

Event Related Potentials and the Musical Brain: The Effects of Music Preference and Music Training on Pre-attentive Stimulus Recognition (N200) and Memory Updating (P300) Processes

George N. Caldwell (gcaldwell@stow.ac.uk)

Glasgow Caledonian University,
70 Cowcaddens Road, Glasgow G4 0BA, UK.

Leigh M. Riby (L.Riby@gcal.ac.uk)

Glasgow Caledonian University,
70 Cowcaddens Road, Glasgow G4 0BA, UK

Previous behavioural research has consistently found enhanced cognitive function whilst listening to classical music; the so called *Mozart Effect* (Rauscher et al, 1993).

However, to date it has proven difficult to draw firm conclusions from this literature because of the diversity of methods used. Indeed, two issues to be substantiated are the impact of own genre preference and type of music training, on the enhancing qualities of music. The present study employed event-related potential (ERP) methodology to examine the effects of preference and training on known ERP markers related to stimulus identification and memory. Sixteen professional musicians from the Orchestra of Scottish Opera, Scottish National Orchestra (classical group) and from the Glasgow School of Modern Guitar (rock group) completed a standard 2 stimulus visual oddball paradigm under 4 task conditions – listening to classical music, rock music, white noise and silence. During the oddball task participants were required to discriminate between an infrequent target stimulus randomly embedded in a train of repetitive background or standard stimuli. The P300 and N200 that are respectively thought to index memory updating and stimulus recognition were elicited in response to the infrequent target stimuli. Three key findings were observed. First, own genre preference resulted in a reduction in amplitude of the P300 for classical musicians exposed to classical music and rock musicians exposed to rock music. This finding, alongside equivalent behavioural performance across conditions and group, indicated less cognitive resources being deployed for task completion when listening to the participant's music of choice. These data suggest that music preference, rather than listening to

classical music per se, is critical to the so-called *Mozart Effect*. However, the second finding at the pre-attentive stage of processing (e.g. N200) indicated beneficial effects of exposure to classical music for both groups of musicians. Finally, the earlier N200 component related to pre-attentive stimulus recognition was larger for classical musicians, particularly in the classical condition. This pre-attentive recognition might be linked to classical musicians' degree of expertise. Together, it seems that the classical musicians were more adept at classifying stimuli at an unconscious level (N200) following the presentation of specific visual stimuli, than the Rock musicians. This might represent the nature and level of training undertaken by professional classical musicians as opposed to that undertaken by rock musicians. Surprisingly, the N200 amplitude for rock musicians was more marked in the classical condition. These data are discussed in terms of short and long-term music benefits on both conscious and unconscious cognitive processes.

Acknowledgements

The authors would like to thank Valerie Gunn for data processing assistance.

References

Rauscher, F.H. Shaw, G.L. & KY, C.N. (1993) Music and spatial task performance, *Nature* 365, 611.