Developmental dyslexia is a specific learning disability that affects reading acquisition, and that is estimated to affect 5-12% of school-age children. It is characterized by a core phonological deficit, although recent studies indicate that semantic impairment also contributes to this condition. In this study, event-related potentials (ERP) were used to examine whether the N400 wave in dyslexic children is modulated by phonological or semantic priming, similarly to age-matched controls. ERPs were recorded while children listened to word lists in which the semantic and phonological congruency of the terminal words were manipulated. No overt judgments were made by participants. In control children the N400 amplitude to both semantically and phonologically incongruent words was enlarged relative to congruent words. Dyslexic children exhibited a dissociation of priming effects depending on whether semantic or phonological primes were used. Semantic priming elicited an N400 effect comparable to controls, though delayed. In phonological priming, the dyslexics differed from controls in both the phonologically incongruent and congruent conditions showing reduced N400 amplitude in the former and enhanced N400 in the latter. This pattern suggests that when faced with phonological priming, dyslexics show abnormal neural responses related to both integration of similarities between the consecutive stimuli and the ability to detect incongruent stimuli. Semantic priming seems relatively intact in dyslexics, however neural responses to contextual incongruency are delayed.