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The Efficacy of the Tomatis Method for Children with Learning and Communication Disorders: A Meta-Analysis

TIM GILMOR

Ottawa, Ontario, Canada

The Tomatis Method is a program of auditory stimulation and counseling primarily used to assist children, adolescents, and adults with learning and communication disorders. This treatment method was evaluated in several research investigations in the 1980s involving 231 children. The present study is a meta-analysis of data from five research studies evaluating the efficacy of this method in assisting children with learning and communication disorders. Positive effect sizes were found for each of the five behavioral domains analyzed: linguistic ($d=0.41$); psychomotor ($d=0.32$); personal and social adjustment ($d=0.31$); cognitive ($d=0.30$); and auditory ($d=0.04$). These results, although positive, are limited by several factors including small sample sizes and limited use of random assignment. Still, the results suggest that effect sizes favoring children who had participated in the program were consistent with clinicians' reports of beneficial effects.

Dr. Alfred Tomatis, a French physician and otolaryngologist, developed his Method of auditory stimulation over the last 45 years (see Tomatis, 1977). The Method's proponents assert that the program accelerates the development of learning, language, and communication skills. Prior to 1980, evidence of the positive benefits of the Tomatis Method as applied by professionals in authorized clinical settings in Europe and the Americas had been largely anecdotal. There was controversy surrounding Tomatis's theory of hearing which challenges more traditional and accepted theories (see Tomatis, 1963). However, an increasing number of professionals, teachers, and parents of children suffering from learning and communication disorders were observing and attributing beneficial effects to the Method. Among the earliest North American studies reporting such results were three doctoral dissertations that measured the Method's longitudinal effects on five dyslexic boys (J. Roy, 1982; R. Roy, 1982; Donner 1982).

In collaboration with Dr. Tomatis, MDS Inc., a Canadian life sciences and health care company, opened clinics in Toronto (1978) and Montreal (1980). It also developed a group program (The Listening Training Pro-

gram or LTP) for application in schools (1981). A number of studies were also undertaken at this time to evaluate the Method's efficacy in treating the language and learning disorders of children and adolescents. The results of these studies held some promise but were mixed. With the advent of meta-analytic methodology (Hunter & Schmidt, 1990), this author was curious to see whether a meta-analysis might provide a more definitive evaluation of the Tomatis Method's effectiveness, as measured by the psychological and educational tests employed in these studies.

BACKGROUND

Beginning in 1980, under the auspices of MDS' Professional Advisory Board, one internal and four external research projects were undertaken in an earnest effort to lend scientific credibility to the Method. Each study used authorized equipment and programs consisting of approximately 100 hours of auditory stimulation. The internal study was conducted at the Tomatis Centre in Toronto, Ontario. Children ages six to fourteen with learning and communication difficulties were assessed using standardized measures of aptitude, achievement, and adjustment before and after they completed the program (Gilmor, 1982; 1984). The findings coincided with parental reports of improvement in learning and communication skills and general adjustment. The average time between pretest and post-test was 13 months for the 102 children.

The second study (the first of four treatment group/control group studies) was carried out under the direction of Dr. Byron Rourke of the University of Windsor, Ontario. The progress of 25 learning disabled children from nine to fourteen years of age was tracked quarterly over a one-year period. Results favoring the performance of children in the treatment (Tomatis) group were found on measures of general adjustment, problem-solving ability, reading, and hand-eye coordination (Rourke & Russell, 1982).

Another neuropsychologist, Dr. Barbara Wilson of North Shore University Hospital, directed a third study at the hospital's Preschool Development Program in which 26 language-impaired preschool children were evaluated. Children who received the Tomatis Method showed significantly greater gains over a nine-month period than the matched control group on tests of auditory processing skill and in their general communication skills as observed by their parents and teachers (Wilson, Iacoviello, Metlay, Risucci, Rosati, & Palmaccio, 1982). An extended follow-up evaluation was attempted the following year, but the number of control group

children available for re-testing was too small to permit meaningful data analysis (Wilson, Palmaccio, Metlay & Risucci, 1984).

