

Steele, K. M., Dalla Bella, S., Peretz, I., Dunlop, T., Dawe, L. A., Humphrey, G. K., Shannon, R. A., Kirby Jr., J. L., & Olmstead, C. G. (1999). Prelude or requiem for the 'Mozart effect'? *Nature*, 400: 827. Published by the Nature Publishing Group (ISSN: 0369-3392). doi:10.1038/23611

Prelude or requiem for the 'Mozart effect'?

Kenneth M. Steele, Simone Dalla Bella, Isabelle Peretz, Tracey Dunlop, Lloyd A. Dawe, G. Keith Humphrey, Roberta A. Shannon, Johnny L. Kirby Jr., and C. G. Olmstead

ABSTRACT

Rauscher et al. reported [1] that brief exposure to a Mozart piano sonata produces a temporary increase in spatial reasoning scores, amounting to the equivalent of 8-9 IQ points on the Stanford-Binet IQ scale [2]. Early attempts to confirm this 'Mozart effect' were unsuccessful [3, 4, 5, 6]. Rauscher et al. subsequently restricted their account to an improvement in spatial-temporal reasoning, as measured by the Paper Folding and Cutting task [7]. We use procedures modelled on the original report to show that there is little evidence for a direct effect of music exposure on reasoning ability.

We tested the performance of subjects on the same task (a 16- or 18-item paper folding and cutting task) after listening to the same Mozart music as in the original experiment. Control conditions were either the same or chosen to broaden the comparison set, and consisted of silence, relaxation instructions, minimalist music (*Music with Changing Parts* by P. Glass) or relaxation music (*The Shining Ones* by P. Thorton). The experimental designs replicated the original study at the University of Montreal (UM); other standard designs were used at the Appalachian State University (ASU) and the University of Western Ontario (UWO).

Table 1 shows the results of the experiments in either Stanford-Binet standard age scores (SAS) or as raw scores when conversion was not appropriate. SAS values in the UM and UWO studies are quite similar to the original report, indicating that the subjects had similar intellectual skills. The results show that listening to the Mozart sonata produced no differential improvement in spatial reasoning in any experiment. The sonata had no effect on performance, as revealed by analyses for main effects (ASU, $F(4, 81) = 0.33, P = 0.86$; UM, $t(30) = 1.14, P = 0.263$; UWO, $F(2, 64) = 1.99, P = 0.145$) and several interactions, and for individual improvement from the pretest (ASU, $F(4, 80) = 0.24, P = 0.91$). When SAS scores were translated into IQ-point equivalents, listening to Mozart produced a 3-point increase relative to silence in one experiment (UWO, 111 versus 108) and a 4-point decrease in the other experiment (UM, 114 versus 118). Conversion of the Mozart and silence comparisons into a measure of effect size indicated that the music had little impact (mean $d = 0.003$). A requiem may therefore be in order.

Table 1 Effect of listening condition on scores from the Paper Folding and Cutting task

Listening condition	Mean	s.e.	N
UM, Stanford-Binet SAS scores			
Mozart	57.31	1.26	32
Silence	59.06	0.88	32
UWO, Stanford-Binet SAS scores			
Mozart	55.58	0.64	24
Silence	54.27	0.67	21
Relaxation music	54.14	0.31	22
ASU, number correct from 16 items			
Mozart	10.78	0.74	18
Silence	11.42	0.91	17
Minimalist music	10.83	0.78	18
10 min relaxation	10.89	0.86	18
20 min relaxation	11.07	0.98	15

In the Paper Folding and Cutting (PFC) task, the subject chooses the appearance of unfolded paper from five alternatives. At UM, subjects listened to music or silence and were then given the Stanford-Binet PFC or Matrices task. After 10 min rest, they had the other treatment and were given the other task. Task order and treatment order were counterbalanced across subjects. Only results from the PFC task are shown; there was no significant effect of treatment on Matrices results, $t(30)=0.40$, $P=0.69$. At UWO, after being randomly assigned a listening condition, subjects were tested with the Stanford-Binet PFC task. At ASU, subjects were pretested with 16 PFC items. After 48 h, they were exposed to a treatment condition and tested with 16 new PFC items, followed by a 20-item mood questionnaire. PFC tasks were counterbalanced across subjects. Pretest results indicated no pre-existing difference among groups, $F(4, 81)=0.66$, $P=0.62$. There was a significant 'practice' effect of improvement from the first to the second test, $F(1, 81)=33.6$, $P<0.001$, but this did not interact with treatment condition, $F(4, 81)=0.59$, $P=0.67$, indicating that no treatment had a differential effect on improvement.

REFERENCES

1. Rauscher, F. H. , Shaw, G. L. & Ky, K. N. *Nature* **365**, 611 (1993).
2. Thorndike, R. L., Hagen, E. P. & Sattler, J. M. *The Stanford-Binet Intelligence Scale*, 4th edn (Riverside, Chicago, 1986).
3. Carstens, C. B. , Huskins, E. & Hounshell, G. W. *Psychol. Rep.* **77**, 111–114 (1995).
4. Kenealy, P. & Monsef, A. *Psychologist* **7**, 346 (1994).
5. Newman, J. *et al.* *Percept. Motor Skills* **81**, 1379–1387 (1995).
6. Stough, C. , Kerkin, B. , Bates, T. & Mangan, G. *Personal. Individ. Diff.* **17**, 695 (1994).
7. Rauscher, F. H. & Shaw, G. L. *Percept. Motor Skills* **86**, 835–841 (1998).