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Guided Imagery/Visualization and the Effects on Attitudes and Academic Performance

Although Galton's Breakfast table (Galton, 1883) is generally recognised as the first scientific study of imagery, imagery was actually used by priests and philosophers in every ancient culture as a tool for growth (Samuels and Samuels, 1975). Since the 1960's, there has been renewed interest in the use of different forms of imagery (Samuels and Samuels, 1975).

Galyean (1981) for example has argued that

"Although much research needs to be done in the field of imagery in education...successes from various projects lead us to conclude that educational models of the future will include imagery activities as a core aspect of the standard curriculum." (P.57)

This paper addresses the need for appropriate research into the nature and educational consequences of the use of guided imagery/visualization. However, we need to define imagery before proceeding further. According to Achterberg (1985), it "is the thought process that invokes and uses the senses: vision, audition, smell, taste, the senses of movement, position and touch" (p.3). Of these, visual imagery appears to be the most common (Mc Keller, 1968). Imagery is used in a variety of ways, depending on the contextual needs at the time. A brief view of how guided imagery/visualization is used in some teaching programs will now be presented.

Suggestopedia, is an educational system that includes relaxation and positive suggestion,both of which frequently relying on guided imagery/visualization, to improve cognitive and affective behaviour (Prichard and Taylor, 1980; Wade, 1990). Recently, Felix (1991), presented the results of three experiments carried out in primary and secondary schools, which focused specifically on many of the elements unique to Suggestopedia such as an initial mental calming exercise, typically using music and some form of positive suggestion. During these mind calming sessions, students were encouraged to visualize, while responding to guided imagery. The purpose of the studies was to examine the effects of Suggestopedia on language acquisition, baehaviour, attitude and self concept. The results were equivocal in that the effects of these strategies depended very strongly on the particular class and teacher. What does not seem to have been tested is the relative effects on the various outcome measures, of the mind calming process itself and the positive suggestions, all of which were frequently embedded in guided imagery/visualization.

Another teaching strategy that employs different types of Guided imagery/visualization is Neuro linguistic programming (NLP), (Bandler and Grinder, 1979), but the empirical evidence comparing the methods adopted is presently lacking. In this context, Gawler (1987), drew attention to different types of imagery, which he distinguished as types of meditation. Integral meditation consisted partly of the relaxation response (Benson, 1975), in which the body was relaxed by focusing on various parts of it. This was then extended by the use of guided imagery/visualization on such things as peaceful scenes in nature.

Gawler (1987) also described what he called creative meditation, also referred to as creative visualization (Shone,1984), which relied apparently on a greater understanding of how the mind worked and how we could control it consciously.

An important question concerned the relative influence of each of these stategies. As mentioned earlier, Gawler (1987), made the distinction between meditative strategies using Guided imagery/visualization that related to developing a still mind, and those that were instrumental in the active process of using the power of such a still mind.
It was of particular interest to the author to investigate the latter category, principally the influences of creative meditation/guided imagery on improving both academic performance and the psychological health of students.
A number of sources (Gawler 1987 ; Storz 1989), have pointed out quite clearly the need for a still mind as a preparation for using the more

active 'creative' meditation/imagery.
This position is strengthened by the finding of Richardson (1969), that for visualization to be
effective, the subject needed to be in a relaxed state for inner awareness. In fact, body relaxation actually facilitated the flow of images (Richardson 1969). It is argued then, that such a state of mind may be a necessary prerequisite for creative imagery, that is being used to overcome self limiting beliefs and improve performance.
However, there is evidence to suggest that the development of a relaxed state of mind may itself be directly conducive to improvements in memory, learning, and thinking skills (Benson 1975; Rose 1990), although some evidence exists, however, that suggests the
ineffectiveness of a purely relaxation program (Hembree, 1990).
Nevertheless, given the need to control for a potential positive influence and any possible
Hawthorn effect, a treatment group was provided with a program of relaxation that also included a component of guided imagery/visualization, the only difference between the treatment programs then being the actual content of the guided imagery that followed the body relaxation.
Mathematics Anxiety/Achievement
There are many areas of cognitive and affective activity, in which relaxation, a still mind and
creative imagery would be of use. In the present study, it was felt appropriate to apply these ideas to the area of mathematics anxiety and particularly mathematics achievement. Mathematics is considered to be an important subject at both the secondary and tertiary level.
It has application to other fields, for example in engineering, science and psychology. Statistical analysis and mathematical modelling are typical applications.
However, many people consider themselves mathematically incompetent, feeling anxious about the situation (Richardson and Suinn, 1972; Richardson and Wolfolk, 1980).

