Struggling with single-digit multiplications: testing several hypotheses

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Single-digit multiplications are usually memorized without too many problems, however, it exists a percentage of children, between 5-10%, who suffers big difficulties in their learning (Geary, 2011). In accordance with previous studies, difficulties in learning multiplications would be related with interference-control problems. The more similar the multiplications are (e.g., 4x6=24; 4x7=28), the greater is the interference that occurs when remembering them. People who have interference-control problems, would not be able to adequately retrieve the solutions (e.g., Geary, 2011; De Visscher et al., 2014, 2015, 2016; Szücs & Myers, 2016). Furthermore, evidences suggest that inhibition would be a key cognitive mechanism underlying numerical development (Askenazi & Henik, 2010; Nath & Szücs, 2016). Another point of view defends that difficulties with basic numerical representations, or their access from symbolic formats (e.g., Arabic, verbal), would be the cause of the multiplication learning difficulties. The footprint in the memory of multiplication problems would be weakened because of an imprecise representation of the numbers and the result which compose them (e.g., Buttwerworth, 2005). This study explored whether the differences in multiplication fluency in adults are due to numerical or non-numerical abilities. High Fluency (N=17; Age=18-32) & Low Fluency (N=17; Age=18-37) groups were created according to their performance in a multiplication fluency test (High= Fluency > P85, Low=Fluency < P15). We used two tasks to assess symbolic and non-symbolic numerical representations, and two memory tasks to assess proactive and retroactive interference. To assess inhibitory control, we used the Attentional Network Task. Finally, we explore the interaction between numerical representations and inhibition using a numerical Stroop task. Results showed differences in numerical representation tasks between groups but not in interference-control measures. A reduced numerical Stroop effect in

the Low Fluency group was also found. Taking together, we conclude that deficits in the numerical domain are in the basis of single-digit multiplication problems.