

THE EFFECT OF CLASSICAL MUSIC ON PAINTING QUALITY AND CLASSROOM BEHAVIOUR FOR STUDENTS WITH SEVERE INTELLECTUAL DISABILITIES IN SPECIAL SCHOOLS

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There are few studies measuring the effects on painting quality of playing background classical music at special schools. Primary students with severe intellectual disabilities (N=24) were taught abstract painting in a two-part method. The first part involved a Pictorial Only method and the second, immediately following it, involved a Pictorial plus Classical Music background. Guttman scales were created to measure both quality of painting and, separately, classroom behaviour, weekly, for six consecutive weeks. A mixed between-within subjects ANOVA (General Linear Model, repeated measures with SPSS) found: (1) that interaction effects did not reach significance; (2) a significant main effect for method of teaching on painting quality, and on classroom behaviour, with the Pictorial and Classical Music method being significantly better; (3) a significant main effect for practice over the six weeks on painting quality, with the Pictorial and Classical Music method being significantly better; and (4) a non-significant main effect for practice over the six weeks on classroom behaviour. Teachers in special schools should try playing classical music as background during the painting sessions of their students, not only to improve painting quality, but also to improve student attitude and behaviour in class.

Introduction

The use of background music, especially during counselling, clinical type situations, one-on-one sessions with parents and a child, and in therapy sessions with students with disabilities has been widely used for many years in many countries. For a summary of music therapy in clinical situations, see Wigram & de Backer (1999). For a summary of musical therapy and education, see Heal & Wigram (1993) and, for a summary of psychotherapeutic methods with music, see Dosen & Day (2001). There is, however, very little research evidence based on experimental data in the literature about the worth of music as therapy (see comments by Dempsey & Foreman, 2001; Krakouer, 1988; Stephenson, in press; Riddoch & Waugh, 2003, in regard to their literature searches). Listening to music (Mozart) has even been claimed to improve IQ and temporal-spatial reasoning (the Mozart effect) (see Hetland, 2000), but this is controversial and by no means proven (Shellenberg & Hallam, 2005; Steele, Brown & Stocker, 1999). Thomas, Shellenberg and Husain (2001) claim to have found evidence that Mozart's music changes mood and causes arousal.

The present study is not about these effects, but about using classical background music in primary classes for students with severe intellectual disabilities as a context for teaching painting. There is a lack of research evidence about the worth of music in a primary or secondary special school situation, involving students with severe intellectual disabilities (see Riddoch & Waugh, 2003; Stephenson, in press). Riddoch and Waugh (2003) have reported on a brief summary of the available research on this topic and nothing seems to have changed since then. Their summary showed that there is some evidence of benefit to students with severe intellectual disabilities through the use of music in an art primary school setting. Improvements in on-task behaviour, development of auditory skills, and attention to task were noted (Daveson & Edwards, 1998). Hallam and Price (1998) have advocated the combined use of music and art for students with severe intellectual disabilities and have tried it out with limited success. Stephenson (in press), from a review of the literature, found that there was some

support for music therapy in the development of communication skills with many case studies claiming communication improvements (see Aldridge, Gustorff & Neugebauer, 1995; Boxill, 1985; Nordorff & Robbins, 1985). From her review, Stephenson (in press) recommends that the use of music for students with severe disabilities could be focused in a school context for the teaching of communication skills and that there is a clear need for further research in the use of music as a context for teaching.

Riddoch and Waugh (2003) reported a related (but non-longitudinal) study, using music as a context for teaching art (painting) in a Primary school setting for students with severe intellectual disabilities. They compared the mean painting scores between regular students and students with severe intellectual disabilities when rock music and, separately, classical music was played as background. They found that the rock music background was associated with a significant decrease in mean painting scores and that classical music was associated with a significant increase in mean painting scores for both regular students and students with severe intellectual disabilities. Rock music was associated with a decrease in focus on the painting and an increase in focus on the music and moving to the music. Classical music had a calming and soothing effect and was associated with an increase in focus on the painting, thus explaining the better painting scores with classical music as background. However, the sample size was small (N=12) and no measures of attitude and behaviour, only painting quality, were made.

It seems, therefore, that there is a need to gather further evidence about the possible benefits of using a classical music background for students with severe intellectual disabilities in a special school setting and to extend the study reported by Riddoch and Waugh (2003). Thus, the main purpose of the present study was to investigate whether the addition of a classical music background improved the quality of abstract painting and of classroom behaviour, over a six week period and so to evaluate the worth of Riddoch's (1993) Pictorial and Musical Art Instruction Programme for primary students with severe intellectual disabilities who are taught painting in special schools.