There is evidence to suggest this mathematics anxiety may in fact be partially responsible for low mathematics achievement (Hembree, 1990; Cooper and Robinson, 1991) and consequently may\ be one contributing factor in underachievement in this subject.

Furthermore, it is argued that evidence related to the specificity of action of particular treatment programs would be of use and some research has been reported along these lines (Deffenbach and Snyder, 1976). Apparently, training in relaxation that incorporated detection of anxiety cues resulted in the learning of general trans-situational anxiety reduction strategies. However more information as to the requirements for the development of general strategies is required.

In addition then, this study was concerned with evaluating the degree to which the effects of the intervention program would be context specific or would generalize across to other contexts. In other words would relaxing and/or being more positive in one context, provide a similar response in other contexts.

The basic aim of this exploratory study, was to test the effect of specific elements of a creative visualization/imagery exercise on mathematics anxiety and a number of performance measures.

Method

Subjects

The intervention groups involved 38 first year students (10 males, 28 females), two classes enrolled in the second semester of 1st year psychology in an Australian university. A random sample of 20 other students (from a variety of other classes), who were also in this course acted as a non intervention group.

Instruments

All students in the intervention groups completed the following tests. The reduced Maths Anxiety Rating Scale (MARS)(Richardson and Woolfolk, 1980); the numerical scale of the Differential Aptitude Tests (DAT), was given to control for differences in the initial levels of basic mathematical ability (Bennett, Seashore and Westman,1974); stress and arousal levels were measured using the LASS scale (King and King,1985). In addition, scores on theory and methodology exams, were collected from all the students.

Design

A repeated measure between group research design was adopted.

The following three groups were used;

a) An experimental group with body relaxation, creative visualization and physical exercise

b) an experimental group with body relaxation, a relatively neutral mental experience of nature and physical exercise

c) a non-intervention random control group of students

Procedure
The first semester theory scores of all students in first year psychology in 1990 were collected
to provide some indication of initial levels of academic competency.
Two practical classes, both in second semester were chosen to be given an intervention treatment program, involving a combination of progressive body relaxation, a range of guided visualizations and generally a short physical exercise. For a period of 9 weeks, each two hour session, began with this treatment program, which required 5-10 minutes each time. The physical exercise for the last six sessions, was used as the final part of the treatment program, to overcome any temporary sleepy effect of the relaxation and /or the guided imagery/visualization (Orr,1986)). To attempt to overcome boredom, a range of music, visualizations and physical exercises were introduced from week to week, but keeping the conditions constant across the two intervention groups.

The MARS and DAT were given prior to the treatment program (along with a request for a
range of demographic information) and following it, the MARS was filled out again. At this time, the second semester theory and methodology exams were also carried out.

Analysis
1. A series of one way ANOVA's, were carried out, along with a series of contrasts and post
hoc tests
2. One way ANCOVA's, were also used to provide additional information

The following series of directional research hypotheses were adopted.
Hypotheses
1. Treatment A will have a significantly greater influence on lowering mathematics anxiety scores than Treatment B.

2. Subjects in treatment group A will have significantly higher scores on tests of methodology
and than subjects in treatment group B.

3. Subjects in treatment group A will have significantly higher scores on a methodology exam as compared to subjects in the control group.
4. Subjects in treatment group B will have significantly higher scores on a methodology
exam as compared to the subjects in the control group.
5. Subjects in treatment group A will have significantly higher scores on a test of theory
than subjects in treatment group B.
6. Subjects in treatment group A will have significantly higher scores on a theory exam as
compared to subjects in the control group.
7. Subjects in treatment group Bwill have significantly higher scores on a theory exam

as compared to subjects in the control group.