A fourth study directed by Dr. John Kershner of the Ontario Institute for Studies in Education began in 1983. Initial findings were first reported in the doctoral dissertation of Richard Cummings (1985). The progress of 32 underachieving children, ages eight to twelve years, was evaluated. They were attending the MacLachlan Preparatory School, a private school with remedial learning programs. Results showed that, while both the treatment and control groups made significant gains on academic and linguistic measures over a 20-month period, there was no appreciably greater gain on the part of the children who received the Listening Training Program, the modified version of the Tomatis Method designed for use in schools (Kershner, Cummings, Clarke, Hadfield, & Kershner, 1986; 1990). In fact, the only statistically significant difference found between the treatment group and control group subjects, on a measure of auditory processing skill, favored the latter. Based on this finding and on the absence of statistically significant results favoring the treatment group, the authors chose to draw strong negative conclusions about the Method's efficacy.

A fifth study directed by Peter Mould, Chief Remedial Teacher of Brickwall House, East Sussex, England, followed the progress of two groups of 46 severely dyslexic boys, ages ten to fifteen, over a two-year period. Their performance on standardized tests of aptitude, achievement, and adjustment showed appreciably greater improvement favoring the treatment group who received the Listening Training Program (Mould, 1985; Gilmore & Mould, 1994). In contrast to the earlier studies, the boys in this sample were a much more homogeneous group, all with significant reading disabilities (i.e., dyslexic). They also lived in residence at this publicly funded school, reducing the mitigating influences of home and social environment during the time of the two-year evaluation.

Results in all but the Kershner et al. (1990) study showed trends favoring the treatment group on one or more measures. However, the number of statistically significant findings was insufficient for any of the authors to draw firm conclusions. Also, each study suffered from one or another methodological shortcoming characteristic of applied research.

For example, treatment and control group differences in IQ scores required Rourke and Russell (1982) to take special measures in the analysis of their results. In the Wilson et al. study (1984), disproportionate attrition of children in the control group weakened the power of the statistical analyses in the follow-up testing. In the Brickwall studies, children were closely

matched on all measures, but could not be completely randomly assigned due to class scheduling constraints.

In the Kershner et al. study (1986; 1990), the children were randomly assigned to groups. However, the control group children received a placebo treatment regimen. It included auditory memory training, audio-vocal feedback using a letter naming task (similar to the treatment group), relaxation tapes, and direct instruction in oral and silent reading and reading comprehension, individualized to meet their needs (see Cummings, 1985, pp. 83-85). While the intention was to control for possible placebo effects, the net result was contamination of the control group. The control group children received three interventions that the treatment group did not receive. They also received a fourth intervention which paralleled a component of the Tomatis treatment. This was in addition to the remedial education program all the children were receiving in class.

META-ANALYSIS

The Hunter-Schmidt (1990) psychometric meta-analysis method used in this study is based on the hypothesis that much of the variation in results across studies may be due to statistical and methodological artifacts rather than to substantive differences in underlying population relationships. Some of these artifacts also reduce the effect sizes below their true, or population, values. The method determines the variance attributable to artifacts (e.g., sampling error) and subtracts that amount from the total amount of variation. This results in an estimate of the true variation across studies and of the true average effect size (Hunter & Schmidt, 1990).

METHOD

The effect sizes used in this meta-analysis were standardized mean differences (Cohen's d) between the Tomatis Method treatment groups and the control groups. A positive d indicates that the Tomatis Method treatment group showed better performance than the control group. The d effect size statistic is expressed in standard score units. Thus, a d score of 1.0 would indicate that the treatment group scored one standard deviation above the control group. In layman's terms, it means that if children were performing at the 50th percentile prior to treatment, they could be expected to perform at the 84th percentile following the treatment.

