

Educational Interpreters and the Tomatis Method: a mixed methods study at the North-West University

Ina-Marí Du Toit

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Supervisor: Prof. W.F. Du Plessis

Co-supervisor: Dr. D.K. Kirsten

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Letter of Consent

We, the supervisor and co-supervisor, hereby give consent for Ina-Marí du Toit to submit the following manuscript for purposes of a dissertation (article format): **Educational Interpreters and the Tomatis Method: a mixed methods study at the North-West University.**

It may also be submitted to Journal of Psychology in Africa for publication.

Prof. W.F. Du Plessis

Supervisor

Dr. D.K. Kirsten

Co-Supervisor

Instructions to Authors

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Cultural approaches to intellectual and social competencies. Paper presented at the Annual Convention of the American Psychological Society, Toronto, Canada. Cook, D. A., & Wiley, C. Y. (2000). Psychotherapy with members of the African American churches and spiritual traditions. In P.S. Richards & A. E. Bergin (Ed.), *Handbook of psychotherapy and religiosity diversity* (pp. 369-396). Washington DC: American Psychological Association.

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Summary

Educational Interpreters and the Tomatis Method: a mixed methods study at the North-West University

On the Potchefstroom Campus of the North-West University, where the predominant language of instruction is Afrikaans, non-Afrikaans speaking students are accommodated due to the use of interpreting services. Educational interpreting implies in-class simultaneous interpreting of Afrikaans lectures into English by trained under- and postgraduate students.

The aim of this research was to determine the impact of the Tomatis Method, a method of sound stimulation, on educational interpreters and explore their experience of the Tomatis programme. The research set out to answer the following questions: (i) Will attendance of a Tomatis programme impact educational interpreters by: improving interpreting performance; enhancing attention, concentration and personality functioning; reducing negative mood states; and enhancing the positive mood state vigour? (ii) What will participants report about their experience during and after the Tomatis programme?

To study the TM's effects on participants, quantitative and qualitative data were combined using a mixed methods triangulation design. After obtaining informed consent, participants were randomly assigned to an experimental ($n = 9$) and control group ($n = 9$). Participants comprised of nine male and nine female, under- and postgraduate students between the ages of 19 and 36.

The experimental group attended 60 half-hour sessions, during which they listened to gradually filtered music, followed by a two-month break for integration of the sound stimuli and, finally, another 60 half-hour sessions of audio-vocal training. A panel of interpreting experts and a speech therapist evaluated both groups' interpreting performance (IPE) pre- and post-program. Both groups also completed assessments on personality (NEO PI-R) and

concentration and memory (WAIS III) pre- and post programme, while the experimental participants additionally completed the Profile of Mood States (POMS) pre-, in- and post-programme. Three focus group discussions during the course of the Tomatis programme enabled participants to verbalize their experiences of the programme and how it impacted their interpreting process.

Despite a bias in favour of the control group during the interpreting performance post-assessment, findings suggested that interpreters benefited from the Tomatis programme in several areas of interpreting and in regards to personal experiences. Regarding interpreting performance, a significant improvement concerning Interpreting Technique occurred in favour of the experimental group. This advance can be explained by participants' qualitative responses regarding improved interpreting efficiency, speech production and listening skills. Experimental participants' decreased Fatigue-Inertia; increased Extraversion, Activity and Vigour; and experiences of enhanced relaxation possibly contributed to improved interpreting performance. Moreover, the experimental group's positive feedback about the enriching effect of the Tomatis programme on their personal lives strengthened the value of the TM for individual growth and psychological well-being. The control group showed some enhancement in aspects of interpreting and sub-domains of personality, but only managed to outperform the experimental group on one subscale, namely Feelings, a facet of the domain Openness of the NEO-PI(R). Thus, it appears that the Tomatis programme had a significantly positive impact on interpreters' performance and that their experience of the interpreting process was enhanced during and after the programme.

Keywords: Tomatis Method, sound stimulation, simultaneous interpreting, psychological well-being, mixed methods.

Opsomming

Opvoedkundige Tolke en die Tomatis Metode: 'n gemengde metodes studie by die Noordwes-Universiteit

Op die Potchefstroom kampus van die Noordwes-Universiteit, waar Afrikaans die oorheersende taal is, word nie-Afrikaanssprekende studente geakkommodeer met behulp van tolkdienste. Opvoedkundige tolking impliseer die tydens-klas simultane tolking van Afrikaanse lesings na Engels, deur opgeleide voor- en nagraadse studente.

Die doel van die navorsing was om vas te stel wat die impak van die Tomatis Metode, 'n metode van klankstimulasie, op opvoedkundige tolke is en om hulle ervaring van die Tomatis program te verken. Die studie was gefokus rondom die beantwoording van die volgende navorsingsvrae: (i) Sal die bywoning van 'n Tomatis program 'n impak hê op opvoedkundige tolke deur: verbetering van tolkprestasie; konsentrasie, aandag en persoonlikheidsfunksionering; die vermindering van negatiewe gemoedstoestande; en versterking van 'n positiewe gemoedstoestand, naamlik lewenskragtigheid? (ii) Wat sal deelnemers rapporteer oor hul ervarings gedurende en na afloop van die Tomatis program?

Kwantitatiewe en kwalitatiewe data is gekombineer, deur gebruik te maak van 'n gemengde metodes triangulasie ontwerp, om sodoende die effek van die TM op die deelnemers te bestudeer. Nadat ingeligte toestemming verkry is, is deelnemers ewekansig toegewys aan 'n eksperimentele groep ($n = 9$) en 'n kontrolegroep ($n = 9$). Die deelnemers was saamgestel uit nege manlike en nege vroulike voor- en nagraadse studente tussen die ouderdomme van 19 en 36.

Die eksperimentele groep het 60 half-uur sessies bygewoon, waartydens hulle na musiek geluister het. Daarna het 'n ruspose van twee maande gevolg vir integrasie van die klankstimuli en, laastens, nog 60 half-uur sessies van audio-vokale opleiding. 'n Paneel,

bestaande uit tolk deskundiges en 'n spraakterapeut, het beide groepe se tolkprestasie (IPE) voor en na afloop van die program geevalueer. Beide groepe het ook assesserings ondergaan in persoonlikheid (NEO PI-R), en konsentrasie en geheue (WAIS III) voor en na die program, terwyl die eksperimentele deelnemers bykomend die Profiel van Gemoedstoestande (POMS) voor, tydens en na afloop van die program afgelê het. Die drie fokusgroepbesprekings het aan die deelnemers die geleentheid gebied om hulle ervaring van die Tomatis program en die impak wat dit op hulle tolkproses gehad het, te verbaliseer.

