

## Audio-psycho-phonology: A comparative outcome study on anxious primary school pupils

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In thirteen evaluation studies of Audio-Psycho-Phonology (APP) mainly positive results were reported. However, the intrinsic contribution of APP to these favourable outcomes is questioned, in view of underlying methodological problems. This investigation was planned to eliminate such design deficits and to effect a more rigorous evaluation of the APP approach on a group of anxious primary school pupils. Forty subjects from the primary school population of Potchefstroom were identified as anxious by the teaching staff. From this target group pupils were assigned to three groups: 10 pupils who completed an APP programme; 9 pupils who were subjected to an alternative therapy programme; and a non-intervention control group of 10 pupils. Control measures included determining pre-treatment group equivalence, controlling the integrity of both treatment programmes, and controlling the effect of therapist competence. The results confirmed significant positive changes following both programmes, but no change in the control group. On a number of variables the APP group achieved significantly better results than the alternative therapy group, especially with regard to hearing and listening. A follow-up study confirmed the long-term effect of the intervention.

In dertien evaluerende ondersoek van Oudiopsigofonologie (OPF) is oorwegend positiewe resultate gerapporteer. Metodologiese probleme veroorsaak egter dat die intrinsieke bydrae van OPF tot die resultate bevaagteken word. Met hierdie ondersoek is gepoog om vorige ontwerpleemtes uit te skakel en 'n strenger evaluering van die OPF-benadering op 'n groep angsvallige laerskoolleerlinge uit te voer. Uit die laerskoolbevolking van Potchefstroom is 40 leerlinge deur onderwyspersoneel as angsvallig geïdentifiseer. Uit die teikengroep is drie groepe geselekteer: 10 leerlinge wat 'n OPF-program gevolg het, 9 leerlinge wat aan 'n alternatiewe terapeutiese program onderwerp is en 'n geen-intervensie kontrolegroep van 10 leerlinge. Kontrolemaatreëls het ingesluit: bepaling van die vergelykbaarheid van die groepe voor behandeling, kontrole oor die integriteit van die behandelingsprogramme, asook kontrole oor die effek van terapeutiese bevoegdheid. Die resultate het betekenisvolle veranderinge na beide terapeutiese programme bevestig, maar geen verandering by die kontrolegroep nie. Die OPF-groep het ten opsigte van 'n aantal veranderlikes betekenisvol beter as die alternatiewe terapieegroep gevaar, veral ten opsigte van gehoor- en luistervermoë. 'n Opvolgondersoek het die standhoudendheid van die verbetering bevestig.

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Audio-psycho-phonology (APP) has elsewhere (Van Jaarsveld & Du Plessis, previous article) been described as a pioneering, dynamic and revolutionary theory implementing unique and original techniques found in no other therapy. Assuming that prenatal rhythmic-acoustic engraving may have important effects on post-natal learning processes, especially on the listening function which subserves the 'humanizing trilogy' of laterality, verticality and language, Tomatis devised an auditory re-education programme by means of the Electronic Ear. It is aimed at stimulating conscious auditory participation in communication, firstly, by auditory stimulation resembling the prenatal acoustic environment through filtered mother's voice, in order to dispel anxiety and to establish feelings of security; secondly, by auditory training with the aid of filtered music aimed at the opening of the auditory diaphragm which increases the ability to perceive sound; and thirdly by audiovocal conditioning as a means of structuring

cybernetically controlled feedback systems. Progress during the auditory re-education programme is monitored by counselling.

APP has evoked severe resistance from some, but has received attention from other practitioners of psychiatry, psychology and education in Europe, Canada, South Africa and the USA. In reviewing outcome studies conducted in South Africa and Canada, we concluded that these studies indicated APP benefits with regard to improved general adjustment, reduction of anxiety, improved self-control and self-concept, improved interpersonal relations and improved academic achievement. However, it was further concluded that a definite statement on the value of the APP approach as an effective therapeutic technique could not be made because, with a few exceptions, the reviewed studies had methodological deficiencies that made it impossible to isolate the unique contribution of APP to the positive outcomes. Furthermore, the results for

anxiety were based only on female students. No studies have been conducted on anxious children.