For this meta-analysis, the effect sizes were corrected for sampling error only. The mean observed effect size was used in the sampling error

variance formula. The computer program used for the analysis is described in McDaniel (1986). Additional detail on the program is presented in Appendix B of McDaniel, Schmidt, and Hunter (1988). The mean d effect sizes are offered as the best estimate of the true effectiveness of the Tomatis Method intervention.

There are at least three contributing factors to the variance in the population distribution. First, the studies differed somewhat in the manner in which the Tomatis Method intervention was implemented. Variations across studies in the frequency and duration of treatment would likely have caused variation across studies in the magnitude of the effect sizes.

Second, variance in the population distribution may be due to differences across studies in the manner in which treatment and control groups were formed. For example, some studies may have had more comparable control and treatment groups prior to the treatment intervention than others. Less comparable treatment and control groups may yield a smaller effect size than average if the control group was less disadvantaged than the treatment group. Alternatively, less comparable treatment and control groups may yield a larger than average effect size if the control group was more disadvantaged than the treatment group. Note that random assignment to groups, on average, will minimize pre-treatment differences between the control and treatment groups, but it does not rule out group differences in any given study. For the effect sizes drawn from studies without random assignment, the possibility of noncomparable treatment and control groups is more likely than in the study that used random assignment.

A third source of variance in the population distribution is the level of treatment received by the control groups. Studies employing control groups that received no effective treatment would likely yield larger effect sizes than studies where the control group received some services that had remedial effects. The magnitude of these three sources of variance cannot be estimated in this data set. However to the extent that the variance produced by these sources is nontrivial, the population variance estimates produced in these studies are likely to overestimate the actual variability in the population effect sizes.

Each of the five studies was reviewed. The first step was to cluster the 75 dependent variable measures used in the studies into meaningful categories or domains of behavior. On an *a priori* basis, the dependent variables were assigned to the following categories:

Auditory Domain

The measures included the Auditory Closure Test; Seashore Rhythm Test; Speech Sounds Perception; Auditory Analysis Test; Sentence Memory; GFW (Quiet and Noise); and Sound Mimicry.

Cognitive Domain

The measures included the Wechsler Intelligence Scale for Children (WISC-R); British Abilities Scales (BAS); and British Picture Vocabulary Scale (BPVS).

Linguistic Domain

The measures included the Wide Range Achievement Test (WRAT); Verbal Fluency Test; Test of Written Language (TOWL); Phonetic Accuracy; Oral Reading (Gray); Monroe Sherman Reading Comprehension Test; Syllabication Test; Wilson Iacoviello Gilmore Inventory for Parents and Teachers (WIG); Articulation Test; and Myklebust Pupil Rating Scale (PRS) Verbal Subscale.

Personal and Social Adjustment Domain

The measures included the Personality Inventory for Children (PIC); Coopersmith Self Esteem Inventory (SEI); WIG Adjustment Subscale; CBC Parent and Teacher Index (CBC); and Myklebust Pupil Rating Scale (PRS) Nonverbal Subscale.

Psychomotor Domain

The measures included the Trails A & B; Grooved Pegboard; WIG Physical Subscale; and Motor Index.

The decision rules were as follows:

1. With one exception, only post-test comparisons between treatment and control groups were used. No data were excluded from the analysis. The one exception was that data from Gilmore (1982; 1984) were included in this analysis. Gilmore had no control group and therefore the effect sizes reflected changes from pretest to post-test.

2. When comparisons were made at many intervals, only data from the longest time interval from initial treatment were used.
3. All results were adjusted for directionality (i.e., higher scores indicating improvement). Two observers checked data coding.
4. Only studies using authorized Tomatis Method procedures and equipment (Electronic Ear Model IV, Agnew & Associates) were included.

This delineation of the decision rules permits interested readers to replicate our results.

