, hitting, kicking
Self-injury	Hurts self by biting hand, banging head
Impatience	Does not wait for needs to be met (wants things immediately)
Fears and anxiety	Often frightened or anxious

Table 2: Marking Criteria for Score.

Score	Marking Criteria
0	No symptoms
1	Minimal symptoms, seldom shown
2	Mild symptoms, often shown
3	Moderate symptoms, usually shown
4	Severe symptoms, always shown

Data analyses were conducted on all participants of both comparison group and treatment group. An alpha level of 0.05 was used for statistical tests. The mean score and standard deviation at different assessment sessions were analyzed using paired t- test. The comparison between the performance of comparison group and treatment group was evaluated by independent t-test. All the calculations were performed on software IBM SPSS Statistics (Windows, version 21).

Procedure

All clinical assessment and scalp acupuncture treatments sessions were performed by principal investigator (Yau Chuen Heung), who is a registered Chinese medicine practitioner and has been performing scalp acupuncture for children with ASD and other developmental disorders for eighteen years in Hong Kong.

In each treatment session, the participants in the treatment

group first sat on a chair or positioned in the bosom of their parents. Their scalps were then sterilized with a 75% alcohol cotton ball before acupuncture needles were obliquely inserted onto the selected acupoints with the depth of 10mm into the subcutaneous tissue. The choice of acupoints included BaiHui (GV20), SiShenChong (EX-NH3), midline of forehead, lateral line 2 of forehead, posterior lateral line of vertex, primary auditory cortex, and auditory speech area. The standard of needles used was 0.20x25mm. Needles were swirled at intervals of 15 minutes before they were carefully removed and discarded after 60 minutes. Treatment sessions were performed twice a week and involved 30 sessions in the whole course.

Results

In order to differentiate the alternation in the scoring owing to the introduction of the treatment from the natural course of the disorder, we carried out paired t-test in both groups (Table 3). In consideration of the performance of comparison group, the fluctuation in scores in the comparison group was insignificant for most of the items ($p>0.05$) except self-injury, which showed a decrease of 0.32 in score with statistical significance ($p<0.05$). The performance of the comparison group during the six months of observation remains relatively stable in most aspects except for a remarkable diminishment in self-injurious behaviors.

Table 3: The score of selected ABC items before and after 6 months (Comparison group) or 30 sessions of scalp acupuncture treatment (Treatment group).

	Comparison Group (n=44)				p-value	Treatment Group (n=45)				p-value
	6 Months Prior		Time of Assessment			Before Treatment		After Treatment		
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Temper tantrum	1.77	1.16	1.61	1.04	0.21	1.53	1.06	1	0.8	0
Aggression to other	0.61	1.04	0.59	1.02	0.77	0.96	1.19	0.53	0.89	0.01
Self-injury	0.82	1.13	0.5	0.82	0	0.33	0.64	0.24	0.48	0.21
Impatience	2.89	0.95	2.68	0.86	0.13	1.96	1	1.53	0.97	0.01

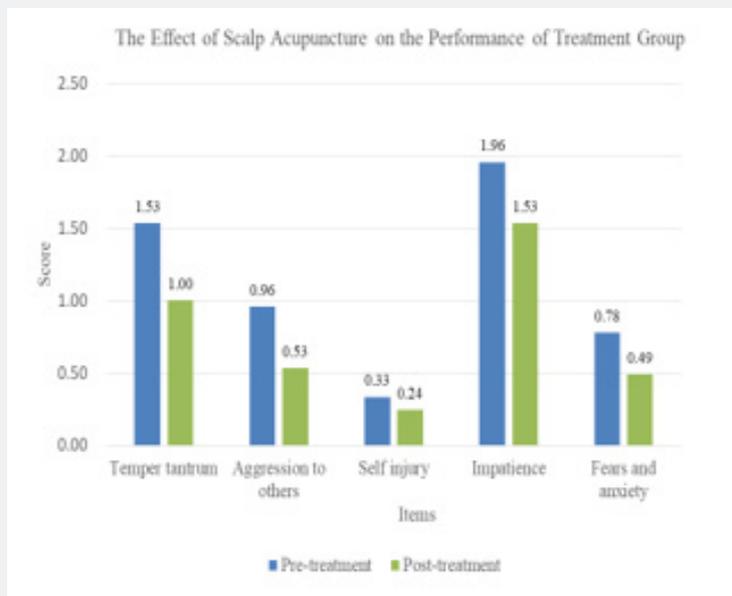


Figure 1: The score of selected ABC items before (t1) and after (t2) scalp acupuncture treatment in the treatment group.

On the contrary, each and all examined items showed improvements in the treatment group (Figure 1). Items including temper tantrum, aggression to others, impatience and fears and anxiety received a significant positive progress with a range of 0.53 to 0.29 points ($p<0.05$); whereas the alteration in the scoring of self-injury was blunt ($p>0.05$). Individuals in treatment group showed less frequent occurrence or milder presentation of temper tantrum, aggression, impatience and anxiety after scalp acupuncture. However, the presentation of self-injurious actions

did not showed significant response towards treatment.