Ten spyte van 'n sydigheid ten gunste van die kontrolegroep tydens assessering van tolkprestasie na afloop van die program, dui die bevindings daarop dat die tolke wel voordeel getrek het uit die Tomatis program in verskeie fasette van tolking, asook ervarings op 'n persoonlike vlak. In sover dit tolkprestasie behels, was daar 'n betekenisvolle verbetering in tolktegniek in die geval van die eksperimentele groep. Hierdie vooruitgang kan verduidelik word deur te kyk na die deelnemers se kwalitatiewe antwoorde in verband met verbeterde tolk bedrewenheid, spraakproduksie en luistervaardighede. Die eksperimentele deelnemers se verlaagde Uitputting-Traagheid; verhoogte Ekstraversie, Aktiwiteit en Lewenskragtigheid; en ervarings van verhoogde ontspanning het alles moontlik bygedra tot die verbetering in tolkprestasie. Daarbenewens is die waarde van die TM vir persoonlike groei verder versterk deur die positiewe terugvoer vanaf die eksperimentele groep oor die verrykende effek van die Tomatis program op hulle persoonlike lewe. Daar was 'n mate van verbetering in aspekte van tolking en fasette van persoonlikheid onder die kontrolegroep, maar hierdie groep kon die eksperimentele groep slegs oortref ten opsigte van Gevoel, 'n faset van die Openheidsdomein van die NEO-PI(R). Dus, blyk dit dat die Tomatis program 'n beduidende positiewe impak gehad het op tolke se prestasie en hulle ervaring van die tolkproses, tydens en na afloop van die program.

Sleutelwoorde: Tomatis Metode, klankstimulasie, simultane tolking, psigologiese welstand, gemengde metodes.

Manuscript for Examination

**Educational Interpreters and the Tomatis Method: a mixed methods study at the
North-West University**

Ina-Marí du Toit¹, *Wynand F. du Plessis² and Doret K. Kirsten²

¹Department of Psychology & ²Institute for Psychotherapy and Counselling

North-West University (Potchefstroom Campus)

Private Bag X6001

Potchefstroom, 2520

South Africa

inamari.dutoit@gmail.com

wynand.duplessis@nwu.ac.za

doret.kirsten@nwu.ac.za

* Corresponding author

Abstract

This study explored the impact of the Tomatis Method of sound stimulation on educational interpreters at the North-West University. A mixed methods design combined pre-post assessments and focus groups. Interpreters were randomly allocated to an experimental (n=9) and control group (n=9) (age range =19-36). Both groups were assessed on interpreting performance (IPE), personality (NEO-PI-R), cognition (WAIS III subtests) and the experimental group additionally on mood states (POMS). Statistical analysis indicated significantly enhanced interpreting technique and psychological well-being in the experimental group. Themes identified through qualitative exploration encompassed interpreting efficiency, speech production, listening skills, personal enrichment, and relaxation. Corresponding quantitative and qualitative results indicated strengthening of interpreting performance and psychological well-being. Replication and extension of educational interpreting across multicultural tertiary contexts and the impact of Tomatis stimulation in improving interpreting performance necessitate further study.

Keywords: Tomatis Method, sound stimulation, simultaneous interpreting, psychological well-being, mixed methods.

Word count: 133

Post-apartheid South Africa gradually introduced cultural diversity and multilingualism to tertiary institutions. A government directive to reduce universities resulted, among others, in the establishment of the North-West University (NWU) on 1 January 2004, a symbolic act of reconciliation and nation building (North-West University, 2010). In this merger, the Potchefstroom University for Christian Higher Education (PU for CHE) merged with the University of the North-West (UNW); and the former Vista University's Sebokeng Campus was incorporated (North-West University, 2010). The NWU, consisting of three campuses at Potchefstroom, Mafikeng and Vanderbijlpark, thus became a multilingual institution comprising of Afrikaans-, English- and Setswana-speaking students.

Afrikaans remained the language of tuition at Potchefstroom Campus, English at the Mafikeng Campus, and parallel medium (Afrikaans/English) at the Vaal Triangle Campus. To overcome the obstacle of retaining Afrikaans, while simultaneously accommodating non-Afrikaans students, a system of educational interpreting was introduced experimentally, with English as target language. Simultaneous interpreting implied a trained interpreter listening to an Afrikaans lecture and immediately rendering it verbally into English.

Despite a lack of evidence-based findings on this kind of interpreting in tertiary contexts, positive student responses led to the implementation of whispered simultaneous educational interpreting across the Potchefstroom campus; making the NWU the first South African university to use the Sennheiser Whispered Interpreting system. This system allows interpreters to speak so softly that no special arrangements are necessary to isolate them from the students and no special equipment is required to hear lecturers. Interpreters use ultra-sensitive radio-transmitter microphones to render interpreted versions of lectures in very low voices, received by non-Afrikaans students via radio-receiver headphones (Van Rooy, 2005).

Students and other persons interested in becoming interpreters are recruited by the University's Language Directorate and required to attend basic training, successfully

complete a standardized interpreting test and obtain practical exposure. After attending an interpreting course approved by the Institutional Committee for Academic Standards (ICAS), in-service training is implemented in order to carry out quality control and evaluations (Verhoef, Blaauw, Cloete, Olivier & Zerwick, 2008).

Although every effort is made by the university's interpreting services to equip students to become effective interpreters, they may still experience stress due to minimal interpreting experience and limited knowledge of coping with the ensuing demands. Given the simultaneous nature of the process they are under great time and cognitive pressure, as it is impossible to clarify conceptual or linguistic uncertainties with lecturers beforehand (Verhoef, 2006). However, access to lecturer's PowerPoint presentations and course study guides associated with target lectures, are perceived as useful in preparing for interpreting sessions.

Heightened cognitive pressure experienced by simultaneous interpreters can be conceptualized by Gile's Effort Model (Gile, 1999). Operational components of interpreting performance comprise three efforts, namely: Listening and Analysis Effort; Production Effort (speech production in simultaneous interpreting); and Short-Term Memory Effort (essentially dealing with memory operations from the moment a speech segment is heard to the moment of reformulating it in the target language or disappearing from memory). Gile's Effort Model can be used to account for errors and omissions in the target text, in the absence of particular technical or other difficulties that can be identified in the source speech. Gile (1999) states that:

“...most of the time, total capacity consumption is close to the interpreter's total available capacity, so that any increase in processing capacity requirements and any instance of mismanagement of cognitive resources by the interpreter can bring about

overload or local attention deficit (in one of the Efforts) and consequent deterioration of the interpreter's output" (p. 159).

Clearly, simultaneous interpreting poses great challenges to interpreters' attention, concentration and memory skills.

Against this background, the Tomatis Method (TM) (Tomatis, 1991; 1996) may be useful to strengthen educational interpreters' skills to achieve and maintain optimal interpreting performance. Tomatis' major invention, the Electronic Ear (EE), was developed "... in order to assist the human ear to establish or re-establish its full potential" (Thompson & Andrews, 2000, p. 176). The EE stimulates sound through special earphones by making use of bone and air conduction (Thompson & Andrews, 2000). Sound stimulation was developed during the last half of the twentieth century by Tomatis when his research led to the establishment of three laws: (i) the voice only contains the harmonics that the ear can hear; (ii) if the possibility is given to the ear to correctly hear distorted frequencies of sounds, these frequencies are immediately and unconsciously restored into the voice; and (iii) if the imposed audition is sufficiently maintained over time, one's audition and phonation will be modified permanently (Davis, 2004; Tomatis, 1996). Three phases are distinguished in the TM, namely: (i) auditory training to 'open up' the ear to develop better listening; (ii) breaks for integration that allow the person to experience, integrate and habituate new listening patterns; and (iii) audio-vocal training to develop the necessary audio-vocal control to maintain gains independently of the Electronic Ear (Thompson, 2004).