The New Pictorial and Musical Programme

This programme was designed by Jane V. Riddoch (see Riddoch & Waugh, 2003) to help students with severe intellectual disabilities improve their painting, enjoy their painting, and improve their attitude and behaviour during painting classes at special schools, and it involves two sections. In the first section, a pictorial stimulus (such as Kandinsky's, *The Park*, Impression V, 1911) was introduced to the students and placed close to their faces in turn, so that they could focus on the painting. The teacher gave a very short biography of Kandinsky and explained some of the important points about his art work such as, the abstract composition, the use of wide brush strokes, and bright colours. The coloured paints available to the students were pointed out to them. The main aim at this stage was to get the students to focus and concentrate on the painting and its characteristics. The teacher tells them not to copy Kandinsky's work, takes Kandinsky's painting away and then asks the students to create their own abstract painting. They are given 15 minutes and may create several paintings but only the first was used in the measurements for the present study.

In the second section, the first section is repeated with one change: the introduction of classical music. In the study reported here, light, calming classical music by Mozart and Debussy were used as background during a repetition of the teaching using the pictorial stimulus.

The reasons for choosing Kandinsky is that he used vibrant colours, especially reds, blues and yellows, and strong brushwork, and this makes it easier than many other paintings for students with severe intellectual disabilities to focus upon. They can also easily follow the form of the painting when the teacher explains the characteristics of the painting. The reasons for choosing Mozart and Debussy is that Riddoch's method doesn't have the music *take over the atmosphere too much* like rock and roll music would, and she didn't want music that was *too soft* and not make much of an impression. The music of both Mozart (Concerto for Violins and Sonata for Two Pianos) and Debussy (Claire de Lune) have a vibrant quality which is ideal as a background, calming music, but which also *grabs the attention* of the students, but not by too much.

Method

Participants

Participants were 28 students with severe intellectual disabilities from three education support special schools in Perth, Western Australia. Because of absences over the six weeks of the study, this was reduced to 24 who were present for all six weeks and submitted 12 paintings each week (One after the Pictorial Only method and the second after the Pictorial plus Music method, for each of the six weeks). Students ranged in age from 6 to 13 and had a range of disabilities. Some were in wheelchairs, many

were autistic, some had cerebral palsy, and many had a combination of disabilities. All were officially classified as having severe intellectual disabilities in order to attend the special schools.

Ethics Approvals

All ethical approvals were gained before the study was begun. These included approvals from the principals and teachers at the special schools, and the guardians and parents of the students with severe intellectual disabilities. There is a requirement that at least two special education teachers must be present during classes at special schools and that class sizes should not be more than 10 students. The study complied with these rules and student names, teacher names and school names are not identified.

The Study

The students were taught art for about 50 minutes each week for six weeks using the Pictorial Only method (as method 1) and, immediately following, the Pictorial and Musical method (as method 2). Each week's lessons were treated in the same way so that the outcomes could be compared without any systematic influence from variables besides the two teaching methods, although the music and paintings were alternated each week to avoid the monotony of simply presenting exactly the same Kandinsky painting and the same Mozart music for each of the six weeks. The paintings and music used by week are presented in Table 1.

Table 1.
Type of painting and music used in treatments by week

Week 1.

Print 1: Kandinsky, *The Park* 1911.

Music 1: Debussy, *Claire de Lune*.

Week 2.

Print 2: Kandinsky, *Murnau with Church* 1910

Music 1: Debussy, *Claire de Lune*

Week 3.

Print 1: Kandinsky, *The Park* 1911

Music 2: Mozart, *Concerto for Violins*.

Week 4.

Print 3: Kandinsky, *The Mountain* 1908

Music 2: Mozart, *Concerto for Violins*.

Week 5.

Print 2: Kandinsky *Murnau with Church* 1910.

Music 3: Mozart, *Sonata for Two Pianos in D major*.

Week 6.

Print 1: Kandinsky, *The Park* 1911.

Music 3: Mozart, *Sonata for Two Pianos in D major*.

The teaching methods were strictly adhered to each week. Teachers were not allowed to *touch up* the paintings of the students. Teachers were able to give positive verbal reinforcement but no physical help in producing, improving or altering the paintings. The paintings were each student's own work, each time. Students were given the same time to paint each week and the same colours for painting, and the same equipment and settings. As far as possible, all conditions were arranged to be the same each time except for the teaching method.

Data Collection

Two lots of data were collected: (1) student paintings for measurement of painting quality and (2) classroom observation data of classroom behaviour. Two paintings were collected each week from each student for six weeks (2 by method by 6 weeks by 24 students = 288 paintings). Twelve measures of painting quality using the same judging items, and order of items were made (one each for methods 1 and 2, each for six weeks) (described below). Observations of attitude and behaviour were recorded each week on a four point scale (never 1, sometimes 2, often 3 and all the time 4) for each student (2 by method by 6 weeks by 24 students = 288 scores). Thus 12 measures of attitude and behaviour using the

same observation aspects (items) were made (one each for methods 1 and 2 for six weeks, described below).