The differences in score in comparison and treatment group is further analyzed using independent t-test (Table 4 and Figure 2). Results revealed the improvement in temper tantrum and aggression is significant in treatment group in comparison with the comparison group ($p<0.05$). The treatment group showed a greater drop of 0.37 and 0.40 points than the comparison group in the respective items. The effect of scalp acupuncture in treating

temper tantrum and aggression symptoms in children with ASD is prominent. Although scalp acupuncture seemingly brought better progress in problems of impatience and anxiety, no statistical

significant differences could be drawn between the two groups. Surprisingly, the amelioration of self-injury condition is greater in comparison group than treatment group.

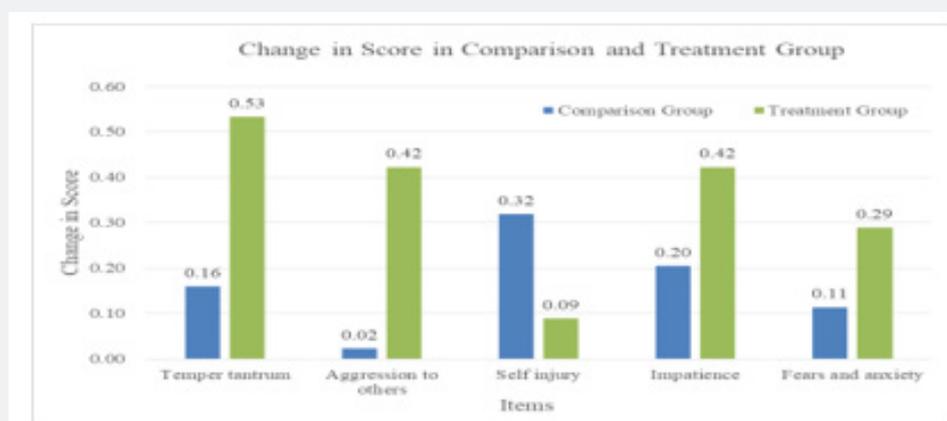


Figure 2: Comparison of change in score between comparison group and treatment group.

Table 4: Comparison of change in score between comparison group and treatment group.

Items	Comparison(n=44)		Treatment (n=45)		p-value
	Mean	SD	Mean	SD	
Temper tantrum	0.16	0.83	0.53	0.84	0.038
Aggression to others	0.02	0.51	0.42	1.12	0.033
Self -Injury	0.32	0.71	0.09	0.47	0.074
Impatience	0.2	0.88	0.42	1.03	0.288
Fears and anxiety	0.11	0.72	0.29	0.82	0.286

Discussion

Temper tantrum is an emotional outburst associated with the emotional distress of the child [6]. Temper tantrum is an emotional process which involves different principle components taking part in different stages of a tantrum, namely anger, distress and coping strategies [7,8]. Aggression is a set of interpersonal actions comprising verbal or physical behaviors that are destructive or injurious to others or to objects [9]. Both aggressive behaviors and tantrum are associated with anger emotion and could be presented in different nature and intensity. Children with low degree of anger typically characterized with crying, screaming and stamping acts. Severer or even injurious behaviors such as throwing, kicking, hitting, and puling/pushing are the expression of intermediate to high anger level. Aggression and temper tantrum are commonly present in typically developing children. However, children with psychiatric disorders, including ASD, have shown to have more aggressive behaviors and express exacerbated temper tantrums with greater emotional arousal lasting for longer period of time [10, 11].

The therapeutic effect of scalp acupuncture on temper tantrum and aggression to others has been most prominent among all examined items. It cohered with our clinical observation that children with ASD might become gentler in temperament, their anger would be presented in a lower degree and the

duration of distress became shorter. Some children may even develop alternative coping strategies such as self- distraction and autosuggestion during stressful or undesirable events (i.e. receiving acupuncture treatment). We suggested that routine treatment sessions might pose a function of regular “emotion training”, allowing the children to develop volitional regulation of affects. However, feedbacks from parents stated that children’s emotion fluctuate at occasional treatment breaks, thus consistency of the scalp acupuncture treatment is crucial.

Apart from the psychological point of view, physiological investigations have suggested structural and biochemical aspects of the brain also contribute the mental activity. Exaggerated temper tantrum, aggressive or even violence behaviors have been related to the frontal (mainly ventromedial frontal and orbitofrontal cortex) and temporal lobe abnormalities, implying damages in the area or reduction in tissue volume and activities. A distinct dysfunction at anterior cingulate cortex (ACC) was perceived in children with conduct misbehaviors using functional Magnetic Resonance Imaging (fMRI) [12]. It was also recognized as a place where acupuncture exerts its analgesic effect [13]. It is reasonable to suggest possible correlation among behavioral problems, ACC and acupuncture.

