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Is more time in general music class associated with stronger extra-musical outcomes in kindergarten?☆

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ABSTRACT

Prior research has suggested an association between increased musical training and extra-musical outcomes, but these studies are primarily correlational, focused on instrumental music, and provide limited information about the type of musical intervention. In the current study, we perform the first randomized controlled study investigating whether more time in general music in kindergarten results in better executive functioning, self-perception, and attitudes towards school. Control students received an average of 45 min of general music class per week while treatment students received 2–7 times more minutes per week. Both control and treatment students had applied to attend a school or program of intensive general music study serving primarily low-income students. Analyses from end-of-kindergarten data revealed no significant group differences on our outcome measures. Results fail to show an association between increased time spent in general music learning and stronger extra-musical outcomes.

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1. Introduction

There is no known human culture without music, and musical instruments have been found from 45,000 years ago (Higham et al., 2012). All typically developing children respond to music and engage in spontaneous and frequent music-making both in and outside school (Goldstein, Lerner, & Winner, 2017). Understanding what children gain from music participation is important for our understanding of human development and learning.

Here we report an investigation of non-musical benefits from music education. We note that it is important to distinguish between intrinsic and extra-musical reasons for engaging children in music. The justification for music education should never, in our view, be based solely on potential extra-musical benefits. Music is one of humankind's most important (and ubiquitous) inventions. We believe that music education is intrinsically valuable even if it leads to no cognitive transfer effects. However, any potential transfer effects are added benefits, and certainly educators want to know about whether such effects exist and under which conditions.

Extra-musical benefits of music participation have been widely reported – in the popular press, in music education advocacy materials, and in empirical studies. Music education has been argued to improve cognition (e.g., IQ, standardized test scores, academic performance, executive functioning; Diamond, 2014; Holochwost et al., 2017; Schellenberg, 2004; Moreno et al., 2011), broad habits of mind (e.g., listening, imagining, and planning; Hodges, 2005; Hogan & Winner, in press), emotional functioning (e.g., empathy, motivation to attend school; Rabinowitch, Cross, & Burnard, 2013; Thomas, Singh, & Klopfenstein, 2015), social affiliation (Cirelli, Wan, Spinelli, & Trainor, 2017; Mehr & Spelke, 2017) and well-being (e.g., relief from depression and anxiety; Lally, 2009; Zanini & Leao, 2006; for reviews of transfer from music learning to other domains, see Hallam, 2015; McCarthy et al., 2001; Schellenberg & Weiss, 2013; and Winner, Goldstein, & Lancrin, 2013).

However, most of this research is correlational, not experimental, with self-selection into music participation being a significant weakness (Corrigall, Schellenberg, & Misura, 2013; Elpus & Abril,

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2011; Foster & Marcus Jenkins, 2017; Hille & Schupp, 2015; Winner et al., 2013). We note also that most of the research on music and extra-musical benefits has focused on instrumental training or listening experiences, with little work on general music instruction (sometimes called classroom music), classes in which children interact with music in a variety of ways – singing, playing simple unpitched percussion instruments, moving one's body to music, guided listening, describing music, and creating simple songs and soundscapes (Baldridge, 1984; Campbell & Scott-Kassner, 2013). General music, instrumental music, and listening experiences may well teach different kinds of skills. General music class has been understudied, despite the fact that this kind of class is nearly universal at the elementary level and forms part of the curriculum in 94% of United States elementary schools (Parsad & Spiegelman, 2012). In many cases, general music is the only music education that children receive, since elective ensemble courses are often a part of the curriculum for only select students in older grades. Because general music classes are compulsory, samples are not contaminated by self-selection.

We report here a randomized controlled study examining extra-musical outcomes (executive functions, self-perception, school liking) in kindergarteners as a function of amount of time spent in general music. Children in our treatment group (consisting of three separate classrooms) received between 90–315 min a week of general music, while those in our control group received only 45 min per week. Thus, treatment children received up to seven times more general music time than those in our control group, making it reasonable to consider whether so much additional time has an effect on cognitive and socio-emotional outcomes.

We focus here on three extra-musical outcomes: executive functioning, self-perception, and school-liking. We first briefly review what is known about the relation of music education of any kind to these three outcomes measures. Because nearly all research studies in music participation focus on instrumental playing rather than general music activities, we include these in our review.