Measures of Painting Quality

The 288 paintings were scored anonymously by three teachers according to a uniform scoring system.

The third teacher was only needed when there was a disagreement between the two judges. Scoring was based on four aspects in order of difficulty: (1) composition (easiest), (2) creativity, (3) colour application, and (4) colour use (hardest).

Composition: One mark was awarded if the student had made an attempt to cover some of the picture plane, two marks if the student had used these brush strokes *cleanly* in an attempt to cover the picture plane, three marks if the brush strokes were used *cleanly* for a *balanced* composition, and four marks if the student had covered the picture plane with a *clean*, clear and well balanced composition. Composition was conceptualised as being the easiest for the students to gain the highest marks.

Creativity: One mark was given if the student had made some attempt to paint with clear brush strokes, two marks for two colourful brush strokes, three marks for an overall *clean* and colourful attempt, and four marks if the painting depicted a good use of colour in a *balanced* composition covering the picture plane. Creativity was conceptualised as being harder than composition for the students to obtain top marks because it involved two extra aspects: more colour and covering the picture frame.

Colour application: One mark for more than one colourful brush stroke, two marks for more than one colourful brush stroke, three marks if the student showed some understanding of complementary colours in the application, and four marks were awarded for a combination of colours applied in a *balanced* and *clean* formation. Colour application was conceptualised as being harder than creativity for the students to obtain top marks because it involved an extra aspect, the production of complementary colours in a *balanced* formation.

Colour Use: One mark for one colour used, two marks for more than two colours used, three marks for using all the colours set out in the palette and four marks if the students used all the colours *cleanly* in a complementary way to produce a pleasing appearance of quality. Colour use was conceptualised as being harder than colour application for the students because it involved the extra aspect of using all the colours in the palette *cleanly* to produce a pleasing appearance of quality.

The total painting scores were then set out in a table in order from high to low by student, vertically down, and by aspect from easy to hard, horizontally to the right. This is what is known as a Guttman pattern (after Guttman, 1944, 1950) (see Tables 2 & 4). That the data fitted a Guttman pattern showed that the judges' scores were consistent and reliable, and that the total raw scores (as a measure of painting quality) form a scale in which higher total scores are directly and reliably related to higher painting quality. That is, because the painting quality data fitted a Guttman pattern, the judges' painting scores must have been consistent and reliable, the total scores must form a reliable scale comprising of a dominant or consistent measure of painting quality although, strictly, it is a non-linear score.

Measurement

While Rasch measurement (Andrich, 1989; Andrich, Sheridan, & Luo, 2005; Rasch, 1960/1980/1992; Waugh, 2003, Waugh, 2005, Waugh in press; Wright, 1999) is the only known method by which one can create a linear scale in the social sciences (and in art quality measurement and in attitude and behaviour), Guttman scales are the next best measurement model (see Andrich, 1989; Wright, 1999). In an ideal Guttman scale, if one knows the total score, one knows uniquely the scoring pattern on the aspects or items. With a Guttman scale, one can guarantee that a ranking of total scores represents a corresponding ranking of the *measure* on a reliable scale (in this case of painting quality), although it is a non-linear scale. It is of interest to note here that the third measurement model (Classical Test Theory or True Score Theory), just summing the scores on a set of items (as in a maths test or art questionnaire) is the most commonly used method with students in special schools, but it does not logically guarantee that the ranking of total scores corresponds to a ranking of the measure (such as maths ability or art quality), because of non-compliance with the so-called cancellation condition; that is, it does not necessarily produce a measure where a higher score always represents more of the variable and it is, strictly, a non-linear measure too, but it is treated almost universally in schools and universities all over the world as a linear measure (see Embretson & Hershberger, 1999; Michell, 1990, 1999; Wright, 1999). It is very easy to obtain data that fit Classical Test Theory and form a scale, but not so easy to obtain data that fit a Guttman pattern or Rasch linear scale because here the data must fit stronger measurement model criteria.

It is difficult to obtain an ideal Guttman pattern for measures for two reasons. One is that it is difficult to devise items or aspects which are ordered from hard to easy where, if one gets the hardest one right,

Table 2
Fit of total painting quality scores and item scores to Guttman pattern
(method 1, week 2, N=24)

Student	Composition	Creativity	Colour application	Colour use	Total score
103	4	3	3	3	13
102	3	3	3	3	12
112	3	3	3	3	12
113	3	3	3	3	12
116	3	3	3	3	12
117	3	3	3	3	12
126	3	3	2	3	11
105	3	3	2	2	10
106	3	3	2	2	10
114	3	3	2	2	10
122	3	3	2	2	10
123	3	3	2	2	10
125	3	3	2	2	10
104	2	2	2	2	8
107	2	2	2	2	8
109	2	2	2	2	8
110	2	2	2	2	8
115	2	2	2	2	8
119	2	2	2	2	8
120	2	2	2	2	8
121	2	2	2	2	8
124	2	2	2	2	8
101	2	2	2	1	7
108	1	2	2	2	7

Note 1. Only two scores do not fit a Guttman pattern (students 126 and 108 have one score not in the pattern). So the total scores form an excellent unidimensional, but non-linear, scale.

