COMMUNICATION IMPROVEMENT THROUGH MUSIC: THE CASE OF CHILDREN WITH DEVELOPMENTAL DISABILITIES

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This paper investigates the effect of music on the communication improvement of children with developmental disabilities. Forty subjects (18 boys and 22 girls) 7-12 years old, were divided into an experimental group (n = 20) which participated in music therapy activities and a control group (n = 20) which was discussing and watching television, both for one hour. The State-Trait Anxiety Inventory Scale for children was used to measure state and trait anxiety respectively. In addition, heart rate response to music therapy was monitored for assessing probable music therapy effect. Findings from paired t-tests revealed that the State Anxiety Inventory Scale score was significantly influenced by the music therapy ($t=5.36$, $p<0.001$) as well as it was not significantly influenced by the discussing and watching television session ($t=1.02$, $p>0.05$: NS). Besides, heart rate alteration analysis revealed that music therapy helps calm young children with developmental disabilities. Consequently, music therapy could lead not only to significant improvements in young CWDD's psychological and physical well-being but also could produce mental benefits, and should constitute a part of therapeutically programs that aim both to the improvement of young CWDD's psychological state and quality of life.

By all odds, music has the power to adjust and channel the collective consciousness of massive groups of people and no one can easily underestimate that music is one of the most prominent relaxing and entertaining activities. It is amazing to notice that, even in the days of philosophers like Plato and Aristotle, they had a profound understanding and respect for the tremendous influence that music can have on its listeners. Plato, for example, observed the effect that music had on society and made this thought provoking statement *When the modes of music change, the fundamental laws of the state change* (Jowett, 1888, p.4) while Aristotle's view was that *Music has the power to form character* (Sinclair & Saunders, 1981, p. 13).

Nowadays, some of the above theories of yesterday may seem somewhat exaggerated. However, as one continues studying, the logic of old great thinkers may start to make plenty of sense today. For example, as Kissinger & Worley (2008) explain, music can be employed as a communication improvement channel for therapeutic or pedagogic reasons, especially for children with developmental disabilities (CWDD). In particular, for children with autism (CWA), music offers a potentially alternative to traditional communication channels.

Music therapy has been defined as *a form of psychotherapeutic treatment where the therapeutic relationship is used to decrease psychic problems, conflicts and disturbances of the client* (Schalkwijk, 1994, p. 5) or as *a systematic process of intervention wherein the therapist helps the client to promote health, using music experiences and the relationships developing through themas dynamic forces of change* (Bruscia, 1998, p. 13). Therefore, music may fill an important gap working as a special type of psychotherapy where forms of musical interaction and communication are used alongside verbal communication.

Several systematic reviews and meta-analyses have been conducted to examine the effects of music therapy in the field of mental health or communication improvement of CWDD (Dileo & Bradt, 2005; Gold, Heldal, et al., 2005; Gold, Voracek, & Wigram, 2004; Gold, Wigram, & Elefant, 2006; Koger, Chapin, & Brotons, 1999; Maratos, Gold, Wang, & Crawford, 2008; Pesek, 2007; Silverman, 2003; Vink, Birks, Bruinsma, & Scholten, 2003). Many of these reviews and studies have found promising results; however, the quality of the included studies varied. As well as, promising results, applying rigorous study selection criteria, have been found in a recent study focused on the feasibility of using the concert harp as a communication channel for CWA (Kissinger & Worley, 2008).

In psychotherapeutic methods such as music therapy, the term *dose* or *dosage* clearly must be understood metaphorically, not literally. In this direction, Howard, Kopta, Krause, & Orlinsky (1986) have argued that the number of music therapy sessions has been widely accepted as a measure of *dose* opening a discussion on whether the dose relationship in music therapy is linear, or whether the first sessions have a greater influence than subsequent sessions. In addition, the same paper sustains that although a therapy model's proposed active ingredients (such as interpretations, empathic reflections, etc.) might be considered as the most theoretically coherent *unit of treatment*, these are not easy to measure. However, the number of therapy sessions a patient has received is most likely correlated to a patient's exposure to those ingredients and can therefore be used as a readily available proxy measure.