Various types of serotonin receptors were found to escalate or suppress anger emotion and therefore regulate aggressive

behaviors [14]. Since patients with ASD often feature with hyperserotonemia conditions, an imbalance in serotonin would result in unstable temperament of an individual, providing biochemical basis for their aggressive behaviors. It might also explain how acupuncture improves behavioral problems of ASD children as acupuncture was suggested to deliver its therapeutic effect by regulating serotonin level [15]. In fact, acupuncture has been known for improving one's mental status and had been widely applied in treating affective disorders such as anxiety and depression in adults.

Self-injury is aggression directed at the self and may occur with or without externally directed aggression. Common self-injury behaviors in children with ASD include head hitting against one's hands or knees, banging stationary object, chin hitting and hair pulling [16]. Self-injury, together with aggression and tantrums are sometimes aggregated as "Aberrant Irritability" as these three items share common context of affective components. However, the nature of the self-injury in children with ASD is peculiar in its repetitive motoric nature and sometimes occurs without obvious intentions. In contrast, aggressive outburst and temper tantrum always serve their functions as means to obtain desirable objects or escape a demand [17]. Therefore, self-injury is often also considered as a type of restricted repetitive behavior (RRB) in children with ASD [18]. Comparable to the clinic observation on RRB, the response of self-injury towards scalp acupuncture was poor; in contrast to the vast improvement in aggression aspects. Moreover, the presence of self-injury is indeed varies upon individuals. Among all participants, 57 (64%) of them scored zero and showed absence of any self-injury behaviors, illustrating that self-injury is not as common as other examined symptoms in young children with ASD. It is also possible that self-injury behavior may not have appeared yet in the age of two to three as mentioned in literatures [19]. On the other hand, we observed a significant drop of self-injurious behaviors in 6 months within the comparison group. The phenomenon cohered with previous studies suggesting that self-injurious behaviors in children with ASD spontaneously alleviates as they grow older as a natural course of the disorder [20]. Further bivariate (Pearson) correlation analysis showed a positive correlation ($P < 0.01$) between the background score and the progress of self-injury.

Apart from the core features of ASD, mood disturbance symptoms including anxiety are so distinguishing that are often sufficient for an additional diagnosis instead of accounting for by the ASD itself. Common manifestations include impatience in daily events and fearfulness towards various objects or sounds.

Nonetheless, many individuals with ASD might express their anxiety differently in comparison to non-ASD children due to their unique processing and sensory profile and cognitive function [21]. Surprisingly, contradictory to the general positive outcomes using acupuncture in common anxiety disorders [22], our participants in the treatment group failed to achieve recognizable improvement in

the course of treatment. Clinically, seldom did we observe children with ASD overcome fearfulness or phobia upon the introduction of acupuncture. But we did observe a general improvement in anxiety and phobia symptomatology in our patients in the long-term. It remains unclear if the improvement should be attributed to acupuncture, increase in age, or exposures and trainings.

Current treatment for emotion and behavioral problems in children with ASD are mainly applied behavior analysis (ABA) [22] and pharmacotherapy of anxiolytics and antipsychotics [23]. Our study suggested an alternate remedy for the distressing problems of the disorder as we clinically observed the mood and emotion regulation of children with ASD benefits from scalp acupuncture. Some parents described their children with ASD being more responsive to environment and more expressive in their demands and emotions after acupuncture. It could be interpreted as the result of elevated cognitive function. They became capable of independent thinking and have their own ideas or requests. In the long-term, children with ASD generally become competent in affect regulation after treatment.

Despite studies had showed that children with ASD are more likely to demonstrate behaviors like temper tantrum, aggression to others, impatience or get frightened, these behaviors are not restricted to autistic children. It is questionable whether the effect of acupuncture is applicable in normal developing kids. Currently no researches have been made on the use of acupuncture in other behavioral problems such as conduct disorder or oppositional defiant disorder other than ASD and attention-deficit/hyperactivity disorder (ADHD). Further investigations should be made in these aspects as to clarify if the effect of acupuncture is general to brain development, or specifically exerts to the pathophysiology of ASD.

Limitation

The number of observations is small. In addition, the patient's homogeneity was not guaranteed, influencing our desired variables. Large-scale clinical trials with detailed demographic study could be implemented and setting up a longer follow-up period is preferable. Electronic imaging tools, such as fMRI were not used in this study. These technologies could be utilized to observe the physical changes upon scalp acupuncture in the further studies.

Conclusion

Scalp acupuncture is effective in alleviating temper tantrum and aggression problems in children with ASD. It can facilitate emotion regulation on anger and diminish the frequency and the intensity of the related behavior. Elevated cognitive function might also contribute to the improvements in emotion. However, items including self-injury, impatience and anxiety did benefit from the treatment. Further investigations are required in order to reveal the underlying mechanism, i.e., the psychological and physiologic effect of scalp acupuncture on children with ASD.

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