

ORIGINAL PAPERS

Scalp Acupuncture Effect on Language Development in Children with Autism: A Pilot Study

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ABSTRACT

Background and objectives: Autism is a neurodevelopmental disorder that manifests in delays in social interaction, language used in social communication, and symbolic or imaginative play, with an onset prior to age 3 years. Language therapy (LT) for children with autism is the main form of rehabilitation, because it emphasizes its major presenting symptom (i.e., language impairment). Scalp acupuncture (scalp AP) is a modality based on the physiologic function of different brain areas, where different scalp zones are stimulated with needles so as to stimulate the reflexively related nervous tissue. This study aimed to evaluate the role of scalp AP as a complementary modality to LT in rehabilitation of children with autism.

Subjects and design: The study involved 20 children (divided into 2 equal groups: A and B), diagnosed as autistic according to DSM IV classification. Their ages ranged between 4 and 7 years old. All subjects underwent LT twice weekly, aiming at stimulation of cognitive and verbal abilities. Group B only was subjected to scalp AP sessions—twice weekly—as a rehabilitation complementary tool during the 9-month period of the study. The acupoints used were: *Du* 20, 26, GV17; three temple needles; and Yamamoto's New Scalp Acupuncture cerebrum and aphasia points (acupuncture needles 0.3×30 mm). A language test was performed before and after therapy to monitor cognition and expression (an Arabic test was included).

Results: Both groups, whose mean age range was $5.5 \text{ years} \pm 1.22 \text{ years}$, showed a significant improvement in cognitive and expressive language skills pre- and post-therapy, which was highly significant among group B children treated with scalp AP (attention 2.8 ± 0.8 in group A versus 3.5 ± 0.8 in group B; receptive semantics were 7 ± 3.8 in group A versus 9.4 ± 3.1 in group B). Expressive semantics significantly improved in both groups.

Conclusions: Scalp AP is a safe complementary modality when combined with LT and has a significantly positive effect on language development in children with autism.

INTRODUCTION

Autism is a pervasive neurologic disorder that impairs language development, communication, and social interaction. The United States Centers for Disease Control and Prevention estimated the prevalence of autism spectrum dis-

order to be 1 of every 500 to 1 of every 166 births; also, the National Institute of Mental Health states it to be 1 in 1000.¹ Without effective treatment, autism sufferers often require lifelong care. Early diagnosis and intensive early intervention have been shown to influence the outcome. Language therapy (LT) for children with autism is the main form of

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rehabilitation, because it addresses one of the major presenting symptoms, which is language impairment. Delays and abnormalities in language development are frequent complaints of the children and their parents. In addition, those children often do not comprehend language spoken to them. Nonverbal children with autism are unable to point or to use gestures in order to indicate their needs. They usually grab their parents' hands and use them as a tool to get a desired object. Such children may also cry until one of their parents suggests, by trial and error, what the child wants.² Many autistic individuals who have acquired verbal language have difficulty with semantics (understanding the meaning of language). All of these children have difficulty in pragmatics (the ability of sense making, initiation of dialogue, and maintaining focus on a topic). Sometimes, words required for understanding of context are particularly difficult to understand; such as prepositions, directional verbs, and pronouns.³

Children with autism who are able to speak in sentences have difficulty in making conversation because these children do not know how to take turns, maintain focus on a topic, or look at conversational partners. Such children may repeat questions over and over again even though they know the answers, or may engage in lengthy monologues on subjects of interest only to themselves. Poor comprehension and concrete thinking affect understanding of humor and sarcasm.⁴

People with autism respond to many treatments, including complementary modalities; these may include acupuncture; Reiki; behavioral, educational therapies; nutritional interventions; and music therapy.⁵

Acupuncture is one of the oldest treatment modalities, and has been successfully practiced in China for the last 4000 years. Traditionally, AP has been used to treat various mental and physical disabilities.