Tomatis (Tomatis, 1996; Thompson & Andrews, 2000) distinguished between *listening*; the active, motivated tuning in to what you want to hear, and *hearing*; an automatic action of sound perception. Listening, as opposed to hearing, is crucial in simultaneous interpreting and involves the complex process of language comprehension. Interpreters have to listen intently to grasp the meaning of the spoken source language as rapidly and precisely

as possible. Tomatis was also concerned with ‘self-listening’; whereby controlled auditory stimulation can alter one’s self-listening and phonation: “If one listens to one’s own voice, heard with a good quality and conditions one’s ear sufficiently in this manner, the changes will be maintained” (Thompson & Andrews, 2000, p.176). This may impact on interpreters’ audio-vocal control and improve their performance, as the speech production effort is associated with self-monitoring (Gile, 1999). Self-listening may be of great importance in whispered interpreting because precise control is needed to communicate in a whispered voice, without sounding unclear or speaking too loud, soft, high, or low.

Developed to stimulate rich interconnections between the ear and the nervous system (Thompson & Andrews, 2000) cognitive gains from the TM, possibly also applicable to interpreters, include improved attention span, concentration, mental alertness, awareness, and improved executive skills, i.e., the ability to focus, shift and maintain goal-directed behaviour (Belk, 1992). In studying the interconnections between ear, brain and voice, Tomatis found that “. . . attention and memory are improved by way of stimulating the attention pathways of the reticular activating system, through the thalamus and on to projections in the frontal lobes” (Thompson & Andrews, 2000, p.184). According to them, sensory integration, reaction time and auditory information processing can be improved by stimulating the pathways through the thalamus, cerebellum and parietal projections. If these improvements can be achieved in educational interpreters, they may be able to improve interpreting speed and accuracy, thereby enhancing interpreting performance. According to Moser-Mercer (2001) simultaneous interpreting is a complex cognitive skill that the human brain can adapt to, given the right conditions and conditioning. Thus, conditioning the ear with the TM may impact on various cognitive abilities.

Furthermore, studies have shown that the TM enhances aspects of personality, including emotional coping and vigour (Du Plessis, Burger, Munro, Wissing & Nel, 2001).

Interpreters may thus cope better with stress and other demands inherent in interpreting, as they have to adjust to a diversity of subjects, lecturers and accents, while confronting an ever present threat of failure (Kurz, 2003). Additionally, Thompson (2004) states that listening to filtered music via the Electronic Ear enhances the tension of the tympanic membrane which fosters psychological well-being so that the client's self-confidence, awareness of abilities, and willingness to use his/her voice from a position of empowerment, are increased. This may be useful to educational interpreters who have to convey lecturers' messages with self-confidence and may benefit users; as it may be easier to comprehend interpreters who communicate clearly, energetically and confidently.

Although the TM has been evaluated across various contexts, its impact on educational interpreters has, to the researcher's knowledge, not been investigated yet. Since the TM comprises a relatively new research field, studies which extend knowledge about its effects are encouraged (Andrews, 2004). The most relevant study in this regard comprised of an evaluation of the TM as a means of improving pronunciation of English in a group of first language Zulu speakers (Lemmer, Wissing & Du Plessis, 2001). Although their pronunciation did not improve significantly, the experimental group outperformed the control group on an attitude test, associated with voice production and confidence; factors deemed potential outcomes of the TM. Finally, participants' subjective experience of attending a Tomatis programme has only been studied once before by means of a mixed methods design (Vercueil, 2010).

In studying the TM and educational interpreters, the theoretical assumptions of a pragmatic worldview was applied. By mixing qualitative and quantitative data, deductive and inductive thinking is combined and the researcher is directed by a pluralistic, practice-orientated approach (Creswell & Plano Clark, 2007). Pragmatism in this study was employed by using multiple methods of data collection relevant to the research question, employing

mixed sources of data collection (quantitative and qualitative), focusing on the implications of the research and emphasizing the importance of the outcomes of the study (Creswell, 2007).

Research Questions

The following research questions will be addressed:

- (i) Will attendance of a Tomatis programme impact educational interpreters by: improving interpreting performance; enhancing attention, concentration and personality functioning; reducing negative mood states; and enhancing the positive mood state vigour?
- (ii) What will participants report about their experience during and after the Tomatis programme?

Method

Research Design

A mixed method approach was used to combine quantitative and qualitative methods in order to gain a better understanding of the research problem than either approach on its own would have achieved (Ivankova, Creswell & Stick, 2006). A triangulation design was used to implement both methods during the same time frame and with equal priority (Creswell & Plano Clark, 2007). The convergence model of this design was applied by collecting and analysing qualitative and quantitative data concurrently on the same phenomenon and then converging different results during interpretation to obtain valid and well-substantiated conclusions about the phenomena being studied (Creswell & Clark, 2007).

Quantitative design. A two-group, pre-post assessment design was used to determine the impact of the TM on participating educational interpreters' experiences. By involving an experimental and control group of interpreters, randomly allocated, a more rigorous study was ensured. It was hypothesized that attendance of the TM would:

- (i) improve interpreting performance;

- (ii) enhance attention, concentration and aspects of personality;
- (iii) reduce negative mood states and enhance a positive mood state, namely, vigour.

Qualitative design. The qualitative design was guided by a phenomenological approach to understand and interpret participants' subjective experiences during and after the Tomatis programme. In phenomenology, people are understood in the context of 'meaning-making', whereby individuals are perceived as constantly trying to make sense of their lives (worlds) or giving meaning to their actions (Babbie & Mouton, 2001). This study describes the meaning for a group of individuals (i.e. the educational interpreters) of their lived experiences of the phenomenon (i.e. interpreting while attending the Tomatis programme) (Creswell, 2007). By engaging participants in focus groups they were able to make sense of their shared experiences of the TM and the interpreting process in a way that might not have been attainable by quantitative methods alone.

Research Context and Participants

A sample of nine male and nine female educational interpreters of the NWU, fluent in Afrikaans and English, was allocated randomly to an experimental (n=9) and non-intervention control group (n=9). Table 1 illustrates the profile of experimental and control group participants. Post-assessment on WAIS III had to be interrupted due to one experimental participant not feeling well close to the final examinations. Another date was set, but he failed to attend and thus only eight participants completed the test (table 2). As will be seen in Table 3, only six of the nine control group members completed all post-assessments. Despite several text messages, phone calls and a schedule of possible dates for the assessment, they failed to attend. Participants consisted of under- and postgraduate students between the ages of 19 and 36 years. Seventeen were white and one coloured. The Tomatis programme was conducted in an area designed and equipped for group and individual listening purposes within the Institute for Psychotherapy and Counselling.