2. High scores represent good painting quality, lower scores poorer painting quality

Table 3
Summary of fit to Guttman pattern for painting quality by method and by week

Method by Week	Number of Scores Fitting Guttman Pattern	Guttman Scale Fit
Method 1 (week 1)	83/96	Acceptable
Method 2 (week 1)	83/96	Acceptable
Method 1 (week 2)	95/96	Excellent
Method 2 (week 2)	91/96	Good
Method 1 (week 3)	90/96	Good
Method 2 (week 3)	89/96	Good
Method 1 (week 4)	92/96	Excellent
Method 2 (week 4)	91/96	Good
Method 1 (week 5)	81/96	Acceptable, just!
Method 2 (week 5)	85/96	Acceptable
Method 1 (week 6)	83/96	Acceptable
Method 2 (week 6)	89/96	Good

Note The acceptance criterion is that the non-fitting scores should not represent more than 15% of the scores: that is, at least 81/96 scores should fit the Guttman pattern. So we have twelve non-linear, unidimensional, scales of painting quality that are comparable.

one gets all the others right too and, if one gets the second hardest one right (but not the hardest), one gets all the others right too, and so on. Two is that many variables may be due to one dominant aspect and a number of other aspects. Painting quality, for example, may be due to a combination of cognitive ability, a physical ability, and an aesthetic appreciation. In the present study, a reasonable fit to a Guttman pattern for all 12 measures of painting quality has been managed (see Table 2), indicating that a reliable, near-unidimensional aspect has been measured. These measures were used in the ANOVA reported in the next section.

An example of a Guttman pattern for method 1, week 2, for painting quality is given in Table 2. The overall results of the 12 Guttman patterns for measuring painting quality (2 by method and 6 by week) are given in Table 3.

Measures of Classroom Behaviour

Four classroom behaviour aspects were conceptually ordered from easy to hard and scores from 4 to 1 (never 4, sometimes 3, often 2 and all the time 1) were given on these aspects based on classroom observations of the students' attitude and behaviour over the lesson time for method 1 and separately for method 2. Not-disrupting peers all the time was conceptualised as being the easiest aspect on which to obtain the highest scores. Not-out-of-seat all the time was conceptualised as being harder than not-disrupting peers all the time because it involved physically getting out of one's seat. Not-vocalising-softly and being-on-task all the time was conceptualised as harder still because it required a stronger on-task attitude and behaviour than just being out-of-seat all the time. Attentive-to-task all the time was conceptualised as being the hardest task as this involved an even stronger on-task attitude and

Table 4

Fit of total classroom behaviour scores and item scores to Guttman pattern (method 2, week 6, N=24)

Student	Not-disruptive to Peers	Not Out of Seat	Not Vocalising Softly & On Task	Inattentive to Task	Total Score
123	4	4	4	4	16
125	4	4	4	4	16
126	4	4	4	4	16
103	4	4	4	4	16
116	4	4	4	3	15
109	4	4	4	3	15
112	4	4	4	3	15
113	4	4	4	3	15
106	4	4	3	4	15
101	4	4	3	3	14
102	4	4	3	3	14
104	4	4	3	3	14
105	4	4	3	3	14
110	4	4	3	3	14
113	4	4	3	3	14
115	4	4	3	3	14
117	4	4	3	3	14
124	4	4	3	3	14
108	4	4	3	2	13
122	4	4	3	2	13
119	4	4	2	2	12
120	4	4	2	2	12
121	4	2	2	2	10
107	3	2	2	1	8

Note 1. Only one score does not fit a Guttman pattern (student 106 has one score not in the pattern). So the total scores form an excellent unidimensional, but non-linear, scale.

2. Response scores are 4 (never), 3 (sometimes), 2 (often) and 1 (all the time)

3. High scores represent good classroom behaviour, lower scores represent poorer classroom behaviour.

behaviour over the class period. The total scores were then set out in a table (Guttman pattern) in order from high to low by student, vertically down, and by aspect from easy to hard, horizontally to the right. An example is shown in Table 4. This gives a non-linear, unidimensional measure of classroom

behaviour to the painting lessons. Twelve Guttman scale measures were obtained and a summary of their fit to a Guttman pattern are presented in Table 5. These measures were used in ANOVA reported in the next section.