Scalp acupuncture (scalp AP) is one of the specialized acupuncture techniques that involves a specific body location, taking its place alongside ear, nose, hand, and foot acuapunctures. The fundamentals of scalp AP were reviewed by Lu Shoukang.⁶

Yamamoto's New Scalp Acupuncture (YNSA) is a relatively new concept developed around 1970 and first officially reported in 1973 in Osaka, Japan. The word "New" was added to the name to differentiate it from Chinese acupuncture.⁷

The use of acupuncture in neurologic and developmental disorders has been increasing lately to a great extent. The World Health Organization (WHO) reviewed and standardized scalp AP in 1984. In 1988, the WHO published the first standard pamphlet on scalp AP.⁸ Many studies conducted all over the world targeting humans and animals have shown that scalp AP is very effective in treating developmental and neurologic diseases in children. Research shows that the level of certain hormones in the body and cerebral blood flow improves with this type of treatment.⁹

Recently, investigation procedures aiming at quantifica-

tion of the effects of acupuncture, using modern biomedical monitoring methods, have gained importance because transcranial doppler sonographic monitoring has proven its positive effect on cerebral blood-flow velocity.¹⁰

SUBJECTS AND METHODS

After an institutional ethical committee approved the study, and having obtained a verbal consent from the children's parents, 20 children with autism who had delayed language development were recruited. They were attending the Special Need Centre at the Childhood Studies Institute, at Ain Shams University, in Cairo, Egypt, having all started therapy at a nonverbal stage of development. They were included in a prospective pilot study.

Eligibility for the study

Eligible subjects were 4–7 years old and both genders were included.

Inclusion criteria

Inclusion criteria for the study were as follows:

- Fulfilled the criteria for autism of the 4th edition of the *Diagnostic and Statistical Manual of Mental Disorders* on the basis of observation of the child (DSM-IV-T),
- Fulfilled the criteria for autism of a structured diagnostic interview of parents using the Autism Diagnostic Interview-Revised test,
- Had a score on the Childhood Autism Rating Scale of 30 or more.

The patients were randomly assigned to either of the two groups: A or B according to randomization tables, and the results were made available to the investigator (a language therapist) in sealed envelopes.

The same language therapist, who was blinded, worked with both groups. Group A received language therapy two times a week without scalp AP. Group B received language therapy two times a week as well as acupuncture as a rehabilitation complementary modality.

Acupuncture procedure

Scalp AP sessions were performed twice weekly for group B children, by the same physician throughout the entire study. The physician was a specialized pediatric acupuncturist.

Acupoints used

The acupoints used were *Du* 20, 26, *GV* 17; 3 temple needles; and Yamamoto YNSA 2 points: cerebrum and aphasia points adding up to a total number of 8 acupoints.

Needles were inserted to a depth of 1/2 to 1 *cun* until *qi* was achieved. No electrical stimulation was applied, only rapid manual stimulation upon insertion and removal of the needles. Needles were retained in place for 20 minutes each session, which was twice weekly for 2 months followed by a period of 2 weeks rest. This cycle was repeated through the 9-month period of the study.

Acupuncture needles (0.3 × 25 mm, disposable, single-use stainless steel) were used.

LT sessions were individualized, and aimed at improving attention of each child and stimulation of receptive and verbal abilities. Evaluation of both groups was measured via follow-up communicative assessment and an Arabic Language test.¹¹ A battery of examinations was performed before and after therapy, which lasted for 9 months in the Special Needs Centre. Exclusively, the Arabic Language Test was included in the battery of examinations.

Items of the evaluative Arabic Language test included mainly the following:

1. Attention of the child by observation, involving 6 stages of attention that each child could achieve as follows:
 - Level 1*—Child has high distractability without any concentration or interest.
 - Level 2*—Child's attention is focused rigidly on whatever he or she decides to do.
 - Level 3*—Attention is single channeled and more flexible and allows shifting from task to directions and back to task.
 - Level 4*—The child can give attention spontaneously to anything given to him or her without verbal direction from an adult.
 - Level 5*—Child can absorb and understand verbal directions related to the task without need to interrupt task and look at the speaker.
 - Level 6*—Child has well-integrated and well-sustained attention; this is the stage of school readiness.
2. The receptive part of semantics (examining the child's ability to recognize different semantic groups as body parts, animals, food utensils, colors, etc., in addition to the ability to recognize concepts).
3. The expressive part of semantics (examining the ability

of the child to name different semantic groups and to verbalize concepts).