To date, this discussion is still ongoing, and therefore the present study aims at examining both possibilities. In addition, the purpose of this paper is to examine the effect of music therapy on the communication improvement of CWDD by measuring the heart rate not only *ex-ante* and *ex-post* the music therapy session, but also in the middle of it. On the other hand, the State-Trait Anxiety Inventory for children (STAIC; Spielberger et al., 1973) was used, for the measurement of subjects' anxiety. All subjects, from both groups, completed the STAIC scale, alone or with their parents' collaboration. For trait anxiety subscale once, just about twenty minutes before the music therapy or watching television session and for the state anxiety subscale twice, just about twenty minutes before and just after the above procedure.

Method

Sample

CWDD from five different European countries (Greece, France, Germany, Cyprus and Italy) were examined. Using a lottery-wheel, we randomly selected two special schools and 20 children (subjects) from each country (ten form each school) who fulfilled the inclusion criteria such as participating only in one music therapy program and having developmental disabilities. Afterwards, communication was made with each one of the selected subjects with regard to the research aims. In addition, a written informed consent was obtained from the parents of each child in order to participate in the research. Before the beginning of the research it could be certified that all the children do not suffer from any unusual disease and that they do not take any unusual medication. Additionally, their parents asked to answer a questionnaire about their personal medical history and any special health problem, while a research assistant and a special pathologist were present in order to give any extra clarifications. Finally, 60 subjects who were found to fulfil the exclusion criteria that is parental agreement, unusual health problems, unusual medication and extra participation in other research programs, were excluded from the research.

A total number of 40 children (18 boys and 22 girls), ranging from 7 to 12 years of age (mean=9.8 and standard deviation=1.7), volunteered to participate in the research. All of the subjects had developmental disabilities. In particular, 26 of them had Down syndrome, four had Fragile X syndrome and the rest had Autism Spectrum disorders. They were, then, divided into an experimental group; (A) which participated in music therapy activities (MT) and a control group (B) which was discussing, playing, having fun, enjoying them-selves or watching television (WT). However, the control group was matched in all respects with the experimental one except for the participation in the MT program, which is the factor, who has been willing to investigate.

Procedure

Before the beginning of the research, a presentation of the main aims and a brief description of the general requirements were given to the parents of the selected children. In addition, psychological instruments and instructions were presented and explained in detail for each one of them. Moreover, an approval for the conduct of the research was given from the committee of each institute, where the children were members, after the aims and the design of the research were described and after the

certification that the procedures were in agreement with the ethical standards of the Declaration of Helsinki (World Medical Association, 2000).

Then, the subjects of the group A participated in a MT program while the subjects of the group B were asked to stay in a separate room, free to discuss with each other, play or watch television. The duration of the above procedure was sixty minutes for both groups and repeated five times in total during a two months period.

Scales of measurement

The STAIC was used, for the measurement of anxiety. It is comprised of separate, self-report scales for measuring two distinct anxiety concepts: state anxiety (S-Anxiety) and trait anxiety (T-Anxiety). Both S-Anxiety scale (SAIC) and T-Anxiety scale (TAIC) consist of twenty statements, each, that describe how respondents feel *right now, at this very moment*, and how respondents *usually feel*, respectively. The STAIC is similar in conception and structure to the State-Trait Anxiety Inventory (STAI), which provides measures of anxiety for adolescents and adults (Spielberger et al., 1970). Moreover, the STAIC was administered both to the children and parents prior to their completing a novel nonverbal task.

All subjects, from both A and B groups, completed the 40-item scale, alone or with their parents' collaboration. For trait anxiety subscale once, just about twenty minutes before the MT or WT session and for the state anxiety subscale twice, just about twenty minutes before and after the above procedure. Children respond to each item on a three-point rating scale, checking one of three alternatives that describes him or her best or indicates frequency of occurrence. The score of each subject ranges from 20 to 60 degrees according to the above three-point rating subscale. Children generally require eight to twelve minutes to complete each subscale, and less than twenty minutes to complete both.

In addition, heart rate (HR) response to MT was monitored for assessing probable MT effect. So, just before the MT session the special pathologist measured the subjects' baseline HR during two ten-second periods. Besides, the HR measurement repeated twice, in the middle of the MT session and just after the termination of the procedure.

