

# The Association Between Arithmetic and Reading Performance in School: A Meta-Analytic Study

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Many studies of school achievement find a significant association between reading and arithmetic achievement. The magnitude of the association varies widely across the studies, but the sources of this variation have not been identified. The purpose of this paper is to examine the magnitude and determinants of the relation between arithmetic and reading performance during elementary and middle school years. We meta-analyzed 210 correlations between math and reading measures, coming from 68 independent samples (the overall sample size was 58923 participants). The meta-analysis yielded an average correlation of 0.55 between math and reading measures. Among the moderators tested, only transparency of orthography and use of timed or untimed tests were significant in explaining the size of the correlation, with the largest correlations observed between timed measures of arithmetic and reading and between math and reading in opaque orthographies.

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Reading and math skills appear to be correlated from early on in development (Duncan et al., 2007; Purpura, Hume, Sims, & Lonigan, 2011). The association between arithmetic and reading achievement has frequently been the focus of research in children with learning disabilities, and those studies regularly report a significant degree of comorbidity between math disabilities and reading disabilities (Badian, 1999; Dirks, Spyer, van Lieshout, & de Sonneville, 2008). By contrast, in typically developing elementary schoolchildren, the association between arithmetic and reading has only been observed incidentally in studies that aim to study either one of them separately (Durand, Hulme, Larkin, & Snowling, 2005; Kail, & Hall, 1999), and occasionally in studies that aim to predict one from the other (Duncan et al., 2007; Fuchs et al., 2016). This study seeks to

systematically analyze the size of the correlation between continuous measures of arithmetic and reading in typically developing children of school age. Knowing the average size of the association between arithmetic and reading achievement in typically developing schoolchildren, and how it varies depending on aspects such as instruments used, age of participants, or characteristics of the language, could contribute to our understanding of the nature of the association between these two constructs, and thereby to our ability to develop effective interventions.

## Previous Studies

In studies of typically developing children, the association between arithmetic and reading performance is usually reported as a correlation. Occasionally, some studies will attempt to predict one of these skills based on concurrent or longitudinal performance on the other. Published correlations between arithmetic and reading, range from 0.09 (Onatsu-Arvilommi, Nurmi, & Aunola, 2002) and 0.75 (Neuenschwander, Röthlisberger, Cimeli, & Roebbers, 2012). Similarly, studies that attempt to predict math from reading or vice versa obtain diver-

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