The primary aim of the present study was to apply the APP technique to a group of anxious primary school children and to evaluate the results by means of a comparative outcome study. The methodological deficiencies of previous outcome studies were avoided by comparing the APP results with the results of a known alternative treatment approach and a no-treatment control group; by using non-solicited clients; by ensuring that treatment procedures were carried out as intended; and by investigating possible differences in therapist competence as a contaminating factor. The results of the study will hopefully contribute towards clarifying the specific therapeutic effect of APP.

## Method

### Subjects

After consent for the project had been obtained from the Transvaal Education Department, subjects were collected on a non-solicited basis. By means of a list of anxiety indicators derived from DSM-III (1980), 40 Afrikaans-speaking pupils in Std 1 to Std 3 were identified by their teachers as 'tense'. The subjects originated from all five of the Afrikaans-medium primary schools in Potchefstroom. Parental consent for participation in the project was obtained via the various headmasters. The subjects were assigned to three groups. The selection of Group 1 (Audio-psycho-phonology group) was determined by the daily availability of the children and their mothers for a period of three weeks during the midyear school holidays. Twelve children and mothers were available for inclusion in this group. Due to illness Group 1 was eventually reduced to 10 children. As six of the remaining 28 children could not be available for the duration of the project, Groups 2 and 3 were randomly selected from the remaining 22. Due to attrition of a further three subjects (two through illness and one through defection from the Alternative Therapy Programme) Groups 2 and 3 eventually consisted of 9 and 10 members respectively. Visiting a university clinic was to most children an interesting experience but created tension in others. During their first interview their problems with tension and anxiety and the possible influence on their academic achievement were openly discussed in the presence of their parents. The possibility of improved scholastic achievement after an auditory training programme therefore served as an incentive. This was judged as important since the Group 1 children had to sacrifice their school holidays for treatment.

### Measuring instruments

The psychometric assessment was carried out individually. It was aimed at tapping anxiety, personality factors, cognitive potential, family functioning and listening aptitude as defined by Tomatis (1973).

Various authors have questioned the usefulness of child psychotherapy outcome research if sufficient information on children's development is not included

(Phillips, 1987; Werry & Aman, 1980). It was therefore decided to assess the clinical characteristics of the children by means of structured interviews with their mothers.

The State-Trait Anxiety Inventory for Children (STAIC) (Spielberger, Edwards, Lushene, Montuorie & Platzek, 1973) was used to measure anxiety, as it is reputed to be among the best assessment devices for screening anxious children (Eason, Finch, Brasted & Saylor, 1985). A second, independent measure of anxiety, the Children's Anxiety Scale (CAS) (Gillis, 1980) was also included. This instrument yields a single score and like the STAIC, appears adequate in terms of its psychometric properties.

As a measure of personality factors, the South African version of the Children's Personality Questionnaire of Porter and Cattell, as adapted and standardized by Du Toit and Madge (1981) was included. This instrument yields scores on 14 main personality factors, each presented as a bi-polar continuum. The test is applicable for children from 8 to 13 years.

Cognitive potential was assessed by means of the Senior South African Individual Scale (SSAIS) (Madge, 1986).

Listening aptitude was measured by the Tomatis Listening Test (Tomatis, 1973). Similar to an audiometric examination, the air and bone conduction acuity scores are plotted on the audiogram, but in addition a test for auditory selectivity and auditory laterality was also carried out by a registered audiologist.

Family functioning was measured by the Family Assessment Device (FAD) (Epstein, Baldwin & Bishop, 1983). This instrument assesses organizational and structural properties of the family group as well as patterns of transactions among family members which have been found to distinguish between healthy and unhealthy families. Six dimensions are identified, namely, problem solving, communication, roles, affective responsiveness, affective involvement, and behaviour control, as well as an overall measure of the health or pathology of the family, called General Functioning. Where possible, this assessment was completed by both parents.

### The therapeutic programmes

#### *Group 1: Audio-psycho-phonological Programme (APP)*

The programme was structured according to the traditional Tomatis guidelines (Tomatis, 1978). The children and their mothers were exposed to a total of 103 half-hour sessions of auditory stimulation by means of the Electronic Ear, during three consecutive weeks of the midyear school holidays. Stimulation occurred via headphones. The mothers were grouped together in a separate treatment room.