Results

Hypotheses 1

An independent T-Test comparing the initial levels of mathematics anxiety in the two intervention groups, found no significant difference ($t(32) = 0.22$, $p > 0.05$). The means and SD are reported in Table 1.

An independent T-Test comparing the levels of mathematics anxiety following the intervention program, again found no significant difference ($t(35) = -0.28$, $P > 0.05$). The means and S.D. are reported in Table 1. However, related within group t-tests, which were carried out on the pre-post changes in mathematics anxiety in each of the treatment groups, found that although there was no statistically significant difference in treatment group B (relaxation) ($t(14) = 1.75$, $P > 0.05$), there was a statistically significant drop in the mathematics anxiety in treatment group A (creative) ($t(17) = 2.76$, $p < 0.05$).

PLACE TABLE 1 ABOUT HERE

But carrying out an ANCOVA, on the final mathematics Anxiety scores, using the initial level as a covariate, found no significant effect of different treatments ($F(1,34)=1.38, P>0.05$).

Performance Pretests

A one way ANOVA, analysing the student's scores on the 1st semester theory paper, found no significant difference ($F(2,54)=1.19, P>0.05$, 1 tailed test) between the three groups. The means and SD's are reported in Table 2.

PLACE TABLE 2 ABOUT HERE

This applied also to the difference in DAT scores ($t(25) = -1.52$, $P > 0.05$, 1 Tailed Test) across the two treatment groups (the non-intervention group was not given the DAT).

The means and SD's are reported in Table 3.

PLACE TABLE 3 ABOUT HERE

Hypotheses 2/3/4

A one way ANOVA, was carried out on the second semester methodology paper and resulted in a significant difference ($F(2,51) = 2.42$, $p < 0.05$, 1 tailed test). The means and SD's are reported in Table 4. Using the Duncan POST HOC test, the two experimental groups were found to be significantly different, with experimental group A having a higher mean score.

PLACE TABLE 4 ABOUT HERE

To confirm these findings, given the small but statistically insignificant difference between groups on the first semester theory paper, ANCOVA's were carried out on the second semester methodology paper, using the 1st

Semester theory scores as a covariate, but in this case, with no significant differences being found (F (2,50) = 1.527, P > 0.10)

Hypotheses 5/6 /7

An ANOVA was carried out to examine the differences between the groups on the 2nd Semester theory paper. The F value in this case was highly significant (F(2,51)=3.15, P <0.05, 1 tailed test), and using the Scheffe POST HOC test, a significant difference was found between the two treatment groups, with experimental group A having a higher mean score. The means and SD's are reported in Table 5 .

PLACE TABLE 5 ABOUT HERE

An ANCOVA was carried out on the second semester theory paper, using the first semester theory paper as a covariate and the results were not significant (F(2,49) = 1.670, p > 0.05).

Discussion

Given the present relatively small sample sizes and the exploratory nature of this project, it is important to be sensitive to trends in the data. On the basis of the between groups t-tests and the ANCOVA, it appears that there has been no significant difference in the effect of the two treatment programs on Mathematics Anxiety. On the other hand, the within group t test suggests otherwise. A careful examination of the pre and post treatment means for the two intervention groups on mathematics anxiety suggests a possible explanation for the apparently discrepant results (see Fig 1).

PLACE FIGURE 1 ABOUT HERE

It is also difficult to explain the non significant ANCOVA, which controls for the initial level of Mathematics Anxiety. ANCOVA's in theory increase power by reducing the variance in the dependent variable. However, this is done at the expense of losing degrees of freedom and with the relatively small sample, this may help to explain the non significant ANCOVA. More information is necessary on the possible influence of other contextual variables to determine the effect of Guided Imagery/Visualization on Mathematics Anxiety.

Hypothesis 2/3/4

Once again, the results and conclusion vary depending on the method of analysis adapted. Hypothesis 2, on the basis of the overall ANOVA and the Duncan POST HOC test, was supported because group A was found to have a significantly higher mean performance on the methodology exam than group B. Hypotheses 3 and 4 were both rejected because neither treatment group

had a significantly higher mean performance on the methodology exam as compared to the control group. Overall then, there is some evidence based on the ANOVA analysis, for treatment A to be seen to be relatively more effective in improving performance on a methodology/statistics exam. However the more conservative view, given the results of the ANCOVA, is that there is in fact no conclusive evidence for the treatment programs, being effective teaching strategies for courses in research methodology and statistics in First Year Psychology.