4. The receptive part of syntax (examining the child's ability to understand a short and a long sentence, in addition to understanding locatives, verb tenses, time indicators, and singular and plural nouns, adjectives, conjunctions, negation forms, comparatives, etc.).
5. The expressive part of syntax (examining the ability of the child to utter all the previous items).
6. Pragmatics (testing the ability of the child to understand and respond to a sentence carrying pragmatic intentions, illustrating functionalism, sense making, and maintaining a topic and ending it).
7. Testing phonology (examining the ability to utter sounds of speech).

During the period of the study, no other interventional skills were taught to the assigned children.

Statistical analysis

Data for all subjects were fed into an IBM-compatible personal computer and SPSS for Windows, student version 9 (Chicago, IL), was applied to analyze the results. Mean and standard deviation were expressed. A paired Student's *t* test was used. The calculated (*p* value) was considered significant if *p* was <0.05, highly significant if *p* was <0.001; and nonsignificant if *p* was >0.05.

RESULTS

After randomization, 10 children with autism were allocated to group A (5 boys, 5 girls), and the other 10 were assigned to group B (7 boys, 3 girls).

All of the subjects completed the study, attending LT sessions, and subjects assigned to acupuncture had a total number of 50 acupuncture sessions.

During the 9-month period of the study, the children only received LT sessions, without any other interventional skills being taught to the children.

In Table 1, language acquisition is compared for group A before and after starting the LT sessions. There were sig-

TABLE 1. LANGUAGE EVALUATION BEFORE AND AFTER 9 MONTHS (PERIOD OF STUDY) IN GROUP A

Test items	Pretherapy	Post-therapy	p value	Significance
Attention	1.4 ± 0.9	2.8 ± 0.8	0.021	Sig.
Receptive semantics	5.2 ± 3.6	7.0 ± 3.8	0.021	Sig.
Expressive semantics	0.9 ± 0.6	4.4 ± 3.4	0.031	Sig.
Receptive syntax	0.0 ± 0.0	0.0 ± 0.0	—	N.S.
Expressive syntax	0.0 ± 0.0	0.0 ± 0.0	—	N.S.
Phonology	0.0 ± 0.0	0.0 ± 0.0	—	N.S.
Pragmatics	0.0 ± 0.0	0.0 ± 0.0	—	N.S.

Sig., significant; N.S., nonsignificant.

TABLE 2. LANGUAGE EVALUATION BEFORE AND AFTER 9 MONTHS (PERIOD OF STUDY) IN GROUP B

<i>Test items</i>	<i>Pretherapy</i>	<i>Post-therapy</i>	<i>p value</i>	<i>Significance</i>
Attention	1.5 \pm 0.8	3.1 \pm 0.8	0.001	H.sig.
Receptive semantics	5.0 \pm 2.7	9.4 \pm 3.1	0.001	H.sig.
Expressive semantics	0.7 \pm 0.5	4.1 \pm 3.4	0.021	Sig.
Receptive syntax	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Expressive syntax	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Phonology	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Pragmatics	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.

H.sig., highly significant; Sig., significant; N.S., nonsignificant.

nificant improvements in attention, receptive, and expressive semantics. With regard to receptive and expressive syntax, phonology, and pragmatics, there were no significant differences before and after termination of LT sessions.

As shown in Table 2, in group B, attention and receptive semantics had highly significant improvement before and after termination of the LT and acupuncture sessions. Expressive semantics improved significantly, while receptive and expressive syntax, phonology, and pragmatics did not have significant changes after combined therapy termination.