The stimulation programme comprised five phases, first, a preparatory phase called 'inverse sonic birth' (seven sessions) during which the subjects were exposed to more and more extensively filtered reproductions of Mozart's violin concertos. Second, the children were

exposed to an average of 16,5 sessions of filtered music. Third, the essence of the programme consisted of an average of 20,6 sessions of exposure to a filtered recording of each child's pre-recorded mother's voice. Fourth, the so-called sonic birth, consisted of a gradual replacement of mother's voice by music over an average of 22,4 sessions.

The final phase constituted the so-called audio-vocal training. Firstly, an average of 8,4 sessions of Gregorian chants were repeated by the children, to prepare them for tapes with semantic content. These tapes, with words rich in high frequencies, had to be articulated into a microphone. This verbal input was then modified by means of the Electronic Ear, to feed back a voice enriched in high frequencies. In this manner the stimulation of a desire for communication was enhanced. An average of 12,3 of these active sessions were completed, alternated with other music tapes, averaging 31,9 sessions.

The mothers were stimulated by 100 sessions of filtered music. Similarity of counselling format for Groups 1 and 2 (except for specific information pertaining to Group 1 members) permits its discussion under the Alternative Therapy Programme.

#### *Group 2: Alternative Therapy Programme (ATP)*

It was decided to compare APP to a more conventional form of brief counselling for children and parents as outlined by Weinberger (1971) and Leventhal and Weinberger (1975). Accordingly the ATP was structured by means of conjoint mother-child sessions, individual sessions with the children, and group counselling for both children and mothers to enhance the effect of this short-term treatment programme.

The conjoint sessions consisted of discussions of the assessment findings, the problems reported by the parents, and the dynamics of the mother-child relationship as observed during the sessions. In individual child sessions problems were openly discussed. An anxiety reduction technique, Leuner's Guided Affective Imagery (Leuner, Horn & Klessmann, 1983) was also applied where appropriate, both diagnostically and therapeutically. Child group counselling involved exercises aimed at promoting group cohesion and communication. Parent group counselling focused on parent-child relationships.

To compensate for the intensive exposure of Group 1 to auditory stimulation, counselling sessions averaged 28 for Group 2 and 23 for Group 1. To maintain integrity of treatment, an important condition of effective outcome research (Kazdin, 1986), the two therapists were involved in both therapeutic programmes and consulted each other regularly about progress and handling of clients, thereby preventing drift away from the established procedures of APP and the short-term strategies of the ATP.

#### *Group 3: Control group*

Between pre- and post-testing no intervention was carried out in this group. A course in reading skills and brief group counselling was offered after post-testing.

#### **Procedure**

The children were identified at school. Parental consent and cooperation was obtained, followed by individual assessment, allocation to three groups and administration of the therapeutic programmes. Retesting followed programme termination. IQ reassessment after three months was combined with a follow-up questionnaire completed by Group 1 and 2 mothers.

#### **Assessing pretreatment group equivalence**

Comparable functioning of the three groups in terms of anxiety level, personality, cognitive and family functioning, and listening aptitude was essential to evaluate the effect of the therapeutic programmes.

Both anxiety questionnaires indicated that sex and group differences were negligible. Mean scores, judged by the American norms, indicated that the children were at least experiencing an above average level of anxiety. Mean scores, for all the groups combined, totalled 9,8 (CAS), 40,0 (trait anxiety, STAIC), and 32,0 (state anxiety, STAIC).

All three groups achieved an average level of cognitive functioning (mean total IQ:106,0). Only one statistically significant difference emerged, namely, Pattern Completion on which Group 2 scored significantly lower than Groups 1 and 3.

Group 2 scored significantly higher than Groups 1 and 3 on personality factors B, I, J and O, indicating that Group 2 was more intelligent, tough-minded, doubting and placid. On Q4 Group 2 scored significantly higher than Group 3, indicating that they tended to be more driven and frustrated than Group 3, but not more so than Group 1.