Data analysis

SPSS V.16 for Windows was employed for both descriptive and multivariate statistical analysis of the dataset. Descriptive statistics was used in order to compare the MT effect between groups including means, standard deviations, paired *t*-tests and non-parametric tests. In particular, the non-parametric *Kolmogorov-Smirnov* test was used to evaluate the normal distribution of the sample and the paired *t*-test was used to evaluate significant differences between measurements, that is before and after the MT or the WT session, while the independent groups' t-test was used to evaluate significant differences between groups. According to the similar literature the level of significance was set to $p<0.05$ (Mavrovouniotis et al., 2009).

Multivariate statistical analysis of the groups' A dataset was used in order to classify the subjects and to determine possible relations between MT effect and personal or other characteristics of groups' A subjects. In particular, two-step cluster analysis (SPSS, 2007) was used to classify the subjects in discernible clusters in order to explore the reasons of different levels of SAIC scale measurement and different HR response to MT and a categorical regression model (Kooij & Meulman, 1997) was estimated to determine the relation between subjects' characteristics and STAIC scale measurement or HR. Finally, Reliability analysis (Bohmstedt, 1970; SPSS, 2007) was used to determine the extent to which the items are related to each other to get an overall index of the internal consistency of the scale as a whole, and to identify items that had to be excluded from the scale. Figure 1 (next page) presents the general methodological framework of data collection, statistical analysis and obtained results.

Although, the number of subjects is too small, for multivariate statistical models, the results indicate great attributive values. Therefore the explanation of the clustering, in combination with the relative importance measures and descriptive statistics, can prove extremely valuable.