Although group A improved in attention, cognition, and receptive semantics, group B (who had received acupuncture) had improvements that were highly significant. With respect to the remaining four parameters of the LT battery, both groups improved, but without significant differences among the children of both groups (Table 3).

DISCUSSION

Autism is a complex neurobiologic disorder of development that lasts throughout life. It is a wide-spectrum disorder; in other words, the symptoms and characteristics of autism can present themselves in a wide variety of combinations, from mild to severe. Therefore, there is no standard “type” or “typical” person with autism. It starts around the age of 3. Its main symptoms and signs involve language, social behavior, and behaviors involving objects and routines.¹²

Although early educational intervention is a key to improving the lives of children with autism, professionals and parents believe that other treatment approaches, such as complementary therapies, may play an important role in improving communication skills and reducing behavioral symptoms associated with this spectrum. These complementary therapies include acupuncture, music, art, or animal therapy, which are performed on an individual basis or integrated into an educational program. Music therapy is good for speech development and language comprehension.¹³ Studies by Myra have shown that music therapy in children with autism has focused on better language, social, emotional, and sensory-motor development. Music therapy, as an adjuvant line, altered and reduced the repetitive behavior pattern and facilitated verbal and nonverbal communications.¹³

Pediatric acupuncture is feasible and safe. According to Chinese medicine, children’s conditions are broadly differentiated into excess and deficiency types. Furthermore, there are five common pathogenic patterns: accumulation disorder; Spleen *qi* deficiency; hyperactive Spleen *qi* deficiency; hyperactive Kidney *qi* deficiency; and lingering pathogenic factors.¹⁴ Some patterns seem to be unique to modern society and are attributed to excessive playing of computer games, eating junk food, softened discipline, and use of vaccines or antibiotics.¹⁵

Our applied technique in this study was scalp AP, which is one of several specialized acupuncture techniques. There are three basic features that differentiate scalp AP from body acupuncture, namely, (1) treatment zones are mapped on the

TABLE 3. COMPARISON BETWEEN LANGUAGE OUTCOME AFTER THERAPY USING LANGUAGE TEST BETWEEN GROUPS A AND B

	<i>Group (A)</i>	<i>Group (B)</i>	<i>p value</i>	<i>Significance</i>
Attention	2.8 \pm 0.8	3.1 \pm 0.8	0.008	H.Sig.
Receptive semantics	7.0 \pm 3.8	9.4 \pm 3.1	0.034	Sig.
Expressive semantics	4.4 \pm 3.4	4.1 \pm 3.4	0.545	N.S.
Receptive syntax	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Expressive syntax	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Phonology	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.
Pragmatics	0.0 \pm 0.0	0.0 \pm 0.0	—	N.S.

H.Sig., Sig., significant; N.S., nonsignificant.

scalp, (2) the needles are inserted within a thin layer of loose tissue beneath the scalp surface—at a low angle of 15–30 degrees involving an insertion distance of 1.2 to 1 *cun* (a unit of measurement based on body size, being about 1 inch for an adult), and (3) those needles are subjected to rapid stimulation.⁹

It was found that in group A, children with autism had improvement in attention span as well as in receptive semantics but improved to a lesser extent in expressive semantics. This was probably due to meticulously applied LT sessions aimed at changing the direction of the children's negative eye contact to positive eye contact. This intervention subsequently affected their attention spans and improved the children's ability to respond to the LT program. As the children's receptive semantics improved, this group became able to understand the meaning of words and could discriminate among things, so, as a result, these children were able to express themselves using some single words. This was reflected as significant in the expressive semantics item of the language test.