Family interaction indicated no differences between the groups.

Clinical characteristics are shown in Table 1.

The group as a whole could be characterized as an Afrikaans-speaking group of latency-aged children with a mean age of 10,3 years, consisting of 58,6% males and 41,4% females. As shown in Table 1, findings highlighted many aspects associated with anxiety in the children. Firstly, a striking finding was that many (41,3%) were eldest children. Although in keeping with findings reported by Werry and Aman (1980), Gittelman (1986) emphasized that the relationship between anxiety and birth order had not been well-documented in clinical studies. Significant features from the developmental histories included the following: 37,7% experienced difficulties at birth, ranging from premature birth (17,2%) and birth complications (6,8%) to delivery by caesarean operation (13,7%). Delayed bonding was experienced by 41,3% of the mothers. A further 41,3% of the children experienced substitute care in their toddler phase.

Normal speech and motor development and lateralization was reported for most of the children, but 20,6% were hyperactive. Many experienced developmental problems such as fears (55,1%), lack of assertiveness (51,7%) and withdrawal tendencies (48,2%).

Familial difficulties included 37,5% divorced parents,

**Table 1** Clinical characteristics of the subjects

	Group		
	1	2	3
Number	10	9	10
Male	4	7	6
Female	6	2	4
Mean age	10,2	10,3	10,6
Ordinal position:			
eldest	3	5	4
second	3	2	5
other	4	2	1
Family of origin:			
biological child	9	8	10
adopted child	1	1	0
Developmental characteristics:			
birth complications	0	1	1
premature birth	3	2	0
caesarean operation	1	3	0
Mother-child bonding:			
immediately experienced	6	3	8
delayed	4	5	3
Primary caretaker during first three years:			
mother	6	6	6
substitute	4	3	4
Normal development of:			
speech	9	8	8
motor control	10	6	7
Lateralization: (Hand, eye, foot)			
complete right	8	8	9
mixed dominance	1	1	0
complete left	1	0	1
Auditory lateralization:			
right	4	1	2
left	4	8	8
Activity level in early childhood:			
normal	8	3	6
hyperactive	0	2	4
Developmental problems (past or present):			
fears	7	6	3
enuresis	3	1	1
stuttering	3	2	2
withdrawal tendencies	6	5	3
lack of self-assertiveness	5	6	4
psychosomatic symptoms	2	0	2
nervous, tense	1	0	0
depression	1	0	0
confirmed neurological dysfunction	0	2	1
Family situation:			
Parental relationship:			
relatively satisfactory	6	2	6
problematic, e.g. communication problems	2	4	2
parents separated or divorced	3	4	1
second marriage	1	1	1
paternal suicide	1	0	0
maternal suicide	0	1	0
maternal death	0	0	1
paternal death	0	0	1
Mother-child relationships:			
relatively satisfactory	1	1	6
difficulties, e.g. over-protectiveness	8	8	4
maternal rejection	1	0	0

**Table 1** (continued)

	Group		
	1	2	3
Father-child relationship:			
relatively satisfactory	4	2	5
difficulties, e.g. communication problems	6	7	5
Child's relationship with siblings:			
relatively satisfactory	0	5	8
conflict-laden, stressful	10	4	2
Academic performance:			
in keeping with cognitive potential	6	4	6
underachieving	4	5	5
failed or repeated a school standard	1	1	1
Learning difficulties:			
perceptual problems	3	4	2
reading problems	4	5	6
writing problems	4	3	4
concentration problems	0	3	1
difficulties with mathematics	0	0	2

the disrupting effect of which is broadly recognized (King & Kleemaier, 1983). In intact families 68,9% mothers noted over-protectiveness, while father-child problems were reported by 62% of the fathers. Since latency-aged children are especially close to same-sex parents (Greenspoon, 1981), a child's sense of security will be reduced by excessive conflict. Stressful sibling relationships were reported for 55,1% of the children.

Underachievement at school, due to learning difficulties such as reading, writing and perceptual problems, was reported for 44,8% of the children. Previous interventions included remedial teaching for 41,3%, occupational therapy for 22,2%, and reading improvement courses for 20,6%.