The loss of degrees of freedom, the relatively large S.D's and small sample sizes in this study, may be partially responsible for the tentative nature of any conclusions based on this study.

Hypotheses 5/6/7

Two points will be addressed here.

Firstly, comparing the change in standard deviations of the theory scores, between first and second semester, for each of the treatment groups revealed some interesting differences. Although a reduced Standard Deviation was observed in treatment group B, essentially no difference was found in the control group, while treatment group A exhibited a higher variance. It is argued, that these changes in variance may be explained by the relative acceptability of the different treatment programs.

More specifically, treatment A was found by the author, to be acceptable to some students and not necessarily acceptible to others, who may have had some objection to positive suggestion and/or any focus on attitudes (Gassner-Roberts, 1990). If in fact the response of students to the treatment program was a significant factor in student performance, then this could conceivably have resulted in an increased variability of performance. On the other hand, treatment B may in general have been perceived as a less threatening and controversial type of experience, with the emphasis being essentially on relaxation, and therefore was less likely to polarise the subjects (although here again there may have been exceptions, depending on the type of music or even the use of music as such, Felix (1991). It was not clear why there should have been a reduction of variance in this group. It is therefore of interest to explore further, particular individuals in terms of possible differences in their reaction to the treatment program and the potential use of this information as covariates.

Secondly, given the significant analysis of variance and the Scheffe test, it is argued that some evidence existed for a differential treatment effect. However, based on the results of the ANCOVA and bearing in mind the previous methodological objections to conclusions based on the ANCOVA, is that Hypotheses 5, 6 and 7 need to be rejected and that there is no conclusive evidence for any treatment effect on performance on a theory paper in First Year Psychology. Further replication with larger samples, may help to clarify this picture.

Some final points now need to be addressed;

1. Despite the tentative nature of these findings, it is worth speculating on the implications of the different effects of the treatment programs on methodology and theory papers. There is some evidence for a smaller differential effect of the two treatment programs on the methodology paper rather than the theory paper (A significant Duncan POST

HOC versus a significant result using the more conservative and stringent SCHEFFE test, respectively) and yet the specific focus of the experimental program for treatment group A, in particular, was on the attitude to mathematics and statistics (that is, Mathematics anxiety) and their performance on the methodology paper. Even in experimental group B, despite the fact that no specific mention was made of methodology in the relaxation sessions, these were after all carried out in the methodology classes and it was expected that if anything they would effect behaviour related closely to the material covered in these classes, rather than less related material.

At this stage, it is difficult to be able to explain this particular finding except to suggest that for some reason, performance on the theory paper was much more susceptible to the attitudinal influences of treatment program A. Further replication of this study, particularly with larger samples is desirable.

2. According to Schuster, Benitez-Bordon and Gritton (1986), their observations indicated that Suggestopedia, an example of a teaching program incorporating relaxation and guided imagery/visualization " is so effective because the individual components in the method have been combined together in an overall, integrated fashion which increases the effectiveness of the individual elements in a cumulative way." (p.9)

Based on this view, it is therefore argued, that relaxation and guided visualization/ imagery may be important, but only small components of a much larger more comprehensive teaching package and may not be guaranteed to produce significant changes in student performance and/ or attitudes. This hypothesis may be a partial explanation for the weak results reported in this study.

In conclusion then, there is some evidence to suggest trends in the data. However, further research with larger samples is essential, particularly given the discrepancy between the results of the variance and covariance forms of analysis, that were adopted in the present study.

Finally, group variability appeared to be influenced differently by the various treatment programs and this suggests the need to look at individual differences.

Bibliography

Achterberg, J. (1985). Imagery in Healing Shamanism and Modern Medicine, Boston and London: New Science Library, Shambala .

Bandler, R. (1985). Using Your Brain-for a CHANGE:Neuro-Linguistic Programming. Connirae and Steve and Andreas (eds). Moab, Utah: UT: Real People Press.