1.1. Music and executive functioning

Executive functions (EFs) are seen by many as core skills critical for cognitive, social, and psychological development (e.g., Diamond, 2013; Jacques & Marcovitch, 2010; Moffitt et al., 2011; Zelazo, Carlson, & Kesek, 2008). They are important for daily life, and they are often more strongly associated with school readiness than are IQ or entry-level reading or math (e.g., Blair & Razza, 2007). Even when IQ, gender, social class, and family circumstances are controlled, better EFs in childhood predict better health, higher educational attainments, higher incomes and better jobs, and fewer arrests (Moffitt et al., 2011; Wong et al., 2010).

There are currently no conclusive answers about the effects of music training on EFs due to the small number of non-correlational studies and their mixed results. For example, a study by Schellenberg (2011) found that on most measures of EF, musically trained children showed no advantage. In contrast, Holochwost et al. (2017) found that on some measures of EF, musically trained children showed an advantage; and Degé et al. (2011) found that on all of the EF measures given, musically trained children showed an advantage. Degé et al. note several possible reasons for these conflicting results: studies did not all use the same EF measures, some of the measures may be more engaging or developmentally appropriate for young children than others, and studies differed in how music training was defined.

While core executive functions often work together, executive functioning is composed of three sub-functions: inhibitory control, working memory, and cognitive flexibility (Diamond, 2013; Huizinga, Dolan, & van der Molen, 2006; Miyake et al., 2000). We consider next what is known about the relationship of music training to each of these sub-functions.

1.1.1. Inhibitory control

Inhibitory control involves being able to override prepotent responses and direct one's attention, behavior, thoughts, and/or emotions to what is appropriate (Diamond, 2013). Joret, Germeys, and Gidron (2016) reported correlational findings that 9–12 year-olds who had begun Suzuki method instrumental lessons before the age of five had better inhibitory control in comparison to non-musicians as measured by the Simon task (Simon & Rudell, 1967). Consistent with this finding, adult musicians showed greater inhibitory control than non-musicians on the Simon task and an auditory Stroop task (Bialystok & DePape, 2009). Inhibitory control is an important aspect of playing music in large ensembles and chamber groups: playing parts that are not in unison requires focusing on one's own part (sometimes screening out others) and inhibiting playing at the wrong time (Jentzsch, Mkrtchian, and Kansal, 2014).

The relationship between inhibitory control and an early childhood music and movement program has been explored in one quasi-experimental study. Winsler, Ducenne, and Koury (2011) speculated that young children involved in music experiences may learn to regulate their behaviors as a result of continual practice in which they respond to changes in music (loud/soft, high/low, happy/sad). In their study of 3- and 4-year-olds involved in the early childhood music program, Kindermusik, which includes activities similar to those found in general music in elementary schools, they found that children in music classes performed better on self-regulation measures and were more likely to use singing or humming as a regulatory behavior when waiting.

1.1.2. Working memory

Working memory (both verbal and non-verbal) is most commonly defined as the ability to hold information in mind while mentally manipulating that information (e.g., doing mental math, re-ordering a to-do list, or relating one idea to another; Baddeley, 2012; Baddeley & Hitch, 1974; D'Esposito & Postle, 2015; Diamond, 2013).[1] Working memory is required for playing music from notation because one must play correct fingerings and bowings while reading ahead to the notes coming next (Meinz & Hambrick, 2010; Nutley, Darki, & Klingberg, 2014). Working memory has been positively related to music experience in numerous studies. In a correlational study by Franklin et al. (2008), undergraduate and graduate music students who had initiated instrumental training before the age of 10 were compared to a non-musical control group. Musicians scored significantly higher on two measures of verbal working memory-reading span and operation span. In a study following child and adult participants over two years, Nutley et al. (2014) found a positive correlation between weekly hours of instrumental music practice and working memory using the Dot Matrix from the Automated Working Memory Assessment (Alloway, 2007) and the Backwards Digit Span. (For similar findings, see Bugos, Perlstein, McCrae, Brophy, & Bedenbaugh, 2007; Degé, Kubicek, & Schwarzer, 2011; Ho, Cheung, & Chan, 2003; Pallesen et al., 2010; and Schellenberg, 2006).

[1] An alternative definition of working memory is holding information in mind while blocking or inhibiting other information from entering that active state (Engle & Kane, 2004; Unsworth & Engle, 2007) – or stated slightly differently, "the ability to keep a representation active, particularly in the face of interference and distraction" (Engle, Tuholski, Laughlin, & Conway, 1999, p. 309). This definition blurs the distinction between inhibitory control and working memory. For the purposes of our study and of what constitutes an appropriate measure of working memory, the difference between these two definitions of working memory is not relevant.

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