Table 5

Summary of fit to Guttman pattern for classroom behaviour to the painting lessons by method and by week

Method by Week	Number of Scores Fitting Guttman Pattern	Guttman Scale Fit
Method 1 (week 1)	91/96	Good
Method 2 (week 1)	92/96	Excellent
Method 1 (week 2)	86/96	Acceptable
Method 2 (week 2)	94/96	Excellent
Method 1 (week 3)	88/96	Acceptable
Method 2 (week 3)	96/96	Excellent
Method 1 (week 4)	92/96	Excellent
Method 2 (week 4)	91/96	Good
Method 1 (week 5)	91/96	Good
Method 2 (week 5)	94/96	Excellent
Method 1 (week 6)	94/96	Excellent
Method 2 (week 6)	95/96	Excellent

Note The acceptance criterion is that the non-fitting scores should not represent more than 15% of the scores: that is, at least 81/96 scores should fit the Guttman pattern. So we have twelve non-linear, unidimensional scales of painting quality that are comparable.

Results

Painting Quality

The mean non-linear scores for painting quality by method and week are set out in Table 6 and displayed graphically in Figure 1 on the next page. They show that there is a general (non-uniform) increase in painting quality for both method 1 and method 2 from week 1 to week 6.

The Guttman scores were then used in a mixed between-within subjects ANOVA (General Linear Model, repeated measures with SPSS) to investigate the effect of the two methods of teaching (Pictorial Only and Pictorial plus Music) and practice (week 1 to week 6) on abstract painting quality for students with severe intellectual disabilities (N=24). The interaction effect between method of teaching and practice over the six weeks did not reach significance, $F(1,5) = 0.60$, $p = .70$. Partial eta squared was 0.14, which is a large effect according to Cohen's commonly accepted rules (Cohen 1988). There was a statistically significant main effect for method of teaching, $F(1,5) = 79.49$, $p = .000$ and partial eta squared was 0.78 which is a very large effect. The Pictorial plus Musical method produced significantly better results than the Pictorial Only method. There was a statistically significant main effect for practice over the six weeks, $F(1,5) = 14.85$, $p = .000$ and partial eta squared was 0.64 which is a very large effect.

Table 6
Mean painting scores by teaching method by week
(N=24, items=4)

Week	Pictorial Only Method	Pictorial plus Music Method
Week 1	M= 8.54, SD=2.41	M= 9.46, SD=2.38
Week 2	M= 9.58, SD=1.86	M=10.37, SD=1.91
Week 3	M= 9.47, SD=2.10	M=10.79, SD=2.28
Week 4	M=11.21, SD=1.74	M=12.21, SD=2.34
Week 5	M=10.75, SD=2.19	M=12.12, SD=2.01
Week 6	M=11.79, SD=2.21	M=12.58, SD=2.30

Note M=mean score and SD=standard deviation

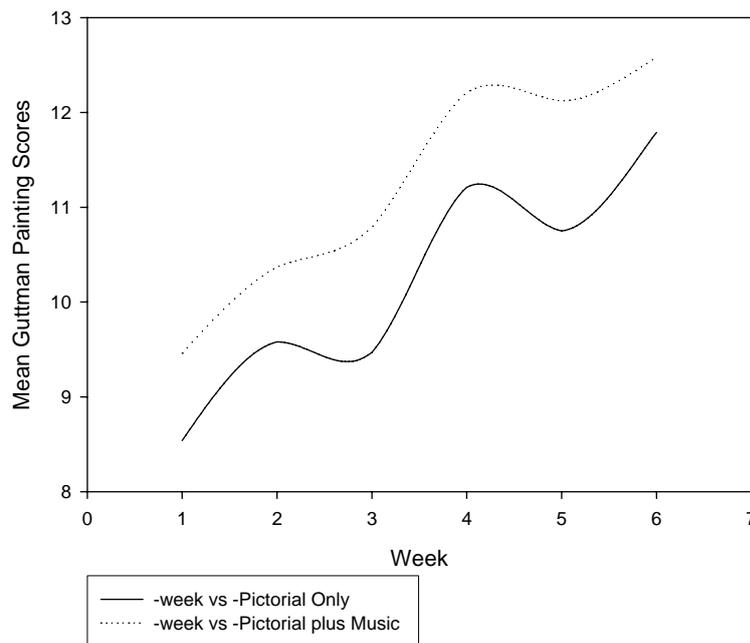


Figure 1
Mean Guttman scores of painting quality by method and week

In order to test whether the differences in mean painting quality are significantly different over various combinations of teaching method and week, paired t-tests were calculated between various pairs of mean painting scores. There were four main findings.

