On the relationship between the approximate number system (ANS) and mathematics in first grade children

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An increasing number of studies have investigated the cognitive components that contribute to the development of mathematical skills. The Approximate Number System (ANS) is a non-verbal, primitive, noisy and imprecise cognitive system of magnitude representation for making quantitative judgments and decisions. It allows discrimination of large numerosities without using counting or numerical symbols. The ANS has been considered one of the foundational-specific skills that underlie the development of mathematical abilities. However, the relationship between the ANS and mathematical abilities in preschool children is still matter of debate as it has been evidenced in some studies but not in others. Therefore, it remains controversial whether the ANS serves as a foundation for mathematical abilities. The present study investigated the relationship between ANS performance and mathematics in 110 first grade children. We measured ANS abilities, verbal intelligence and different aspects of numerical competence. Correlational analyses indicated that performance in the approximate addition ANS task was associated with mathematical abilities, even when age and verbal IQ were controlled for. Moreover, it was found that the subgroup of children with higher ANS performance showed better mathematical abilities than the subgroup of children with lower ANS performance. Longitudinal and training studies are needed to identify the direction of the link between ANS and mathematical ability.