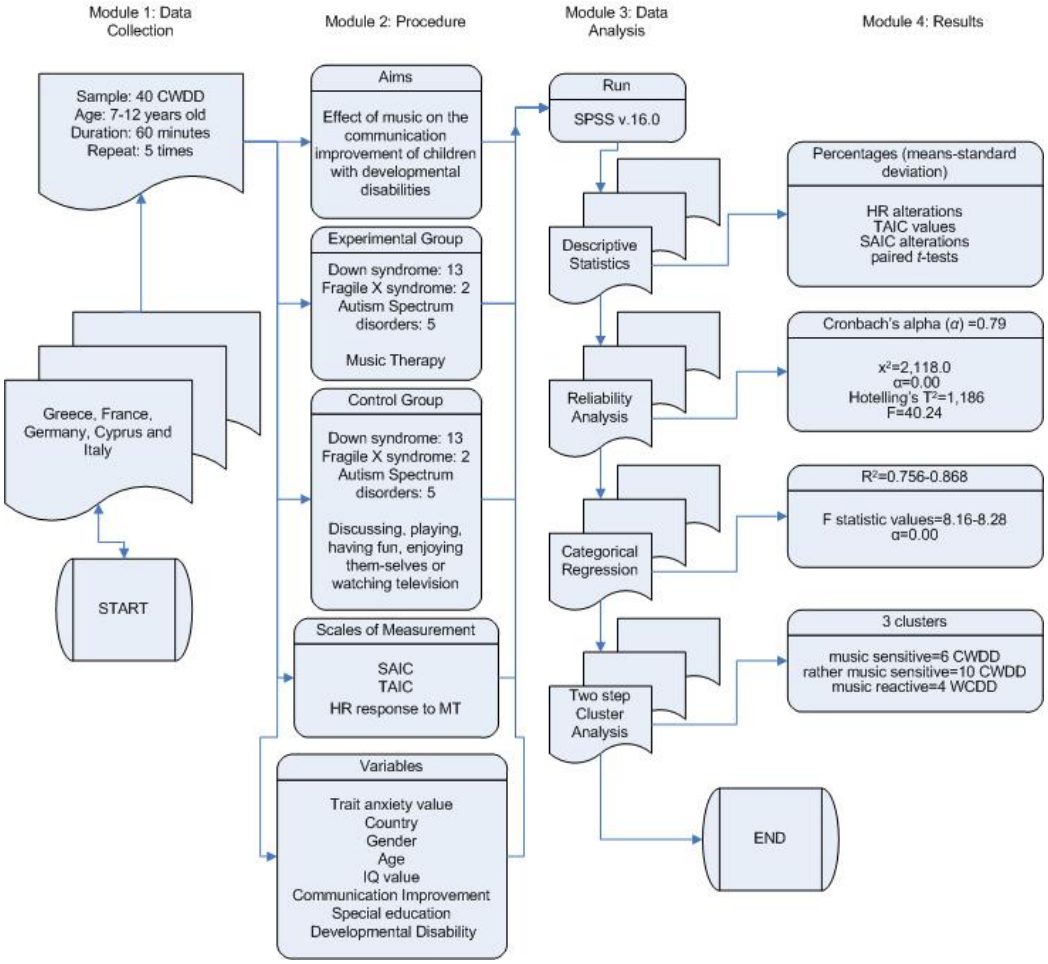

Figure 1.
General methodological framework

Results

Figure 2 presents the minimum, maximum and mean values of all measurements of group A subjects' HR just before the MT session, as well after 30 and 60 minutes respectively. Findings from HR alteration analysis revealed that MT helps calm young children with mental retardation. More specifically, 30 minutes after the beginning of the MT the HR mean value decreased from 105.7 bps to 101.9 bps and just after the end of the session decreased more to 100.1 bps. A very interesting point of this observation is that the major part of the HR decrease (67.85%) realized at the first half-hour of the session suggesting that the dose relationship in music therapy is not absolutely linear.

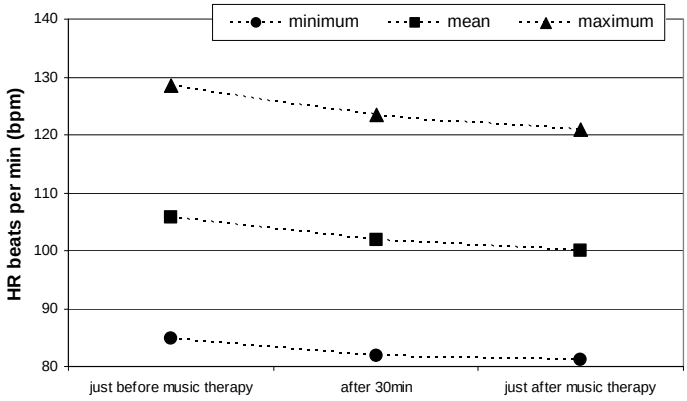

Figure 2.
HR alteration during music therapy session (group A)

Descriptive statistics for each STAIC measure assessed prior to and following the MT and WT sessions and the significance of any demonstrated change are shown in Figure 3. In regard to SAIC, it is obvious that, it was observed a larger decrease in the mean value after the MT session (M=-2.44, SD=3.48) than after the WT one (M=-0.31, SD=1.98). On the other hand, both SAIC and TAIC factors present similar mean values between groups indicating that the control group was very well matched in all respects with the experimental one. Moreover, from paired *t*-tests, it was found out that SAIC score was significantly influenced by the MT (t=5.36, p<0.001) as well as it was not significantly influenced by the WT session (t=1.02, p>0.05: NS).