One: A significant positive change in painting quality from the Pictorial Only to the Pictorial plus Musical method for week 1, $t=3.33$, $df=23$, $p=.003$ (a positive classical music effect);

Two: A significant positive change in painting quality from the Pictorial Only to the Pictorial plus Music method for week 6, $t=6.51$, $df=23$, $p=.000$ (a positive classical music effect);

Three: A significant positive change in painting quality from week 1 to week 2 for the Pictorial Only method, $t=5.37$, $df=23$, $p=.000$ (a positive practice effect);

Four: A significant positive change in painting quality from week 1 to week 6 for the Pictorial plus Music method, $t=5.90$, $df=23$, $p=.000$ (a positive practice effect).

Classroom Behaviour

The mean non-linear scores for classroom behaviour by method and week are set out in Table 7 and displayed graphically in Figure 2. They show that there is a general (non-uniform) increase in classroom behaviour for the Pictorial plus Musical method from week 1 to week 6, but not for the Pictorial Only method.

Table 7
Mean classroom behaviour scores by teaching method by week
(N=24, items=4)

Week	Pictorial Only Method	Pictorial plus Music Method
Week 1	M=14.04, SD=1.85	M=15.08, SD=1.32
Week 2	M=13.92, SD=2.22	M=14.79, SD=1.28
Week 3	M=13.92, SD=1.69	M=15.17, SD=0.87
Week 4	M=13.54, SD=1.96	M=14.67, SD=1.66
Week 5	M=13.48, SD=1.53	M=15.12, SD=0.85
Week 6	M=13.87, SD=1.90	M=15.38, SD=0.82

Note: M=mean score and SD=standard deviation

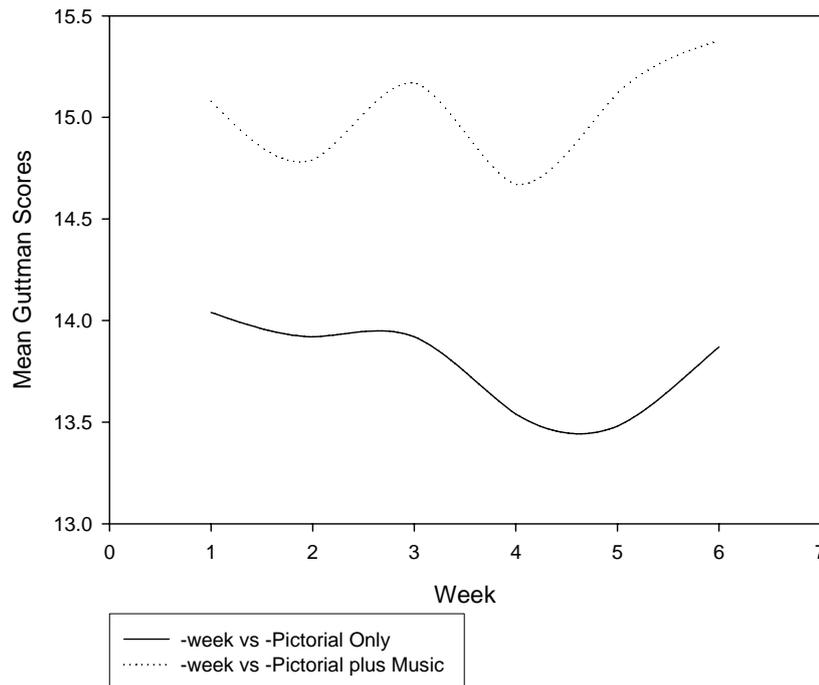


Figure 2
Graph of attitude and behaviour scores by week

The Guttman scores were used in a mixed between-within subjects ANOVA (General Linear Model, repeated measures with SPSS) to investigate the effect of method of teaching (Pictorial Only and Pictorial plus Music) and practice (week 1 to week 6) on classroom behaviour of students with severe intellectual disabilities ($N=24$). The interaction effect between method of teaching and practice over the six weeks did not reach significance, $F(1,5) = 1.57, p = .22$. Partial eta squared was 0.05, which is a moderate effect according to Cohen's commonly accepted rules (Cohen 1988). There was a statistically significant main effect for method of teaching, $F(1,5) = 76.01, p = .000$ and partial eta squared was 0.77 which is a very large effect. The Pictorial plus Musical method produced significantly better results than the Pictorial Only method. The main effect for practice did not reach statistical significance over the six weeks, $F(1,5) = 1.29, p = .31$ and partial eta squared was 0.04 which is a small to moderate effect according to Cohen's (1988) rules.

In order to test whether the differences in mean classroom behaviour scores are significantly different over various combinations of teaching method and week, paired t-tests were calculated between pairs of mean classroom behaviour scores. There were four main findings.