Procedure

Permission for the study was granted by the Ethics Committee of the Faculty of Health Sciences of North-West University. Participants provided individual written informed consent. Two stimulation phases of 60 half-hour sessions were conducted over two periods of three weeks each, interspersed by a break for neurological integration of three and a half months.

During Phase One, experimental participants spent a total of 30 hours passively listening to CD's with Mozartian music, alternated with Gregorian chants, while just relaxing, talking informally to each other, drawing, or playing board games. During Phase Two, they listened individually to a 9-CD series of English words and texts, each progressively filtered to develop their ability to perceive language sounds accurately. During a space between words and phrases on the CD's, participants had to repeat the word or phrase into a microphone while maintaining an upright posture. They received feedback via air and bone conduction. In this way their right ears were progressively stimulated as well as the language areas in the left hemisphere, thereby strengthening their right auditory pathways to the brain. At completion of these language CD's, provided by *Tomatis Développement* in Luxembourg, the participants continued to read aloud in similar fashion from books of their choice. Post-assessment occurred within one month post-programme and quantitative data was scored and analysed by the University's Statistical Consultation Services.

Measures

Interpreting Performance Evaluation (IPE). Pre-post evaluation was conducted by a 'blind' panel of four: three interpreting experts and a speech therapist. Performance was evaluated on the South African Translators Institute's (SATI) internationally acknowledged 10-scale assessment grid for simultaneous interpreting. The grid is also used for the South

African interpreting accreditation examinations and applied for educational interpreting evaluation at the North-West University. Scales included:

(i) accuracy and coherence of message; (ii) target language vocabulary and register; (iii) target language grammar, idiom and purity; and (iv) interpreting technique (fluency of delivery, voice quality and booth behaviour).

In this study a high degree of homogeneity in the ratings of each scale by each rater was obtained. A mean item alpha reliability of 0.97 and inter-rater reliability of 0.90 were obtained. Inter-item Cronbach alphas ranged between 0.95 and 0.96 and inter-rater reliability between 0.84 and 0.92.

Wechsler Adult Intelligence Scale (WAIS III). Two subtests of the WAIS III (Kaufman & Lichtenberger, 1999) were used, namely Digit Span and Letter-Number Sequencing; these subtests form part of the Verbal Comprehension Index. Digit Span measured: working memory; attention; concentration; conceptual tracking; short-term acquisition and retrieval; and sequential auditory processing. Letter-Number Sequencing measured: working memory; attention; concentration; conceptual and executive skills; fluid intelligence; visualization; short-term acquisition; and sequential processing. These scores rendered information on participants' abilities to perceive stimuli passively, sustain attention span and concentration, track concepts and monitor their own functioning, as well as their proneness to anxiety, distractibility and negativism.

WAIS III, standardised for the entire South African population, is a reliable test with outstanding standard errors of measurement and high reliability coefficients. Split-half reliability is 0.90 for Digit Span and 0.82 for Letter-Number Sequencing, and test-retest reliability is 0.82 for Digit Span and 0.75 for Letter-Number Sequencing (Kaufman & Lichtenberger, 1999). The Pearson correlation coefficients for this study were 0.02 (correlation between pre- and post-test scores for both subtests), 0.07 (correlation between

post-test scores of subtests), and 0.00 (correlation between pre-test scores of subtests). These correlations can be interpreted as sufficiently high concurrent reliabilities.

NEO Personality Inventory Revised (NEO PI-R). The NEO PI-R (a 240-item, self-report scale) was developed by Costa and McCrae (1992) to measure five broad domains of normal personality, namely: Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), and Conscientiousness (C), each consisting of six subscales or facets of personality.

Although not standardized in South Africa, the NEO PI-R was found to be valid and reliable on a number of populations. Reliability indices of the domains range from 0.86 to 0.92, while the reliability of the subscales range from 0.56 to 0.81 (Costa & McCrae, 1992). Chronbach alphas for South African populations were lower than those of Americans (Costa & McCrae, 1992), ranging from 0.69 to 0.83 for the abovementioned, and with all the Chronbach alphas for subscales having lower reliability indices than that proposed by Costa and McCrae (Van der Walt, 1996). In this study Cronbach alphas for domains ranged between 0.79 and 0.90, whereas reliability indices for subscales ranged between: N (0.86 and 0.90), E (0.80 and 0.86), O (0.72 and 0.82), A (0.75 and 0.78), and C (0.69 and 0.82).

Profile of Mood States (POMS). McNair, Lorr & Droppelman (1992) developed the POMS, a 65-item five-point adjective rating scale, developed as a “. . . rapid, economical method of identifying and assessing transient, fluctuating affective states” (McNair et al., 1992, p.1). The POMS measures six identifiable mood or affective states: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigour-Activity, Fatigue-Inertia and Confusion-Bewilderment. In this study, the Tension and Vigour factors was of special importance.

Alpha coefficients obtained by McNair et al. (1992) ranged from 0.78 to 0.93. Although not standardized for South African populations, a mean Cronbach alpha reliability index of 0.72 was found in two Tomatis-related South African studies (Du Plessis et al., 2001) and a mean Cronbach alpha of 0.71 obtained in this study indicated good reliability.

Focus groups with experimental participants. Focus groups, “a form of group interview that capitalises on communication between participants to generate data” (Kitzinger, 1995, p.299) were used pre-, in- and post-programme to enlighten the researcher about participants’ subjective accounts of the Tomatis programme and the educational interpreting process. At the pre-programme focus group, the introductory, open-ended question: “How do you experience the educational interpreting process?” was asked in order to clarify participants’ interpreting context and experience. At the second focus group interview, towards the end of the first phase of the programme, they were asked: “How have you experienced the Tomatis programme so far, and what is your experience of the interpreting process now?” This question was repeated during a third focus group discussion at the end of the second phase.

Data Analysis

Quantitative data analysis. The SAS System for Windows Release 9.1 (SAS Institute Inc., 2003) was used for statistical analysis. Pre-post differences within and between groups were determined by non-parametric statistics, using the Mann-Whitney Test and Willcoxon Sign Rank Test respectively. Descriptive statistics and Cronbach Alpha reliability indices were computed for each scale and/or subscale and inter-rater reliability was determined for the Interpreting Performance Evaluation. Paired t-tests were performed to compare pre-post-means within each group. Using the GLM Procedure of SAS, analysis of covariance (ANCOVA) was performed to compare post-test means of the two groups, first correcting for possible differences between groups at pre-assessment. For the POMS, a repeated measures analysis of variance was implemented to determine within-subject effects. Pre-test scores were subtracted from post-test scores in all cases, except the POMS, where post-test scores were subtracted from pre-test scores. Statistical significance was measured by

means of p-values. Practical significance was excluded as statistically significant differences in small groups suggest practical significance.