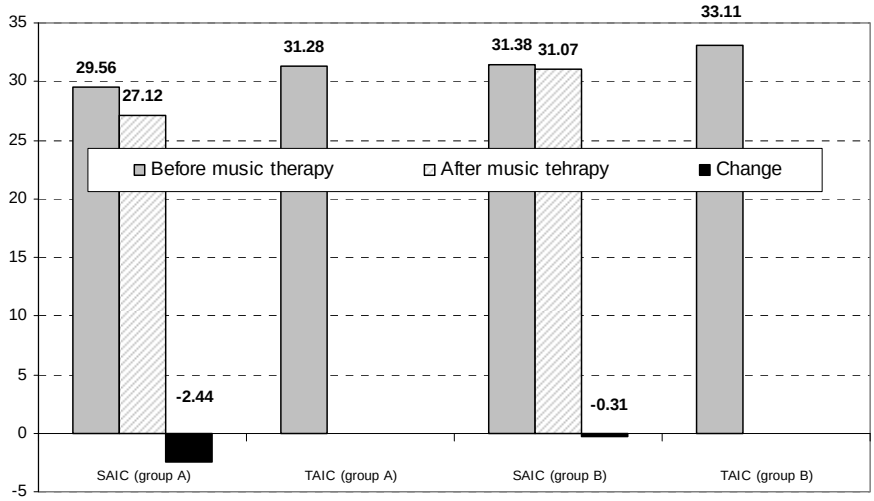

Figure 3.
Alterations to SAIC factors and TAIC mean values for both groups

The two-step cluster analysis extracted automatically the optimal solution of three clusters. The majority of the subjects (10 or 50%) were included in the second cluster while 6 (30%) and 4 (20%) of them included in the first and third cluster respectively. Regarding the distribution of observations in the above clusters, it is shown in Table 1, that mainly female children with Autism Spectrum disorders

Table 1.
Distribution of observations each cluster (frequencies and percentages)

Continuous variables	**Clusters**		
	1st (6, 30%)	**2nd** (10, 50%)	**3rd** (4, 20%)
1. Down syndrome	**1** (16.7%)	**10** (100.0%)	**2** (50.0%)
2. Fragile X syndrome			**2** (50.0%)
3. Autism Spectrum disorders	**5** (83.3%)		
4. Male	**1** (16.7%)	**7** (70.0%)	**1** (25.0%)
5. Female	**5** (83.3%)	**3** (30.0%)	**3** (75.0%)
6. SAIC decrease	**6** (100.0%)	**7** (70.0%)	**1** (25.0%)
7. HR decrease	**6** (100.0%)	**4** (40.0%)	**2** (50.0%)
8. SAIC increase		**3** (30.0%)	**3** (75.0%)
9. HR increase		**6** (60.0%)	**2** (50.0%)
10. Communication Improvement (YES)*	**6** (100.0%)	**10** (100.0%)	**2** (50.0%)
11. Communication Improvement (NO)*			**2** (50.0%)
12. TAIC mean value (>28)		**2** (20.0%)	**4** (100.0%)
13. TAIC mean value (<28)	**6** (100.0%)	**8** (80.0%)	

* *Subjective estimations of the research assistant*

constitute the first cluster. It is important to point out that all the SAIC and HR mean values, related to the subjects of first cluster, decreased just after the MT session indicating the positive effect of MT on the children with Autism Spectrum disorders. As well as, according to the research assistant estimations, all the subjects of the first cluster improved their communication ability after the MT session. On the other hand, female children with Down syndrome or Fragile X syndrome constitute the third cluster. All the subjects of this cluster presented large TAIC values (>28) while the majority of their SAIC and HR mean values increased after the MT session indicating the negative effect of MT on the children of the third cluster. Finally, the second cluster mainly includes male children with Down syndrome who affected rather positive regarding their SAIC change and rather negative regarding their HR change. In tabloid form, we could describe the subjects of the first cluster as *music sensitive*, of the second cluster as *rather music sensitive* and of the third clusters as *music reactive*.

Reliability analysis (Bohmstedt, 1970; SPSS, 2007) was then employed in order to determine the extent to which the eight continuous variables of Table 2 are related to each other and to investigate the reliability of the selected scales. The value of Cronbach's alpha (α) reliability coefficients (SPSS, 2007) were found equal to 0.79 for the SAIC scale measurement and 0.82 for the HR change scale. So, the selected scales are reliable as the related coefficients exceed the constant value (>0.70) suggested by Bohmstedt (1970). In addition, Friedman two-way analysis of variance, with x^2=2,118 (α=0.00) and Hotelling's T^2=1,186 (F=40.24 & α=0.00), indicated the significance in differences of item means. Having accepted the consistency of the eight items, the average rankings for each subject were used as the numerical values of the dependent variable *SAIC or HR decrease* which along with the categories of eight independent variables are shown in Table 2.