One: A significant positive change in classroom behaviour from the Pictorial Only to Pictorial plus Musical method for week 1, $t=5.11, df=23, p = .000$ (a classical music effect);

Two: A significant positive change in classroom behaviour from the Pictorial Only to Pictorial plus Music method for week 6, $t=4.20, df=23, p = .000$ (a classical music effect);

Three: An insignificant decrease from week 1 to week 6 for the Pictorial Only method, $t=0.34, df=23, p = .73$ (no practice effect); and

Four: An insignificant increase in classroom behaviour from week 1 to week 6 for Pictorial plus Musical method, $t=1.19, df=23, p = .25$ (no practice effect).

Discussion

This study was prompted by the question about whether students with severe intellectual disabilities produce higher quality art work and show better classroom behaviour in classroom settings, when classical music (such as Mozart and Debussy) is played as background. Riddoch and Waugh (2003) had found that classical background music was associated with better quality non-representation art than rock music as background for primary students with severe intellectual disabilities, but the sample was small ($N=12$) and not longitudinal. It was claimed that classical music quietens special students and produces a calming effect in the classroom and that this is, at least, part of reason that students

produce better paintings (see Figures 3 and 4 for a sample of their paintings with classical music as background in the present study).

Quality of Measurement

Near-ideal Guttman patterns were created from four judging aspects to measure abstract painting quality. These scales conformed to a higher measurement standard than is usually used in these types of studies because they had to fit a Guttman pattern in which the items have the same order from easy to hard for all 24 students and each total score was directly related to its unique scoring pattern across items in order from low to high. These measurements are much better (that is, more reliable and consistent) than those that could be constructed from using the total scores without any ordering of items by difficulty (as is typically done in Classical Test Theory). Furthermore, the measures were performed 12 times (2 times 6 weeks = 12), adding more evidence of the reliability of the scale data. The measures are also better in that painting quality is measured as a more single dominant aspect, not as more of a multi-dimensional variable, than would be done using Classical Test Theory.

Similarly, near-ideal Guttman patterns were created from four classroom observation aspects to measure classroom behaviour to the painting lessons conducted using the Pictorial and Musical teaching method. Once again, it is claimed that these measures are much better than those usually done in studies like these because the observation scores have to conform to higher measurement standards than those used in Classical Test Theory.

Improvements in Painting Quality

Since we have made consistent and reliable measures of painting quality, we can now make valid inferences from these measures and answer the research question with some surety. First, we can see that painting quality improved significantly as soon as the classical music was introduced in week 1 and it remained like that in each of the six weeks; that is, the improvements are so large that they are very unlikely to be due to chance or this particular sample of students. Is this due to a practice effect entirely, to the classical music entirely, or to a combination of practice and classical music? There was no interaction effect of significance, but there were two significant main effects. For these 24 students with severe intellectual disabilities, practice certainly helped them improve their painting quality significantly (as it does for regular students), and there was a significant improvement effect due to the addition of classical music. This means that teachers in special schools should try playing classical music as background during some of the painting sessions of their students to help them improve their painting outcomes. This improvement is probably due to both a calming and a focusing effect. The students become calmer and they focus on their painting better, when classical music is played compared to a non-musical background. This supports the findings of Riddoch and Waugh (2003), and Thompson, Shellenberg and Husain (2001) that background music can produce arousal and focus feelings in students. The experiment of the present study used music sometimes and no music at other times, and it may be that the results would only apply in classrooms where this mix of music and no music is applied (not classical music played all the time).

Improvements in Classroom Behaviour

Since we have made consistent and reliable measures of classroom behaviour during the painting sessions, we can now make valid inferences from these measures and answer the next research question with some surety. First, we can see that classroom behaviour improved significantly as soon as the classical music was introduced in week 1 and significantly improved over the six weeks of the study (and this supported the general views of the author and special teachers present); that is, the improvements are so large that they are very unlikely to be due to chance or to this particular sample of students only. Is this due to a practice effect entirely, to the classical music entirely, or to a combination of practice and classical music? There was no interaction effect of significance and, in this case, there was only one significant main effect. For these 24 students with severe intellectual disabilities there was a significant improvement in classroom behaviour due to the addition of classical music, but no practice effect. This result adds to the reliability of the measures and the study, and supports the claim about making higher standards of measures, because it would not make much sense to say that attitude and behaviour improves with practice like painting quality improves with practice. The law of diminishing returns in relation to practice over time applies much more quickly to classroom attitude and behaviour than to painting quality for these 24 students, in the circumstances of the present study. It is probable that the addition of classical music helps these students concentrate on the task. This means that teachers in special schools should try playing classical music as background during some of the painting sessions with their students, not only to improve painting quality, but also

to improve student classroom behaviour in class. That is, teachers should probably use of mix of music and no music during painting classes.



