

Memory Span and Retardate Performance and Learning in Multi-Trial Free Recall¹

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According to Murdock (1960), the multi-trial free recall task allows a nice operational distinction between performance and learning. Performance is assessed by Trial 1 scores and rate of learning is assessed by the slope of the Trial by Trial acquisition curve. Murdock proposed a mathematical model of multi-trial free recall in college students. In the process of curve fitting Murdock derived an empirical constant, m , which he interpreted to be the immediate memory span. Murdock was not immediately concerned with individual differences, but his derived equations involving m predict a positive relation between span (m) and Trial 1 scores (performance) and between span and the slope of the acquisition curve (rate of learning). Murdock did not pursue the implications of m as an individual differences variable; rather, he treated it as a constant. The present experiment examined a range of span abilities and directly assessed the implications of Murdock's equations.

The subjects were 20 mildly and moderately retarded adolescents divided into high-span and low-span groups (word spans = 4.78 and 2.50). Each subject attempted 16 trials on 10-word lists. The high-span subjects scored reliably higher overall and on Trial 1. The correlation between span and Trial 1 scores was $.54, p < .01$, which supports the expectation that span and performance are directly related.

In multi-trial free recall, when number of correct responses is plotted against trials the curve is negatively accelerated. In order to compare the slopes of the learning curves, the numbers of correct responses were plotted against log Trials. The resultant curves were linear. The slopes produced by the high-span subjects were reliably greater than the slopes produced by the low-span subjects; and span and slope correlated $.47, p < .025$. These findings support the expectation that span is directly related to rate of learning.

The data also indicate that, compared with IQ, span is the more fundamental individual differences variable in multi-trial free recall. Span correlated $.64$ with total number correct; IQ correlated $.56$ with the total number of correct responses; and span and IQ correlated $.82$. The correlation of span and total number correct with IQ held constant was $.44, p < .05$. The correlation of IQ and total number correct with span held constant was $.02$.

These data bear upon the common finding that immediate memory span is directly related to intelligence. According to Span Theory (Bachelder & Denny, 1977a, 1977b), IQ is directly related to span for two reasons: a) Higher-span subjects achieve more items on an IQ test because the more advanced items require greater amounts of span ability for their successful *performance*. and b) Higher-span subjects achieve more items on an IQ test because most or all items of an IQ test measure achievement. If higher-span subjects *learn* faster they should achieve more per period of instruction than lower-span subjects and thus attain higher scores on those items which assess achievement. Since the present data show that span is related both to performance and to learning, this interpretation of the relation between span and intelligence is supported.

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