Although possibly biased by maternal subjectivity and limited by the absence of information on the children's emotional assets, the clinical characteristics confirmed that developmental difficulties were evenly distributed among the three groups.

An audiometric investigation confirmed pretreatment group hearing equivalence. Only three out of a possible 66 scores on the children's Listening Test differed significantly: Group 1 scored higher than Group 3 at one frequency (8000 Hz, left ear, air conduction), and higher than Group 2 (1500 Hz, left ear, bone conduction). Group 2 registered more selectivity closures at one frequency (2000 Hz, right ear) than the other two groups.

The maternal Listening Test revealed only two significant inter-group differences: Group 1 mothers achieved higher acuity scores than Group 3 at one frequency (250 Hz, left ear, air conduction), and Group 2 scored higher at one frequency (750 Hz, left ear, air conduction).

Pretreatment group equivalence was thus confirmed for all variables.

**Table 2** Pre- and posttesting mean scores on the CAS and STAIC obtained by Groups 1, 2 and 3

Instrument	Pretesting		Posttesting		Significance <sup>a</sup>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<b>Group 1</b>					
CAS	9,6	4,5	7,6	3,1	0,027*
STAIC					
(Trait A)	42,8	6,8	32,9	7,3	0,001*
(State A)	32,8	7,5	27,6	6,5	0,011*
<b>Group 2</b>					
CAS	11,0	3,9	11,3	3,8	0,801
STAIC					
(Trait A)	41,2	6,8	37,1	6,8	0,017*
(State A)	30,7	5,3	28,1	4,9	0,242
<b>Group 3</b>					
CAS	8,4	4,5	7,7	5,5	0,523
STAIC					
(Trait A)	37,2	9,3	37,6	7,3	0,762
(State A)	31,3	6,2	30,0	5,4	0,562

<sup>a</sup> Two-tailed test of significance

\* 0,05 level of significance

### Results of the therapeutic programmes

The SAS computer programme (1985) was used firstly to compute an analysis of variance to determine pre-treatment group equivalence. Where differences were found, Tukey's test was used to determine where inter-group differences were located. Secondly, intra-group differences between pretesting and posttesting were assessed by means of *t* tests for matched groups. Intra-group differences were subjected to Tukey's test to determine how the differences compared between the groups. A maternal follow-up questionnaire and therapist competence were analysed non-parametrically.

#### Anxiety reduction

Findings are reported in Table 2. From Table 2 it is evident that a statistically significant reduction of anxiety was achieved in Group 1, on both the STAIC and the CAS, in Group 2 on trait anxiety only, and no reduction of anxiety was evident in Group 3. Thus the primary objective of the APP programme was achieved with Group 1, while the alternative therapy programme had a lesser impact.

#### Improved personality functioning

Group 1 achieved four statistically significant changes in a positive direction. According to the norms (Du Toit & Madge, 1981) they became truly phlegmatic (mean score 2,8 on factor D); submissive (mean score 2,1 on factor E); closer to being 'naive' (mean score 3,7 on factor N) and placid (mean score 2,7 on factor 0). The results indicated an improved mother-child relationship and increased calmness supporting Tomatis's assumptions on the effect of stimulation by means of filtered mother's voice.

Group 2 scored significantly lower on factor 0, thus

confirming the lowered trait anxiety on the STAIC. No change in Group 3 was in keeping with treatment expectations.

#### Improved cognitive functioning

Retesting three months after programme termination indicated five statistically significant intra-group changes in Groups 1 and 2. In Group 1 Vocabulary, Pattern Completion and non-verbal IQ increased significantly. In Group 2 Pattern Completion and non-verbal IQ increased significantly. No change occurred in Group 3.

A general practice effect cannot be the sole explanation of these increases, as change only took place in Groups 1 and 2. It was therefore concluded that both groups benefited from the programmes, since they improved their visual orientation and ability to think logically (increased Pattern Completion scores). In addition Group 1 manifested increased learning capacities and richness of ideation (increased scores on Vocabulary) perhaps as a result of stimulation by music and language.