Table 2.
Selected independent variables

Independent variables	Type	Categories
1. Trait anxiety value	Ordinal	1=over 28, 2=under 28
2. Country	Nominal	1=Greece, 2=France, 3=Germany, 4=Cyprus, 5=Italy
3. Gender	Nominal	1=male, 2=female
4. Age	Ordinal	1=under 8, 2=9-10, 3=over 11
5. IQ value	Ordinal	1=under 24, 2=25-39, 3=40-54, 4=55-69, 5=over 70
6. Communication Improvement	Ordinal	1=no, 2=rather no, 3=neither yes nor no, 4=rather yes, 5=yes
7. Special education	Ordinal	1=2 or less years, 2=3-4 years, 3=5 or more years
8. Developmental Disability	Nominal	1=Down syndrome, 2=Fragile X syndrome, 3=Autism Spectrum disorders

Then, investigating further the dependent variable *SAIC or HR decrease* in order to find out how SAIC or HR mean values influenced by personal characteristics of each clusters' subjects we employed the categorical regression model. Categorical regression (Kooij & Meulman, 1997) was used to handle the optimally transformed categorical variables. It yielded R^2 values ranging from 0.756 (1st cluster) to 0.868 (3rd cluster) indicating moderate relation between the *SAIC or HR decrease* and the group of selected predictors (Table 3). However, since R^2>0.70, it is indicated that more than 70% from (75.6% to 86.8%) of the variance in the *SAIC or HR decrease* rankings is explained by the regression of the optimally transformed variables used. The F statistic values from (8.16 to 8.28) with corresponding α=0.00 indicates that this model is always performing well.

Table 3.
Relative Importance Measures

Cluster	N	R^2	Relative Importance Measures			Total Explanation
1st	6	0.756	Communication Improvement (0.584)	Developmental Disability (0.226)	Gender (0.125)	(93.5%)
2nd	10	0.770	Developmental Disability (0.632)	Communication Improvement (0.156)	Trait anxiety value (0.118)	(90.6%)
3rd	4	0.868	Trait anxiety value (0.512)	Developmental Disability (0.236)	Gender (0.103)	(85.1%)

Dependent variable: SAIC or HR decrease

The relative importance measures (Pratt, 1987) of the independent variables show that the most influential factors predicting *SAIC or HR decrease* in the first cluster correspond to *Communication*

improvement (accounting for 58.4%), followed by *Developmental Disability* (22.6%), and *Gender* (12.5%). Respectively, the relative importance measures of the independent variables, which are reported in the second cluster, are higher for the variables of *Developmental Disability*, *Communication Improvement* and *Trait anxiety value*. Finally, the relative importance of the above independent variables in the third cluster is presented high for the variables of *Trait anxiety value*, *Developmental Disability* and *Gender*. The total percentage of the *SAIC or HR decrease* which is explained by the estimated three independent variables, in each cluster, is calculated in the last column of Table 3. In particular, the additive importance of estimated independent variables accounts for about 93.5%, 90.6% and 85.1% for the first, second and third clusters respectively.

Discussion

In recent years, MT offers a potentially viable alternative to traditional communication channels for CWDD and especially for CWA (Kissinger & Worley, 2008). In the context of treatment options for CWDD, MT may fill an important gap, which traditional therapies do not fill. Previous clinical reports (Rolvsjord, 2001; Solli, 2008) as well as research studies (Hannibal, 2005; Hanser & Thompson, 1994; Meschede, Bender, & Pfeiffer, 1983) have reported that MT has helped some patients and especially children who did not benefit from exclusively verbal psychotherapy. Many of these have found promising results; however, the quality of the included studies varied.

In this paper an indicatory dataset, centralized from 40 typical subjects, have been analyzed using two-step clustering, categorical regression models and descriptive statistics analysis in order to classify the subjects and to determine possible relation between MT and communication improvement of the subjects. The results overall indicate that the MT process improved the communication ability of CWDD.

More specifically, we found out that there is a strong statistical relation between communication improvement and SAIC or HR decrease, for CWA and for children with Down syndrome (CWDS), indicating that communication improvement for the majority of CWDD can be well explained through the analysis of the *SAIC or HR decrease* dependent variable. In this direction, HR alteration analysis revealed that MT helps calm young CWDD. In addition, the major part of the HR decrease realized at the first half-hour of the MT session suggesting that the dose relationship in music therapy is not linear. A further finding is that SAIC score was significantly influenced by the MT as well as it was not significantly influenced by the WT session.