Qualitative data analysis. The experimental group's qualitative data was explored by the researcher, as well as a senior psychologist experienced in qualitative studies, by means of thematic content analysis; "a method for identifying, analysing and reporting patterns (themes) within data" (Braun & Clarke, 2006, p.79). Braun and Clarke's (2006, p.87) phases of thematic analysis were followed by reading and re-reading data, generating initial codes across the entire data set, collating codes into potential themes, gathering data relevant to each potential theme and generating a thematic 'map' of the analysis. The last phase involved generating clear definitions and names for each theme.

Trustworthiness

By adopting strategies proposed by Shenton (2004), Guba's model of trustworthiness (Krefting, 1991), consisting of four criteria, was used to ensure methodological rigour. *Credibility* was ensured by using well-established research methods, i.e., thematic content analysis and triangulated methods of data gathering. *Transferability*, i.e., the extent to which findings can be applied to other situations, was met by ensuring that sufficient contextual information about fieldwork and detailed descriptions of phenomena were provided to enable readers to transfer findings to other situations. *Dependability* was ensured by using "overlapping methods" (Shenton, 2004, p.71), i.e., using both focus groups and field notes to gather qualitative data. *Confirmability* was met by using more than one researcher for data analysis to ensure that findings were, as far as possible, the results of the experiences of the participants, rather than characteristics and preferences of the researcher.

Ethical Considerations

This study was part of the project "An exploration of enabling contexts" for which ethical approval was granted by the Ethics Committee of the North-West University

(clearance number 05K14). Informed consent was obtained from all participants and information communicated included aims of the research project, expectations from prospective participants, use of data for research purposes, termination of study participation, confidentiality, risk factors, accountability, and inquiries. Participants were informed about the stages of the Tomatis programme as well as its potential impact.

Results

Quantitative Results

In Table 1 the profile of the experimental and control groups is portrayed. Group similarities and differences, evident on the profiles, will be elaborated upon in the discussion of results.

<Insert Table 1 here>

In Table 2 the significance of pre- and post-programme differences within the experimental group is provided with regard to the Interpreting Performance Evaluation (IPE), WAIS III, and NEO-Personality Inventory (R) (NEO-PI R).

<Insert Table 2 here>

In the case of the IPE a statistically significant increase occurred on the Target Language Grammar, Idiom and Purity subscale ($p=0.04$). In the NEO-PI(R) statistically significant increases occurred with regard to: Self-Consciousness ($p=0.01$), Vulnerability to Stress ($p=0.04$), Positive Emotions ($p=0.01$) and Actions ($p=0.01$). In contrast, there was a statistically significant reduction in Feelings ($p=0.04$) and Dutifulness ($p=0.02$) facets.

Table 3 shows the significance of pre-post differences within the control group regarding the IPE, WAIS III, and NEO-PI (R) is indicated.

<Insert Table 3 here>

Statistically significant increases in the IPE were noted on the following subscales: Target Language Vocabulary and Register ($p=0.00$), Target Language Grammar, Idiom and Purity ($p=0.00$), Interpreting Technique ($p=0.05$), and Overall Interpreting Performance ($p=0.00$). With regard to WAIS III, a statistically significant reduction occurred on the Letter Number Sequencing subscale ($p=0.03$). The NEO-PI(R) indicated reductions on the Activity ($p=0.01$) facet of Extraversion and Actions ($p=0.01$) facet of Openness which were statistically significant. A statistically significant increase occurred on the Dutifulness ($p=0.05$) facet of Conscientiousness.

In Table 4 the significance of differences between the experimental and control group at post-assessment, adjusted for pre-assessment differences, with regard to the IPE, NEO-PI (R), and WAIS III, is provided.

<Insert Table 4 here>

During the post-assessment of IPE, the experimental group scored higher than the control group on the Interpreting Technique subscale ($p=0.05$) to a statistically significant degree. In the NEO-PI(R), the experimental group exceeded the control group to a statistically significant degree with regard to Extraversion ($p=0.04$) and its Activity facet ($p=0.01$). The control group exceeded the experimental group in the Feelings facet ($p=0.00$) of Openness.

In Table 5 the significance of pre-, in-, and post-programme differences in the POMS, within the experimental group, is provided.

<Insert Table 5 here>

The POMS showed a statistically significant reduction in Fatigue-Inertia at both in- and post-programme assessment ($p=0.01$ and $p=0.05$ respectively). Tension-Anxiety and Confusion-Bewilderment showed reductions close to the 5% level of significance for the post-programme assessment ($p=0.06$). In Table 6 the univariate test of hypothesis with regard to the POMS, for effects within the experimental group, is provided.

<Insert Table 6 here>

A statistically significant increase from pre- to in-programme and from pre- to post-programme assessment occurred between various means of the experimental group on the Fatigue-Inertia subscale ($p=0.02$). Also, Total Mood Disturbance had a decrease close to the 5% level of significance with $p=0.06$.

Graph 1 shows the mean scores of the experimental group on the POMS.

<Insert Graph 1 here>

Graph 1 indicates the formation of the Iceberg Profile obtained as a result of reductions in Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia and Confusion-Bewilderment, and a tendency towards increased Vigour-Activity.

Qualitative Results

The qualitative analysis emerging from three focus groups rendered five themes, each differentiated in terms of categories and sub-categories. Appropriate verbatim quotations are provided as validation.

Experiences associated with relaxation. This theme encompasses participants' experiences of relaxation during and after the Tomatis programme and constituted the most prominent theme, as it was articulated most frequently. Almost all participants experienced an increase in relaxation after listening sessions and in some cases a positive influence on sleeping patterns, tension and energy levels.

Lower tension levels refer to participants feeling less stressed and 'uptight' than before. One participant experienced reduced tension in his interaction with people: *Especially on an interpersonal level, I feel my tension levels were much lower after the Tomatis programme. I think this is also why I will communicate much more readily with other people.* Another participant experienced reduced tension in the interpreting context:

These days I find I am much more relaxed. I don't stress anymore, it's sort of like I am much calmer and I think if you are calm you do a better job than when you stress and grapple with the words.

Higher energy levels can be explained due to participants feeling more refreshed and energetic after Tomatis sessions: *The Tomatis sessions are very relaxing and I also felt that it is very good because you feel more energetic afterwards, you feel refreshed, so yes, I enjoyed it very much.* Another participant experienced enhanced energy in the interpreting context: *Where previously I tired easily when sitting in a class, I can now interpret for longer without getting tired so quickly.*

Healthier sleeping patterns refer to participants' experience of positive changes in quality of sleep and ease in falling asleep. One stated: *I developed a very good sleeping*

pattern. I fall asleep every night at the same time. I am able to fall asleep without any trouble. Another agreed: When I go to bed at night and it's quiet and I close my eyes, I hear the music and fall asleep much quicker and I must say I wake up a lot easier too.