#### Improved listening aptitude in children and mothers

Pre- and posttesting Listening Test curves are shown in Figures 1 and 2. Left and right ear curves for Group 1 children and mothers are included, and only right ear curves for Groups 2 and 3 since right ear functioning is more prominent in APP.

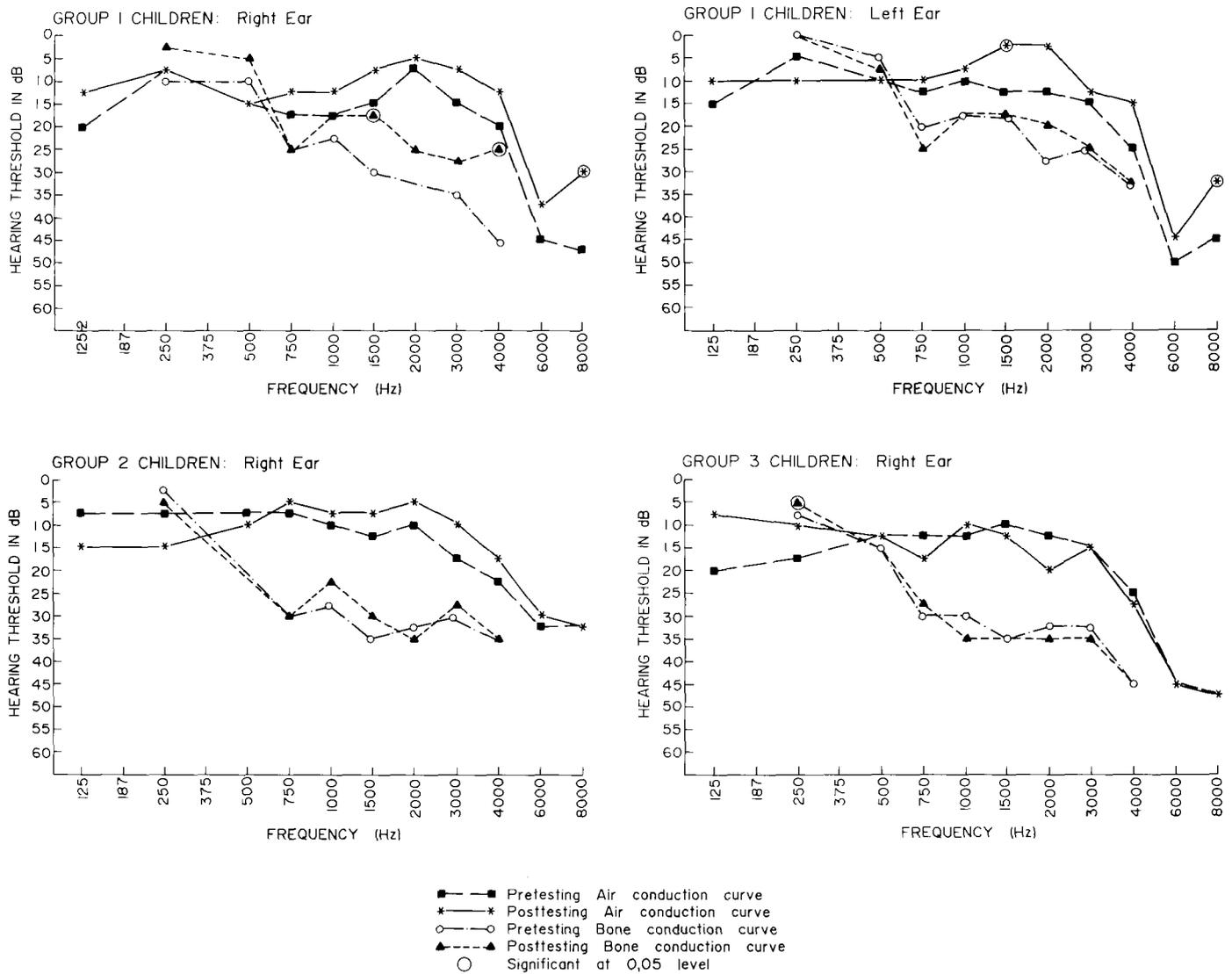
As shown in Figure 1 the children's Listening Test indicated significant increases in acuity scores on five frequencies and a significant shift of auditory laterality towards the right ear in Group 1. Gains occurred in the direction predicted by Tomatis, namely, increased ability to select higher frequencies in the sound spectrum, indicating an increased receptivity towards communication and perhaps explaining the increased submissiveness on the CPQ.