Figure 3

Example of student painting (with severe intellectual disability)

Note: Taught with classical music background



Figure 4

Example of primary student painting (with severe intellectual disability)

Note: Taught with classical music background

References

- Aldridge, D., Gustorff, D., & Neugebauer, L. (1995). A preliminary study of creative music therapy in the treatment of children with development delay. *The Arts in Psychotherapy*, 22, 189-205.
- Andrich, D.A. (1989). An elaboration of Guttman scaling with Rasch models for Measurement. In N. Brandon_Tuna (Ed.), *Sociological methodology* (pp.33-80). San Francisco, CA: Jossey-Bass
- Andrich, D.A., Sheridan, B.E., & Luo, G. (2005). RUMM: A windows-based item analysis computer program employing Rasch Unidimensional Measurement Models. Perth, WA: RUMM Laboratory.
- Boxill (1995). *Music therapy for the developmentally disabled*. Austin, TX: Pro-Ed publishers.
- Cohen, J. (1988). *Statistical power analyses for the behavioural sciences*. New York: Lawrence Erlbaum Associates
- Daveson, B. & Edwards, J. (1998). A role for music therapy in special education. *International Journal of Disability, Development and Education*, 45, 449-457.
- Dempsey, I. & Foreman, P. (2001). A review of educational approaches for individuals with autism. *International Journal of Disability, Development and Education*, 48, 103-115.
- Dosen, A. & Day, K. (2001). *Treating mental illness and behaviour disorders in children and adults with mental retardation*. Washington, DC: American Psychiatric press.
- Embretson, S.E. & Hershberger, S.L. (1999). *The new rules of measurement: What every psychologist and educator should know*. Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Guttman, L. (1944). A basis for scaling quantitative data. *American Sociological Review*, 9, 139-150.
- Guttman, L. (1950). The basis for scalogram analysis. In Stouffer et al. (Eds.), *Measurement and prediction* (Vol.4), (pp.60-90). Princeton, NJ: Princeton University Press.
- Heal, M. & Wigram, T. (Eds.). *Music therapy in health and education*. London: Jessica Kingsley.
- Hetland, L. (2000). Listening to music enhances spatial-temporal reasoning: Evidence for the Mozart effect. *The Journal of Aesthetic Education*, 34 (3/4), 105-148.
- Krakouer, L. (1998). *Evaluating the Use of Music as a Therapy for Individuals with Cerebral Palsy*. A dissertation submitted in partial fulfilment of the requirements for the degree of Master of Education at the University of Western Australia. Perth: The University of Western Australia.
- Michell, J. (1990). *An introduction to the logic of psychological measurement*. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Michell, J. (1999). *Measurement in psychology: Critical history of a methodological Concept*. Cambridge, UK: Cambridge University Press.
- Nordoff, P. & Robbins, C. (1985). *Therapy in music for handicapped children*. London: Gollancz.
- Pallant, J. (2001). *SPSS survival manual: A step by step guide to data analysis using SPSS*. Crows Nest, NSW: Allen & Unwin.
- Rasch, G. (1960, 1980, 1992). *Probabilistic models for some intelligence and attainment tests* (expanded edition). Chicago, IL: University of Chicago Press (original work published in 1960).
- Riddoch, J.V. & Waugh, R.F. (2003). Teaching students with severe intellectual disabilities non-representational art using a new pictorial and musical programme. *Journal of Intellectual and Developmental Disability*, 28 (2), 145-162.
- Shellenberg, E.G. & Hallam, S. (2005). Music listening and cognitive abilities in 10- and 11-Year-Olds: The Blur Effect. *Annals of New York Academy of Sciences*, 1060:1, 202-209.
- Steele, K.M., Brown, J.D. & Stocker, J.A. (1999). Failure to confirm the Rauscher and Shaw description of recovery of the Mozart effect. *Perception and Motor Skills*, 3 (1), 843-848.
- Stephenson, J. (in press). Music therapy and the education of students with severe Disabilities. *Education and Training in Developmental Disabilities*.
- Thompson, W.F., Shellenberg, E.G., & Husain, G. (2001). Mozart effect as an artefact of arousal and mood. *Psychological Science*, 12 (3), 248-251.
- Waugh, R.F. (2003) (Ed.). *On the forefront of educational psychology*. New York: Nova Science Publishers.
- Waugh, R.F. (2005) (Ed.). *Frontiers in educational psychology*. New York: Nova Science Publishers.
- Waugh, R.F. (in press). Rasch measurement. In Neil J. Salkind (Ed.), *The Encyclopedia of Measurement and Statistics*. Thousand Oaks, CA: Sage Publications
- Wigram, T. & de Backer, J. (eds.). *Clinical applications of music therapy in developmental disability, paediatrics and neurology*. London: Jessica Kingsley.
- Wright, B.D. (1999). Fundamental measurement for psychology. In S.E. Embretson & S.L. Hershberger (eds.), *The new rules of measurement: What every psychologist and educator should know*, (pp.65-104). Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.