Regarding the distribution of observations in the clustering procedure, all the subjects of the first and third cluster improved their communication ability, after the MT session, and the majority of them improved their SAIC and HR mean values. Synoptically, we could describe the CWA as *music sensitive* subjects, the majority (77%) of the CWDS as *rather music sensitive* subjects and the rest of the CWDD as *music reactive* subjects.

Moreover, the relative importance measures of the independent variables show that the most influential factors predicting *SAIC or HR decrease* correspond to *Communication improvement*, *Developmental Disability* and *Trait Anxiety value*. More specifically, in the first cluster, the decrease of SAIC or HR values explained mainly by the *Communication improvement* of the subjects. In addition, in the second and third cluster, the decrease of SAIC or HR values explained by the Down syndrome and the TAIC mean values (>28) of the subjects, respectively.

From a methodological point of view the contribution of this paper provided an application of modern multivariate methodologies in the field of special education. In particular, although several articles have been conducted to examine the effects of music therapy our study presents a first application of categorical methodologies in the field of mental health. The main benefit of employing the above methodologies is that they can handle optimally both continuous and categorical variables as well as attributes (Michailidis, 2007). Thus, a combination of categorical regression model with a two-step cluster analysis can be very useful, in the examination of communication improvement of CWDD, as the categorical variables of Table 2 can be better accommodated (Michailidis, 2007).

Consequently, this study provides interesting and initial observations as well as it demonstrates verifiability. However, as a first systematic attempt to assess the effect of MT on the communication improvement of CWDD, our study was limited to a rather small sample and a rather restrained amount of time for the observations. Therefore, due to the small number of subjects (sample) and due to the

indefinable number of CWDD (population) our study rather lacks generalizability. Nevertheless, the observations made in this study provide a beginning for further research, which could extend the investigation to more representative sample.

In conclusion, MT could lead to significant improvements in young CWDD's psychological and physical well-being. In addition, the participation of CWDD in MT programs could produce not only psychological and physical but also mental benefits, and should constitute a part of therapeutically programs that aim both to the improvement of young CWDD's psychological state and quality of life. However, these observations about the value of MT are preliminary. Although there have been indications for the positive effects these cannot be generalized to assess long-term participation in a MT program. In order to support these observations further validation research is necessary.

References

Bruscia, K. E. (1998). *Defining music therapy.* (2nd ed.) Gilsum, NH: Barcelona Publishers.

Bohmstedt, G. W. (1970). Reliability and validity assessment in attitude measurement. In *Attitude Measurement.* (ed. Summers, G. F.) Chicago: Rand-McNally & Co.

Dileo, C., & Bradt, J. (2005). *Medical music therapy: A meta-analysis*. Cherry Hill: Jeffrey Books.

Gold, C., Heldal, T. O., Dahle, T., & Wigram, T. (2005). Music therapy for schizophrenia or schizophrenia-like illnesses. *Cochrane Database of Systematic Reviews*, 2.

Gold, C., Voracek, M., & Wigram, T. (2004). Effects of music therapy for children and adolescents with psychopathology: A meta-analysis. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 45*(6), 1054-1063.

Gold, C., Wigram, T., & Elefant, C. (2006). Music therapy for autistic spectrum disorder. *Cochrane Database of Systematic Reviews*, 2.

Hannibal, N. (2005). *Beskrivelse av patientpopulationen i klinisk musikterapi på fem psykiatriske institutioner i Danmark i perioden August 2003-Juli 2004* [Description of the patient population in clinical music therapy in five psychiatric institutions in Denmark, August 2003-July 2004]. In Ochsner Ridder, H. M., Nygaard Pedersen, I., & Hannibal, N. (Eds.), Musikterapi i psykiatrien (64-75). Aalborg, Denmark: Musikterapiklinikken, Aalborg Psykiatriske Sygehus, Aalborg Universitet.