Two inter-group differences were significant. Group 1 achieved higher acuity scores than Group 3 on air conduction, right ear, at 8000 Hz, and bone conduction right ear, at 4000 Hz, also exceeding Group 2 significantly on this frequency.

As shown in Figure 2 post-treatment assessment indicated that Group 1 mothers had significantly increased acuity scores, implying increased perceptiveness of auditory stimuli, on 23 frequencies of air and bone conduction, especially in the high frequency area. Post-treatment gains included ascending curves corresponding to the ideal audiometric curve of the 'musical ear', described by Tomatis. Gains in high frequency perception indicated an increased willingness to listen, perhaps explaining the increased maternal affective involvement on the FAD. In Group 2 only three significant increases in acuity scores occurred and in Group 3 only one. In 13 significant inter-group differences Group 1 consistently achieved higher hearing acuity scores than Groups 2 and 3.

#### Maternal follow-up questionnaire

The results of a three-month follow-up indicated con-



**Figure 1** Pre-treatment and post-treatment mean acuity scores on air and bone conduction on the Listening Test for Group 1, 2 and 3 children

tinued progress. Most mothers (88%) felt that their own functioning was better or much better, while 94% perceived their children to be functioning better or much better. The entire group reported better or much better understanding and handling of their child's problem. Remaining problems included over-protectiveness in 26% mothers and fears (in 21%) about negative effects should children be allowed more freedom. Significantly more Group 1 mothers reported child gains in terms of communication.

**Therapist observations**

To expand the meaning of the findings, observations on Group 1 children are briefly noted. The children became increasingly zestful, especially during the phase of filtered mothers' voice. Talkativeness, friendliness, increased laughter and receptiveness towards parental commands were prominent. During the music birth phase a girl briefly regressed to babyish thumb-sucking conduct and regressed speech, but within days resumed