In group B, the highly significant improvement attained in the LT evaluation (with respect to attention) could be attributed to the effect of applying both scalp AP and LT. Acupuncture is highly effective in children; a fact that can be secondary to the development rate of the cerebrum in children; which is higher than that of adults. Thus, intervention caused by the insertion of needles on the scalp is more apt to regulate the brain function. After the age of 12 years, the cerebrum reaches adult-level shape and form. Hence, the regulatory functions of acupuncture become more limited.¹³ Better cognitive performance achieved by the latter group was due to the added effect of the acupuncture sessions, which increased the blood-flow velocity to the brain. This fact was demonstrated in a study carried out by Litscher and his colleagues.¹⁴ They used transcranial Doppler sonographic monitoring to record blood flow in cerebral blood vessels before and after acupuncture needling. Blood-flow velocity was found to be higher when using acupuncture needles and, more interestingly, this velocity was dependent on the particular process performed by the brain, being highest with cognitive stimulation (speech, memory, and calculation stimuli).¹⁰

Our results were in concordance with a single, open, non-comparative study, conducted at Anwar Shah's Paralysis Clinic and Research Centre,¹⁶ to evaluate the effects of Aculaser Therapy in children who had cerebral palsy (CP) of various types. The study lasted for a period of 6 months. Of 15 CP children with speech disorders, 8 children improved—a 57% improvement rate.

In comparison between both groups A and B in the present study (Table 3), there was a significant difference in the degree of improvement with respect to attention span and receptive semantics, but no difference was found in expressive semantics. This may be due to the need to have a longer period of therapy sessions (more than the 9-month duration

of the current study) to have a chance to produce better expressive results. The nonsignificant parameters that are shown in all of the tables regarding receptive and expressive syntax, phonology, and pragmatics were due to the limited abilities of the children with autism to acquire language in a short time. In both groups, the children were nonverbal and, after intervention, they became verbal in the stage of uttering some single words. This idea was also clarified by the pilot study carried out by Fiala-Petr¹⁷ at Charles University, Czech Republic, where a special acupuncture complementary modality was applied to 13 CP patients with speech disorders, in conjunction with speech therapy. In that study, the acupressure technique was performed almost daily and was also taught to the parents (to ensure its frequent application) and the researchers used body acupuncture for a longer period than the current study (which lasted for more than 1 year). Concluding that there was significant speech improvement in 12 of the studied CP subjects, the researchers recommended applying further techniques of acupuncture such as scalp AP and YNSA to continue the observed success in attaining better speech.

The development of an interdisciplinary approach involving Western and Chinese Medicine provides an innovative starting point for a new conceptual treatment framework for addressing autism. Our aim is to use a simple, relatively noninvasive, quick treatment strategy to benefit families with autism worldwide.

Tongue acupuncture (TAC), another microsystem acupuncture technique, was viewed as a start-up program or adjunctive therapy for autism, as tried by scientists from Hong Kong. They conducted their research to test how TAC might affect the cerebellum (cognition), temporal lobe (language), frontal lobe (executive function and affect), and basal ganglia (ritualistic/stereotypical mannerisms). It was done through monitoring changes in glucose metabolism, via positron emission tomography scanning.¹⁸

In March 1999, the researchers launched a pioneer research program integrating acupuncture, a complementary modality, for treating children with various forms of brain disorders, of which about 250 cases involved children with autism. The majority had functional improvement of various degrees, depending on the age and severity of their disabilities. Some improvement was noticeable within a few TAC sessions. With this revolutionary new treatment, the research team demonstrated how acupuncture can successfully reduce the dysfunction related to autism, by activating vital connections in the brain. Most children tolerated TAC well, with only occasional pain and minor bleeding in some patients.¹⁸

CONCLUSIONS

In conclusion, we noted a number of possible limitations to our work, including the fact that sessions were performed

by a pediatric acupuncturist, because not all practitioners are trained to administer acupuncture to children, which could lead to different outcomes among patients and parents. The survey was also limited to patients who actually went to see the acupuncturist; thus, further spread of information is required to expand the positive role of acupuncture in dealing with pediatric problems. Despite these limitations, which also faced other researchers,¹⁹ we believe that we offered important data about acupuncture therapy for children with autism—that the therapy was accepted by pediatric patients and appeared to offer clear benefits that augmented other forms of care. The presented results open the way for larger, longer, and more controlled studies in the future. It is hoped that the credibility of this information will increase with the authors' incorporation of research-based efforts to examine and interpret their experiences.

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