RESULTS

Table 1 presents the data that entered the meta-analysis broken out by behavioral domain and source. For each behavioral domain, one effect size for each sample was used. When a study reported more than one effect size per sample for a given behavioral domain, the effect sizes were averaged to obtain a single effect size.

Table 2 presents the meta-analysis for each of the behavioral domains. The strongest effects due to treatment were found for the: Linguistic Domain (mean effect size = 0.41); Psychomotor Domain (mean effect size = 0.32); Personal and Social Adjustment Domain (mean effect size = 0.31); and, Cognitive Domain (mean effect size = 0.30). A relatively weaker result was found for the Auditory Domain (mean effect size = 0.04). The residual standard deviation is the amount of variance in the effect sizes across studies that cannot be attributed to random sampling error. A substantial amount of the variability across studies could be attributed to random sampling error. The 95% credibility interval represents a band around the mean coefficient reflecting variance not attributable to sampling error.

DISCUSSION

The results presented in this article confirm that the trends reported in the individual studies favor the treatment group participants in four of the five behavioral domains sampled with mean effect sizes in all domains except auditory ranging from 0.30 to 0.41. An intervention that moves the treated population .3 to .4 of a standard deviation in a favorable direction has important utility. It means that a child performing at the 50th percentile

TABLE 1
Data Contributing to the Meta-analysis.
Effect Sizes, Sample Sizes, and Data Sources

<i>Linguistic Domain</i>		
<i>d effect size</i>	<i>Sample size</i>	<i>Data source</i>
.06	26	Kershner, J., Cummings, Clarke, Hadfield, & Kershner, B. (1990).
.61	25	Rourke & Russell (1982).
.44	26	Wilson, Iacoviello, Metlay, Risucci, Rosati, & Palmaccio (1982).
.60	24	Gilmor & Mould (1994), (1983/1984 sample).
.87	22	Mould (1985), (1982/1983 sample).
.29	102	Gilmor (1982; 1984).
<i>Psychomotor Domain</i>		
.04	25	Rourke & Russell (1982).
-.18	26	Wilson, Iacoviello, Metlay, Risucci, Rosati, & Palmaccio (1982).
.51	102	Gilmor (1982; 1984).
<i>Personal and Social Adjustment Domain</i>		
.15	26	Kershner, J., Cummings, Clarke, Hadfield, & Kershner, B. (1990).
.34	25	Rourke & Russell (1982).
-.02	26	Wilson, Iacoviello, Metlay, Risucci, Rosati, & Palmaccio (1982).
.16	24	Gilmor & Mould (1994), (1983/1984 sample).
1.11	22	Mould (1985), (1982/1983 sample).
.28	102	Gilmor (1982; 1984).
<i>Cognitive Domain</i>		
-.08	26	Kershner, J., Cummings, Clarke, Hadfield, & Kershner, B. (1990).
.46	24	Gilmor & Mould (1994), (1983/1984 sample).
.36	102	Gilmor (1982; 1984).
<i>Auditory Domain</i>		
-.55	26	Kershner, J., Cummings, Clarke, Hadfield, & Kershner, B. (1990).
.47	25	Rourke & Russell (1982).
.23	26	Wilson, Iacoviello, Metlay, Risucci, Rosati, & Palmaccio (1982).

TABLE 2
Meta-analyses of Effect Sizes Summarizing
the Efficacy of the Tomatis Method

<i>Distribution Analyzed</i>	<i>Number of effect sizes</i>	<i>Number of Observations</i>	<i>Effect Size Observed Distribution</i>			
			<i>Mean</i>	<i>SD</i>	<i>Residual SD</i>	<i>95 % credibility</i>
Linguistic	6	225	.41	.22	.00	.41 to .41
Psychomotor	3	153	.32	.28	.00	.32 to .32
Personal and social adjustment.	6	225	.31	.28	.00	.31 to .31
Cognitive	3	152	.30	.18	.00	.30 to .30
Auditory	3	77	.04	0.44	0.18	-.32 to .41

prior to treatment could be expected to perform at the 62nd to 65th percentile after treatment. Given the fact that these children were having significant learning difficulties and were already receiving additional remedial help, these differences in performance improvement are compelling.