Bandler, R. and Grinder, J. (1979). Frogs Into Princes, Moab, Utah: Real People Press.

Bennett, G.K., Seashore, H.G. and Westman,A.G. (1974) Differential Aptitude Tests,Grades 8-12, Manual 5th Edition, Psychological Corporation

Benson, H. (1975). The Relaxation Response, New York: Morrow.
Cooper, E. and Robinson, D.A. G.(1991). The Relationship of Mathematics Self-Efficacy Beliefs to Mathematics Anxiety and Performance, Measurement and Evaluation in Counselling and development, 24, 4-11
Deffenbacher, J.L. and Snyder, A.L. (1976). Relaxation as Self-Control in the Treatment of Tst and Otjher Anxieties, Psychological Reports, 39,379-385
Felix, U. (1991). Die Effektivitat Der Suggestopadischen Methode Im Licht Empirischer Untersuchungen . In Unterrichts Wissenschaft, No. 1, Page 23-48
Galton, F. (1883). Inquiries into Human faculty and its Development. Reprinted, 1973, New York: AMS Press Inc.
Galyean, B-C. (1981). Guided Imagery in Education, Journal of Humanistic Psychology, 21, 4, 57-68
Gasner-Roberts, S. (1990). Suggestopedia, Unpublished report of an 'Accelerated Learning Society Of Australia'(ALSA) workshop, Melbourne, Australia.
Gawler, I. (1987). Peace of Mind. Melbourne, Australia: Hill of Content Publishing Company.
Hembree, R. (1990). The nature, effects and relief of mathematics anxiety, Journal For Research in Mathematics Education, 21, 33-46
Hird, J.S., Landers,D.M. and Thomas, J.R. (1991). Physical Practice is Superior to Mental Practice in Enhancing cognitive and Motor task Performance, Journal of Sport and Exercise Psychology, 8, 281-293
King, M.G. and Symons, M.R. (1985). A rapid assesment of Arousal and Stress: Introducing the LASS. Unpublished Manuscript
Lozanov, G. (1979). Suggestopedia, London: Gordon and Beach.
Mckeller, P. (1968). Experience and Behaviour , Penguin
Orr, F. (1986). Time Management for Personal Effectiveness, University of New South Wales: Continuing Education Support Unit .
Prichard, A and Taylor, J. (1980). Accelerating Learning: The Use of Suggestion in the classroom, Novato, California: Academic Therapy Publications.
Richardson (1969). Mental Imagery. London: Routledge and Kegan Paul.
Richardson, F.C. and Sinn, R.M. (1972). The mathematics anxiety rating scale; psychometric data. Journal of Counselling Psychology. 19, 51-554
Richardson, F, and Wolfolk, C. (1980). Mathematics Anxiety.In I.G.Sarason (Ed). Test Anxiety: Theory Research and Applications (pp 271-288). Hillsdale, NJ: Erlbaum.
Rose, C. (1990). Accelerated Learning, New York: Dell Publishing,
Samuels, M. and Samuels, N. (1975). Seeing With The Mind's Eye, The History, Techniques and Uses of Visualization, New York : Random House Inc.The Bookworks
Schuster, D., Benitez-Bordon, R. and Gritton, C. (1976). Suggestive-Accelerative Learning and Teaching: A Manual of Classroom Procedures Based on the Lozanov Method. Des Moines, IA: Society for Suggestive-Accelerative Learning and Teaching.
Sharpley, C.F. (1987). Research Findings on Neurolinguistic Programming: Nonsupportive Data or an Untestable Theory?, Journal of Counselling Psychology, 34, 1, 103-107

Storz, M. (1989). Mind Body Power, Singapore: Times Editions.
Suinn, R. (1983). Imagery and Sports. In A . Sheikh (Ed.), Imagery; Current theory, research and application (pp. 507-534). New York: Wiley.
Wade, J. (1990).Super Study; A new age study guide. Melbourne: Dellasta.