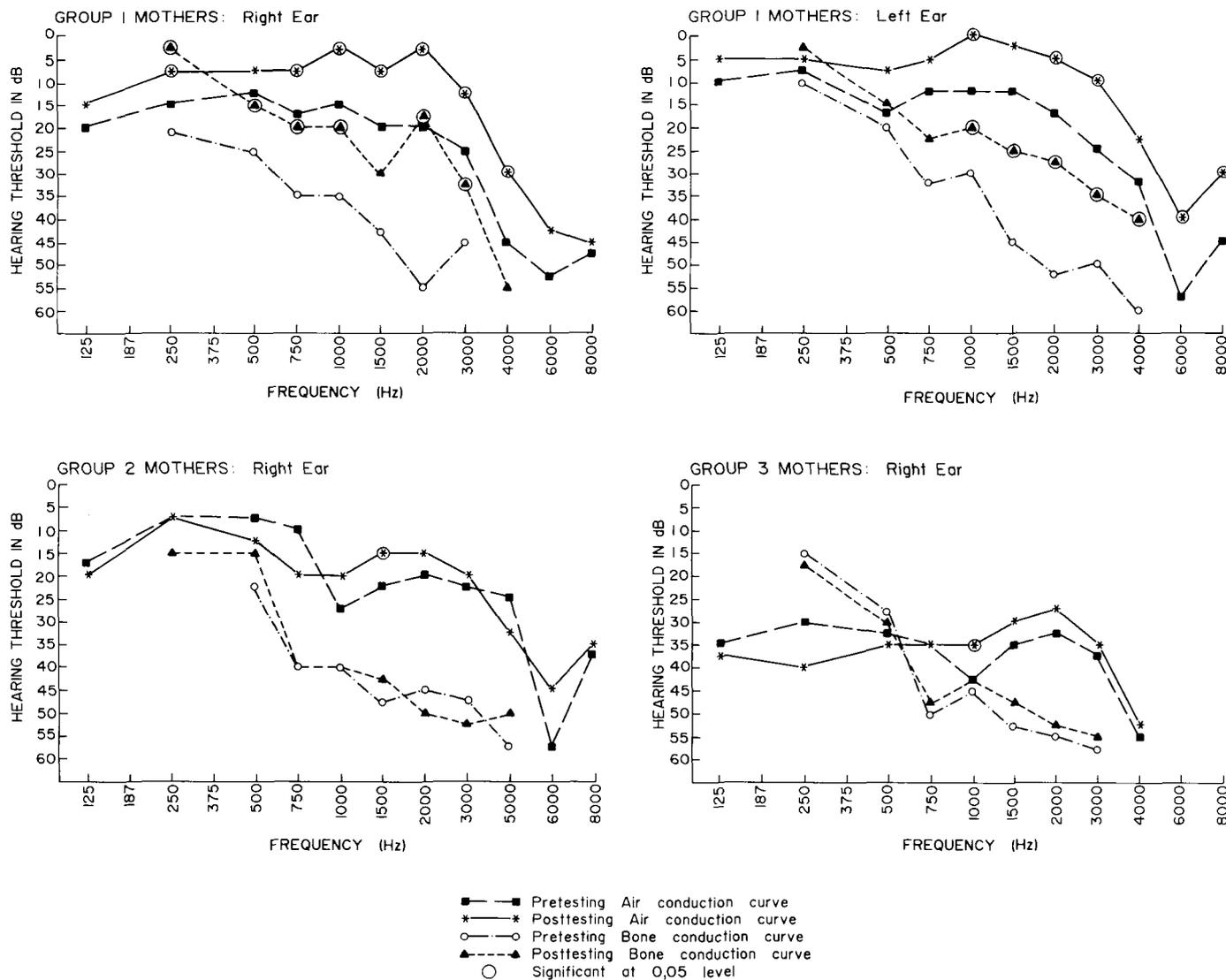
age-appropriate behaviour. In the phase of audio-vocal stimulation children became increasingly industrious, for example, played more constructively with peers, reached out towards others and risked new pursuits, such as jogging.

**Therapist competence**

Regrouping children in therapist-led groups for both programmes, showed that the APP group led by therapist 1 became significantly more outgoing, daring and self-controlled. Mothers of these children achieved significantly more progress on problem solving, affective responsivity and general functioning. The APP group of therapist 2 became significantly more tough-minded. On the ATP only one significant difference occurred. The group led by therapist 2 became significantly calmer.

**Discussion**

Our results validated the basic premises of APP on



**Figure 2** Pre-treatment and post-treatment mean acuity scores on air and bone conduction on the Listening Test for Group 1, 2 and 3 mothers

several dimensions: auditory stimulation in the prescribed way led to anxiety reduction, cognitive sharpening, improved listening in mothers and children, enhanced mother-child communication, increased affective involvement, and maternal role clarification. Since verbal interaction between therapists and clients via both methods were similar, it appeared as if the specific agent responsible for the changes in Group 1 was the filtered mother's voice, presumably acting in an anxiety reducing and communication fostering way. The effect of listening to filtered music also effected changes in the maternal listening curves, and increased the mothers' susceptibility to communication. Signs of increased age-appropriate behaviour, such as increased willingness to listen and obey parental commands, and increased signs of independence and self-reliance were clinically significant.

The findings extended the established anxiety reducing effect of auditory stimulation on adults (Van

Jaarsveld & Du Plessis, previous article) to latency-aged children. However, the significance of the results may be limited by design deficits. Firstly, APP was compared to an alternative therapy programme which did not have an adequate research track record for all its components. Secondly, assessment objectivity was restricted by the absence of a standardized child behaviour checklist (e.g. Quay & Peterson, 1983) and relevant physiological measurements as used by Zaichkovsky and Zaichkovsky (1984), inadequate independent behaviour ratings and a follow-up of limited time-span. Hopefully these design deficits will be surpassed in future studies on larger samples.

Still, the results support a new short-term approach to anxiety reduction, based on auditory training with the Electronic Ear. It is applicable to groups, and therefore cost-effective, which is important in an era of limited therapeutic resources and rising childhood stress and anxiety.

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