The low effect size for the auditory domain derives from the contrasting results found in the Kershner et al. study (1990) and those found in the Rourke and Russell (1982) and Wilson et al. studies (1982; 1984). Rourke and Russell reported that the treatment group's performance on the Seashore Rhythm Test was significantly stronger than that of the control group. The reverse was found by Kershner et al. (1990) on the same measure. Wilson et al. (1982) reported a finding similar to Rourke and Russell's on a different auditory measure. It is difficult to reconcile Kershner et al.'s finding, other than to question whether one or another of the "placebo" interventions they introduced may have influenced their control group's performance on this measure. Auditory tests of this kind generally have lower reliability than linguistic or cognitive measures, especially with younger learning disabled children. Different methods of assessing auditory processing skills, including neurophysiological measures, must be employed in further evaluating the changes in listening attributed to the Tomatis Method by clinicians and parents.

Some caution is warranted in interpreting the results of this meta-analysis. First, the sample sizes are small. There were between 22 and 26 children in each of the four treatment group/control group studies. Second, while groups were matched as closely as possible for age, degree of disability, and general adjustment, fully randomized assignment of children to

groups was possible in only one. Constraints inherent in doing field research accounted for this. In some instances, parents were not ready to have their children assigned to a control group (Wilson et al., 1982). In other cases, minimizing the disruption of class schedules precluded random assignment for some students (Mould, 1985). Finally, unlike the other studies reported, the pretest and posttest data gathered by this author used the children as their own controls. Nonetheless, considering the context in which these studies were carried out, the results can be considered supportive of the efficacy of the Tomatis Method. It suggests that something important is being achieved with this form of auditory stimulation above and beyond what other approaches have provided.

One thing is clear -- overgeneralization from the results of a single study on the part of any author must be met with caution. Research in this area often employs relatively small numbers of subjects. A clear understanding of the nature and extent of the efficacy of the Tomatis Method can only be achieved through multiple studies whose results are appropriately cumulated. Proponents, practitioners, and critics of the Tomatis Method may best serve the interests of disadvantaged children by conducting additional careful and systematic research so that remaining questions and issues concerning its effects can be addressed.

For those interested in case studies of young people whose lives have been changed by the Tomatis Method, Paul Madaule's book, *When Listening Comes Alive* (1994), is a good source. Thompson (1993) has summarized the relevance of Tomatis's theory and method to education. The application of Tomatis's ideas to early childhood development is presented in an article by Gilmore (1989). Thompson and Andrews (1999) discuss the fact that the field of Sound Training has grown out of Tomatis's breakthrough research and technology. It has expanded to a variety of educational, training, and healing methods. Unfortunately, Tomatis's seminal work in the field of auditory processing has not been sufficiently acknowledged by researchers and theorists in North America. In part, this may stem from the fact that, until recently, his original work was only available in French. It is the author's hope that this will change and that the potential benefit of his contribution can be fully realized.

NOTES

Author's Note: Tim Gilmor, Ph.D., is a psychologist in private practice in Ottawa, Ontario, Canada. Michael A. McDaniel, Ph.D., University of Akron, served as the statistical consultant on this project. He audited the data, calculated the meta-analysis statistics, and contributed to the methods and results section of the manuscript. For information about the Tomatis Method, contact Paul Madaule, The Listening Centre, 599 Markham Street, Toronto, Ontario, M6G 2L7, Canada, 416-588-4136 or Billie Thompson, Ph.D., Sound Listening and Learning Center, 2701 E Camelback Road, Suite 205, Phoenix, AZ 85016, 602-381-0086.

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