Improved interpreting efficiency. This theme comprises perceived enhancements in efficient interpreting due to improved concentration and attention during the interpreting process, and subsequent improvements in the amount of effort required to interpret the lecture message into English.

Improved concentration refers to participants' experience of being able to concentrate and focus more effectively for longer periods of time, both in interpreting and study contexts. One interpreter's improved concentration resulted in productivity during studying: *I do more in a shorter amount of time. Where I usually would have spent time daydreaming or something, I now work more, just work, without distractions.* Another participant experienced improved concentration when focusing attention on sound: *It doesn't tire me anymore when I concentrate the whole time. I think my concentration has improved in the sense of sound perception.*

More effortless interpreting implies that interpreters require less effort than usual to interpret the source message due to improvements in energy and concentration during the simultaneous interpreting process. One participant explained this as follows:

Suppose you have ten concentration points and you have to spend two of them on listening, suppose you have to spend two of them to process it in your head, you have to spend two of them to speak and, you know, various things on which you have to concentrate. And if a lecturer speaks unclear or something like that, you have to spend a few extra points on listening and that exhausts you. Now [after completion of the Tomatis programme] you sort of have points left, so I think we work more effectively . . . or the whole process is easier now.

Another participant remarked:

I also feel that my interpretation is more fluent, that it is less halting. See, sometimes a lecturer can start talking very fast and in the past it took a lot more effort to keep up and I feel I have started to interpret that better; that less is lost and that I keep up better and that I apply my coping mechanisms better in a situation like that.

Improved speech production. This theme refers to participants' perceived improvements in vocal production as a result of audio-vocal training during the second phase of the Tomatis programme.

Improved self-regulation of speech refers to the experience of enhanced self-evaluation of speech that allows the interpreter to make vocal adjustments so that flaws in speech can be corrected and pronunciation and accent improved. One interpreter explained:

I think that's one of the things from which we all benefited. You heard how you sound; you heard actively how you sound, not like a recorder afterwards. You hear how you sound on the spot and then you can correct it.

Improved vocal confidence was reflected by participants perceiving themselves as more comfortable with their own voices as a result of self-listening and getting used to their unique voice quality:

I am not ashamed of my own voice anymore. Because I heard it so much in my own ears all the time, I sort of got used to it and even though I didn't make peace with it, I am not shy about my voice anymore.

More controlled whispering refers to the improved ability to interpret in a clear, low voice so as to not disturb the lecturer and without articulating too softly or being unclear to recipients. Participants felt that they were better able to balance the whispering technique after the TM: *It's sort of easier to pronounce words better, softer. It is easy to mumble if you have to talk in a soft voice, but now it is sort of easier to talk softly, but still talk clearly.*

Improved listening skills. Participants reported enhanced hearing and listening during and after attending the Tomatis programme. One of the improvements in listening included that interpreters were able to hear sounds further away in class and in informal contexts: *I can hear people further away in class. If they say something there at the back, I can actually hear them these days.* Some participants noticed an improvement in listening comprehension, enabling them to listen more effectively to students in the class setting:

I found that previously I often struggled to hear a student's question in class, because they simply don't talk clear enough so that you can hear what they say. But nowadays it is easier for me to recognise what they say and to interpret it.

Personal enrichment. This theme refers to participants' perceptions of positive changes that occurred in their personal lives, outside the interpreting context. They seemed to experience enhancement in certain aspects of their personalities, as well as improvements in interpersonal communication.

Improved interpersonal skills refer to enhancements in some participants' spontaneity, warmth and approachability towards other people. One participant commented on another's perceived change in the desire to communicate: *Previously you had to approach her to talk with her, but now it's sort of the other way around.* One participant remarked:

I noticed that my spontaneity has increased a bit, possibly. I will be more friendly with strangers which I feel is perceived to be an asset for me as well, that I am a bit warmer towards people that I do not know.

Enhanced personal strengths refer to participants' experience that some of their personal strengths have been enhanced: *In my personal life and in my personality and my self-confidence I can see definite changes, and I will say that my sense of humour has improved a bit.* The same participant seemed to be more in touch with her psychological needs: *I think I'm more in touch with myself, with my inner voice, with my own needs.* One

participant reported enhanced creative thinking: *I think one of two things: either it made me more creative or it enabled me to express my creativity better, but I feel that I actualise my creativity better.*

Discussion

Despite random selection the profiles of study participants in Table 1 reflected an unanticipated advantage of the control group over the experimental group in terms of age (two years older); interpreting experience (21 vs. 19 months, respectively); and appointment status (five vs. one fulltime interpreters, respectively). Since full-time interpreters were allowed opportunities to interpret outside the tertiary environment, they inevitably accrued more experience and confidence during the study period than the experimental group.

The resignation of two experimental participants from interpreting for academic reasons well ahead of post-assessment, at the beginning of the second semester, inevitably also impacted negatively on their post-interpreting performance evaluation. Yet, despite these inter-group discrepancies the experimental group's functioning was enhanced to such an extent that they outperformed the control group on several crucial outcomes, in all likelihood due to the impact of the TM.

With regard to the Interpreting Performance Evaluation, within-group differences showed improvements in one subscale in the experimental group and four subscales in the control group. Presumably, the higher number of improvements in the control group might be due to the so-called 'practice effect' as they were able to gain more interpreting exposure prior to post-assessment.

Regarding Interpreting Technique, pre-post between-group differences showed a significant difference in favour of the experimental group. However, to attain a satisfying interpreting product all four subscales needed to be integrated. Although not statistically significant, the experimental group also outperformed the control group on all other criteria

except Target Language Vocabulary and Register, proving an improvement in their overall interpreting performance. According to the assessment grid for simultaneous interpreting, enhanced Interpreting Technique indicated improvements in (i) fluency of delivery, e.g., little or no hesitation or backtracking; (ii) ability to vary following distance; and (iii) voice quality, e.g., voice and breath control and distance from microphone. These findings resonated with the group's subjective experiences of improved speech self-regulation, vocal confidence and controlled whispering reflected in the focus group statements. Improvements could be attributed to the active phase of the TM; during which their voices were fed back to their ears via air and bone conduction and presented in a way that is designed to enhance voice quality and encourage audio-vocal self-control.

Experimental participants' perceived improvements in concentration might also have impacted interpreting efficiency. According to them, it decreased the efforts required during interpreting, thus enhancing fluency and confirming the tightrope hypothesis of Gile's Effort Model (Gile, 1999). Clearly the stimulation of neurological connections via the ear, as a consequence of listening to filtered music, had a positive outcome on attention and concentration, increasing the total available interpreting capacity. Also, participants' positive feedback about more effective listening might have added to improved interpreting by reducing the effort required during listening comprehension.

Csikszentmihalyi's (1975) concept of 'flow' might be applied in explaining the interaction between improvements in interpreting and concentration. During the flow state the person is aware of the action that is taking place, but not of the awareness itself and experiences a flowing from one action to the next, while maintaining a sense of control over the actions. The task becomes enjoyable, anxiety is reduced and confidence enhanced. Interpreting becomes a flow activity when increased concentration, as reported by the experimental group,

results in attention being centred on the interpreting task, making them more engaged and focused; to such an extent that flowing is maintained and speech becomes more fluent.