Hanser, S. B., & Thompson, L. W. (1994). Effects of a music therapy strategy on depressed older adults. *Journals of Gerontology, 49*(6), 265-269.

Howard, K. I., Kopta, S. M., Krause, M. S., & Orlinsky, D. E. (1986). The dose-effect relationship in psychotherapy. *American Psychologist, 41*(2), 159-164.

Jowett, B. (1888). *The Republic of Plato.* (Translated by Benjamin Jowett) Oxford: Oxford Clarendon Press.

Kissinger, L., & Worley, D. W. (2008). Using the Harp as a Communication Channel with Children with Autism. *International Journal of Special Education, 23*(3), 149-156.

Koger, S. M., Chapin, K., & Brotons, M. (1999). Is music therapy an effective intervention for dementia? A meta-analytic review of literature. *Journal of Music Therapy, 36*(1), 2-15.

Kooij, Van der, A. J., & Meulman, J. J (1997). MURALS: multiple regression and optimal scaling using alternating least squares. In *Advances in Statistical Software.* (ed.. Bandilla, W., & Faulbaum, F.) Stuttgart: Lucius & Lucius.

Maratos, A., Gold, C., Wang, X., & Crawford, M. (2008). Music therapy for depression. *Cochrane Database of Systematic Reviews*, 1.

Mavrovouniotis, F. H., Argiriadou, E. A., & Papaioannou, C. S. (2009). Greek traditional dances and quality of old people's life. *Journal of Bodywork and Movement Therapies*, doi: 10.1016/j.jbmt.2008.11.05.

Meschede, H. G., Bender, W., & Pfeiffer, H. (1983). Musiktherapie mit psychiatrischen Problempatienten [Music therapy with psychiatric problem patients]. Psychotherapie, Psychosomatik, *Medizinische Psychologie*, *33*(3), 101-106.

Michailidis, A. (2007). Agricultural extension services in mountain areas of Greece. *Journal of International Agricultural Extension and Education, 14*(1), 71-80.

Pesek, U. (2007). Musiktherapiewirkung: Eine Meta-Analyse [Effects of music therapy: A meta-analysis]. *Musiktherapeutische Umschau, 28*(2), 110-135.

Pratt, J. W. (1987). *Dividing the indivisible: using simple symmetry to partition variance explained.* In Proceedings of the second International Conference in Statistics. (ed. Pukkika, T., & Puntanen, S.) Tampere: University of Tampere.

Rolvsjord, R. (2001). Sophie learns to play her songs of tears: A case study exploring the dialectics between didactic and psychotherapeutic music therapy practices. *Nordic Journal of Music Therapy, 10*(1), 77-85.

Schalkwijk, F. W. (1994). *Music and People with Developmental Disabilities: Music Therapy, Remedial Music Making and Musical Activities.* (Translated by Andrew James) London: Jessica Kingsley Publishers.
Silverman, M. J. (2003). The influence of music on the symptoms of psychosis: A meta-analysis. *Journal of Music Therapy*, *40*(1), 27-40.
Sinclair, T. A., & Saunders, T. J. (1981). *The Politics.* (Translated by Sinclair, T. A., Revised by Saunders, T. J.) London: Penguin.
Solli, H. P. (2008). Improvisational use of popular music for a man with schizophrenia. *Nordic Journal of Music Therapy*, *17*(1), 67-77.
Spielberger, C. D., Gorsuch, R., & Lushene, R. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto: Consulting Psychologists Press, Inc.
Spielberger, C., Edwards, D., Lushene, R., Montuori, J., & Platzek, D. (1973). *State-Trait Anxiety Inventory for Children.* Palo Alto: Consulting Psychologists Press, Inc.
SPSS (2007). *SPSS Categories 16.0 and User Manual*. Chicago: SPSS Inc.
Vink, A. C., Birks, J. S., Bruinsma, M. S., & Scholten, R. J. (2003). Music therapy for people with dementia. *Cochrane Database of Systematic Reviews*, 4.
World Medical Association (2000). World Medical Association Declaration of Helsinki: *Ethical Principles of Medical Research Involving Human Subjects*. List date: October 22, 2008. Retrieved from http://www.wma.net/e/policy/b3.htm.