Wrisberg, C.A and Anshel, H. (1989). The Effect of Cognitive Strategies on the Free Throw Shooting Performance of Young Athletes, The Sport Psychologist, 3, 95-104
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TABLE 1:
Maths Anxiety (MARS) For Treatment Groups

Group	No	Mean	SD	SE
Pre				
Exp (A)	18	96.94	16.65	3.9
EXP(B)	15	95.27	19.57	5.05
Post				
Exp (A)	18	86.72	18.44	4.35
EXP(B)	15	89.47	21.34	5.51

TABLE 2:
1 way ANOVA Theory Paper (1st Semester)

Group	N	Mean	SD	SE	F	P
EXP(A)	21	34.57	6.55	1.43		
EXP(B)	17	30.53	4.68	1.16		
Control(NI*)	19	33.74	6.74	1.54	1.19	0.06

* Random non intervention group

TABLE 3:
Independent T -TEST (DAT)

GROUP	N	Mean	SD
EXP(A)	16	23.125	6.195
EXP (B)	11	26.45	4.591

t(25)=-1.52, P> 0.05, 1 tailed test

TABLE 4:
1 way ANOVA on the Methodology Paper
Hypotheses 2/4

Group	N	Mean	SD	SE	F	P
Exp (A)	21	33.12	5.47	1.19		
EXP(B)	17	29.06	6.24	1.51		
Control(NI)*	16	30.16	6.07	0.83	2.42	0.049

* Random

TABLE 5:
1 way ANOVA Theory Paper (2nd semester)
Hypotheses (3/5)

Group	N	Mean	SD	SE	F	P
EXP(A)	20	31.30	7.28	1.63		
EXP(B)	16	26.50	3.08	0.77		
Control (NI)*	17	30.65	6.52	1.58	3.15	0.026

* Random

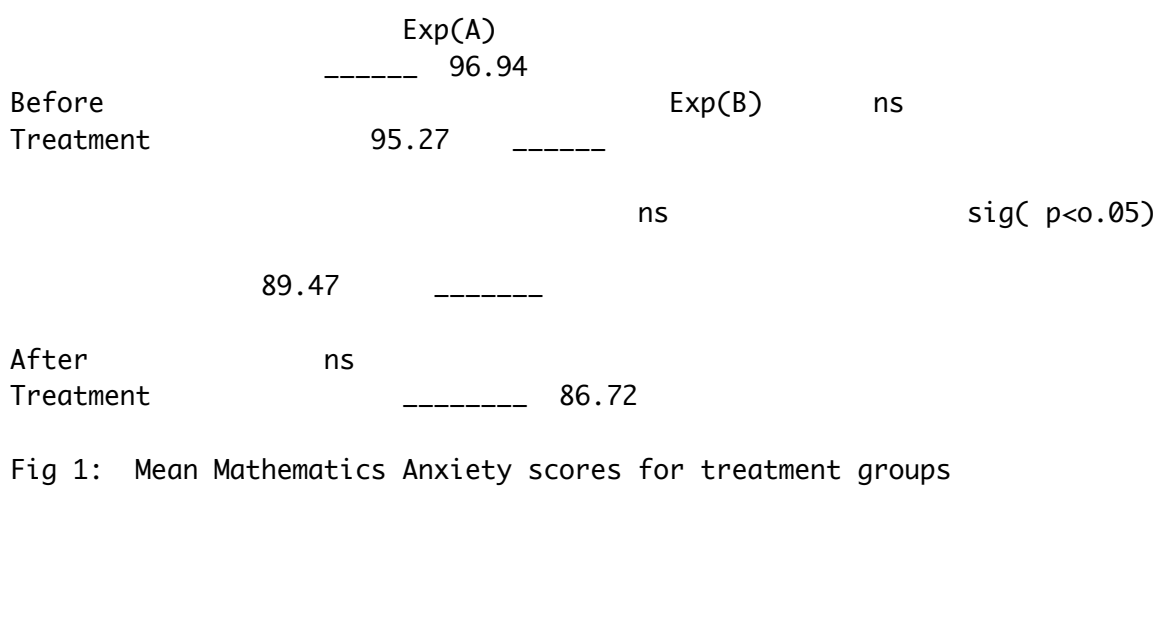

Fig 1: Mean Mathematics Anxiety scores for treatment groups