With regard to the WAIS III, which measured attention, concentration and memory, no statistically significant increases occurred between-groups, which is quite normal since WAIS III is an index of IQ whose compounds are known to be generally stable. The control group experienced did however experience a statistically significant decrease in Letter Number Sequencing, possibly due to increased tension and fatigue towards the end of the academic year. The fact that the experimental group didn't show the same decrease in scores might be explained by their reduced negative mood states as indicated by the POMS Ice Berg Profile, and consistent reports of the relaxation effect of the TM.

The TM also seemed to impact experimental participants' personalities, as evidenced by their qualitative responses, and these findings were closely linked to their interpreting experiences. Since many life experiences might influence aspects of participants' personalities, findings need to be interpreted with caution. Within the experimental group, enhanced Positive Emotions and Actions facets (preference for novelty and variety) confirmed their statements of generally feeling less uptight and inhibited. Increased Self-Consciousness might imply that participants became more aware of themselves due to the process of self-listening as part of the active phase of the programme. Increased Vulnerability to Stress scores contrasted with their feedback during focus groups regarding feeling more relaxed and in control of stressful interpreting situations. Decreased Dutifulness might be explained by their statements of feeling less tense and uptight, possibly leading them to relax the effort of fulfilling their duties.

In the control group, decreases in Activity and Actions facets might suggest increased levels of fatigue and lack of enthusiasm towards the end of the year as a result of accumulated stress and pressure in the interpreting environment. Increased Dutifulness could

possibly be explained by referring to the higher number of full-time interpreters in the control group, who had more interpreting obligations throughout the year than the part-time interpreters, which might have contributed to enhanced sense of dutifulness.

Between-group differences also showed enhanced Extraversion in favour of the experimental group, suggesting that the TM brought about positive changes in their tendency to be more outgoing, assertive, active, talkative, cheerful, energetic, and optimistic (Costa & McCrae, 1992). This was consistent with their feedback regarding improved interpersonal spontaneity, arguably due to listening sessions that ‘opened them up’ to communicate more freely. The increase regarding Extraversion’s Activity facet could be seen as “rapid tempo and vigorous movements, in a sense of energy, and in a need to keep busy” (Costa & McCrae, 1992, p.17). These findings corroborated participants’ perceptions of an increased sense of energy. Enhanced Vigour-Activity and decreased Fatigue-Inertia in the POMS, which could be explained by the energizing effect of the TM’s musical and vocal sounds rich in high frequency, further strengthened these findings. In contrast to expected increases in the Feelings facet of Openness in the experimental group, the control group tested significantly higher in this facet. The control group’s higher scores might be attributed to various life experiences, which could have influenced their emotional awareness, variety and intensity.

In the experimental group, reductions in negative mood states and elevations in Vigour-Activity, a positive mood state, confirmed the hypothesis that the Tomatis programme would positively impact their emotional states. The Iceberg Profile attained in- and post-programme showed the positive changes in subjective experiences of their moods, as a response to high frequency stimulation and the cortical re-energizing effect of the TM, and thus resonated with similar findings in other Tomatis-related studies (Du Plessis et al., 2001; Vermeulen, Du Plessis & Kirsten, 2004; Akakios, 2001). These findings converged with their feedback during focus groups of feeling more energetic, relaxed and lively after

attending listening sessions. Increased energy, Vigour, Extraversion and Activity corroborated participants' experiences of enhanced personal strengths, i.e., self-confidence, creativity, improved interpersonal skills, and spontaneity. These changes associated with personal growth emphasized the diverse impact of the TM on crucial aspects of individuals' functioning. Clearly, these experiences also extended to the interpreting process. Reduced negative feelings and fatigue seemed to enhance their interpreting efficiency, rendering the entire process less stressful and leading to increased competence.

Finally, the most significant observation during the course of the study pertained to the enthusiasm and perseverance with which experimental participants attended listening sessions: whether early in the morning, around lunch, at night or during weekends. Irrespective of anticipated outcomes, this already suggested a positive force in progress despite their packed academic and interpreting schedules further being complicated by the programme demands.

Limitations

Limitations of this study are, firstly, that sample size was restricted to nine experimental participants, due to the limited number of Electronic Ears available. Although adequate for qualitative research, the sample size remains too small to perform more complex statistical calculations.

Secondly, the control group did not complete the POMS assessment due to non-availability of participants, leaving a gap in the comparison of mood states. Although efforts were made to contact participants in this regard, their tight interpreting schedules made it difficult to attend all the tests.

Since the effect of the TM may only peak months after programme completion, a follow-up ought to have been included. However, as some members of both groups

completed their studies at the end of 2009 this was impossible and, thus, results may not reflect the true impact of the TM.

Conclusion

Qualitative study outcomes confirmed that the experimental participants experienced an improvement as interpreters, as evidenced by experiences associated with relaxation and improved interpreting resources, improved speech production and improved listening skills, even though only attaining quantitative improvement on one of four aspects of interpreting performance. Additionally, they experienced statistically significant personality enrichment in terms of Extraversion, augmented by corresponding qualitative evidence of being more at ease. The beneficial impact of the TM was thus extended beyond its traditional clinical context to that of educational interpreting, though replication remains essential. The importance of this study lies in its contribution to interpreters' performance and well-being, thereby enhancing the multilingual environment at the NWU.

Recommendations

Future research should include in-class evaluations by student users of interpreting services, and interpreters should preferably be evaluated in subjects usually interpreted by them to minimize variables in the Interpreting Performance Evaluation.

Post-programme Listening Tests could also be included to determine changes in listening aptitude, which could add valuable feedback about subtle changes associated with the Tomatis listening programme.

Future investigations should aim to increase existing knowledge in the relatively new field of simultaneous interpreting at tertiary level in order to help interpreters cope with its high cognitive demands.

The ultimate challenge remains to enable interpreters from different cultural backgrounds to attain their full potential as educational interpreters, so that students can

receive lectures in their mother tongue, and in this manner multiculturalism and multilingualism at tertiary level will be advanced even further.

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Table 1

Profile of experimental and control group participants.

	Experimental Group	Control Group
Gender:	Male: 4	Male: 5
	Female: 5	Female: 4
Mean Age:	24 years	26 years
Home Language*:	Afrikaans: 4	Afrikaans: 8
	Bilingual (Eng/Afr): 5	German: 1
Mean Interpreting Experience:	19 months	21 months
Appointment Status:	Full-time: 1	Full-time: 5
	Part-time: 8	Part-time: 4
Study Degree:	Pre-graduate: 4	Pre-graduate: 4
	Post-graduate: 5	Post-graduate: 5
Resignations during 2009:	2	None

*Although participants identified these as their mother tongue languages, all 18 participants were fluent in both Afrikaans and English, and thus bilingual.

Table 2

Significance of pre-post test differences for IPE (n=9), WAIS III (n=8) and NEO PI(R) (n=9) within the experimental group.

Dependent variable	Min	Max	M-diff	SD-diff	t	p
IPE						
Accuracy and coherence of message	-0.42	1.88	0.38	0.76	1.49	0.16
TL vocabulary and register	-0.95	1.08	0.12	0.59	0.62	0.55
TL grammar, idiom and purity	-0.12	1.96	0.50	0.61	2.45	0.04*
Interpreting technique	-0.08	2.17	0.47	0.76	1.87	0.1
Overall IP	-0.11	1.77	0.37	0.59	1.88	0.1
WAIS III						
Digit span	-2	5	0.75	2.61	0.81	0.44
Letter number sequencing	-3	4	0.25	2.55	0.28	0.79
NEO_PI(R)						
N4_Self-consciousness	-2	5	2.33	2.12	3.30	0.01*
N6_Vulnerability to stress	-1	4	1.33	1.66	2.41	0.04*
E6_Positive emotions	-1	3	1.44	1.24	3.51	0.01**
O3_Feelings	-3	0	-1.11	1.36	-2.44	0.04*
O4_Actions	-1	3	1.67	1.41	3.54	0.01**
C3_Dutifulness	-5	0	-2	1.94	-3.10	0.02*

Note. TL: Target Language; IP: Interpreting Performance; Min: minimum difference; Max: maximum difference; M-diff: Mean difference (post mean-pre mean); SD-diff: standard deviation of difference; t: test statistic; p: statistical significance;

* $p \leq 0.05$, ** $p \leq 0.01$

Table 3

Significance of pre-post test differences for IPE (n=9), WAIS III (n=6) and NEO PI(R) (n=7) within the control group

Dependent variable	Min	Max	M-diff	SD-diff	t	p
IPE						
Accuracy and coherence of message	-0.33	0.88	0.24	0.36	2.03	0.08
TL vocabulary and register	-0.04	0.83	0.41	0.31	4.07	0.00**
TL grammar, idiom and purity	-0.04	0.75	0.34	0.24	4.35	0.00**
Interpreting technique	-0.04	0.75	0.22	0.28	2.36	0.05*
Overall IP	0.00	0.76	0.30	0.22	4.15	0.00**
WAIS III						
Digit span	-1.00	3.00	1.00	1.41	1.73	0.14
Letter number sequencing	-5.00	0.00	-2.33	1.86	-3.07	0.03*
NEO_PI(R)						
E4_Activity	-7.00	-1.00	-3.00	2.08	-3.81	0.01**
O4_Actions	-5.00	-1.00	-2.57	1.72	-3.96	0.01**
C3_Dutifulness	-3.00	-1.429	1.51	1.94	-2.50	0.05*

Note. TL: Target Language; IP: Interpreting Performance; Min: minimum difference; Max: maximum difference; M-diff: Mean difference (post mean-pre mean); SD-diff: standard deviation of difference; t: test statistic; p: statistical significance;

* $p \leq 0.05$, ** $p \leq 0.01$

Table 4

Analysis of covariance (ANCOVA) for IPE, WAIS III and NEO PI(R) of post-tests corrected for pre-test counts, to compare groups (df = 1)

Dependent variable	Type III SS	Adj. PM Exp.	Adj. PM Control	F	p
IPE					
Accuracy and coherence of message	0.32	7.38	7.11	2.17	0.16
TL vocabulary and register	0.08	7.16	7.30	0.51	0.49
TL grammar, idiom and purity	0.19	7.47	7.26	2.06	0.17
Interpreting technique	0.56	7.23	6.87	4.72	0.05*
Overall IP	0.13	7.31	7.13	1.67	0.22
WAIS III					
Digit span	0.50	11.83	12.22	0.10	0.76
Letter number sequencing	13.37	14.24	12.18	2.85	0.12
NEO_PI(R)					
Extraversion (E)	162.97	118.93	112.37	5.24	0.04*
Activity (E4)	32.34	19.26	16.38	9.58	0.01**
Feelings (O3)	21.02	24.86	27.18	13.63	0.00**

Note. TL: Target Language; IPE: Interpreting Performance Evaluation; df: degrees of freedom; Type III SS: Type III Sum of Squares; Adj. PM: Adjusted Post Mean; F: F statistic; p: statistical significance; * $p \leq 0.05$, ** $p \leq 0.01$

Table 5

Significance of pre-post test differences on the POMS within the experimental group

Dependent variable	Min	Max	M-diff.	SD-diff.	t	p
Tension-Anxiety_2	-14	7	0.22	6.32	0.11	0.92
Tension-Anxiety_3	-4	14	3.89	5.33	2.19	0.06
Depression-Dejection_2	-13	24	3.00	12.11	0.74	0.48
Depression-Dejection_3	-10	32	4.56	13.91	0.98	0.35
Anger-Hostility_2	-13	26	5.22	13.1	1.20	0.27
Anger-Hostility_3	-16	29	5.44	13.97	1.17	0.28
Vigour-Activity_2	-21	3	-4.33	6.91	-1.88	0.10
Vigour-Activity_3	-24	4	-5.78	8.98	-1.93	0.09
Fatigue-Inertia_2	0	14	6.00	4.69	3.84	0.01**
Fatigue-Inertia_3	-5	18	6.11	7.77	2.36	0.05*
Confusion-Bewilderment_2	-7	16	3.67	8.19	1.34	0.22
Confusion-Bewilderment_3	-3	14	4.22	5.78	2.19	0.06
Total Mood Disturbance_2	-20	80	24.78	36.22	2.05	0.07
Total Mood Disturbance_3	-25	103	32.33	46.84	2.07	0.07

Note. Tension Anxiety_N represents the contrast between the Nth level of the variable

Tension-Anxiety and the first level. Min: Minimum difference; Max: Maximum difference;

M-diff: Mean difference (pre-mean, post-mean); SD-diff: Standard deviation of difference; t:

test statistic; p: statistical significance;

* $p \leq 0.05$, ** $p \leq 0.01$

Table 6

Repeated Measures Analysis of Variance on the POMS (df = 2 & 16)

Dependent variable	Error Mean	Mean Square	F	p
Tension-Anxiety	18.84	42.93	2.28	0.14
Depression-Dejection	68.43	48.26	0.71	0.48
Anger-Hostility	73.49	85.44	1.16	0.33
Vigour-Activity	24.87	81.37	3.27	0.09
Fatigue-Inertia	20.91	110.04	5.26	0.03*
Confusion-Bewilderment	19.12	47.37	2.48	0.15
Total Mood Disturbance	712.04	2564.7	3.62	0.06

Note. df: degrees of freedom; F: F statistic; p: statistical significance;

* $p \leq 0.05$, ** $p \leq 0.01$

Graph 1

Pre- in- and post-programme mean scores on the Profile of Mood States for the experimental group (n=9)

