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Inhibitory Control as a Possible Mediator in the Relation Between Pretend Play and Math Skills During Early Childhood

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Inhibition, Math, & Pretend Play

Inhibitory control, also commonly called effortful control, is the cognitive function of inhibiting or acting against one's own natural impulses. Inhibitory control is one of the most appropriate measures of executive function during early childhood (Carlson, Moses, & Breton, 2002). Mathematical ability, for example, has a strong relation with inhibitory control that is stronger than other academic skills (e.g., literacy) (Allan et al., 2014). Inhibitory control in early childhood also acts as a predictor for acquisition of mathematical skills later in life (Clark, Pritchard, & Woodward, 2010). Interestingly, inhibitory control also correlates with greater relative frequency of pretend play actions and pretense representation (Carlson, White, & Davis-Unger, 2014).

Pretend play functions as a way for children to practice or develop their inhibition. Children must make choices—and inhibit others—about what they are pretending. Similarly, math requires inhibition, as suppressing distracting information or neglecting other related processes is necessary.

Hot vs Cool Inhibitory Control

Inhibitory control can be divided into two groups: hot and cool. Hot inhibitory control describes inhibition of impulses that are emotionally stimulating or personally and directly affecting an individual. For example, a child that successfully waits five minutes in front of a marshmallow before eating it to receive an additional one would be exhibiting hot inhibitory control. Cool inhibitory control describes inhibition in abstract or hypothetical scenarios that may not directly affect the individual.

For example, a child that suggests a hypothetical character should wait five minutes in front of a marshmallow before eating it to receive an additional one would be exhibiting cool inhibitory control. Previous research has found cool inhibitory control to have a stronger correlation with mathematical ability than hot inhibitory control does in early childhood (Brock et al., 2009). Cool inhibitory control has a stronger positive correlation with frequency of pretend play and pretense representation than hot inhibitory control as well (Carlson, White, & Davis-Unger, 2014).

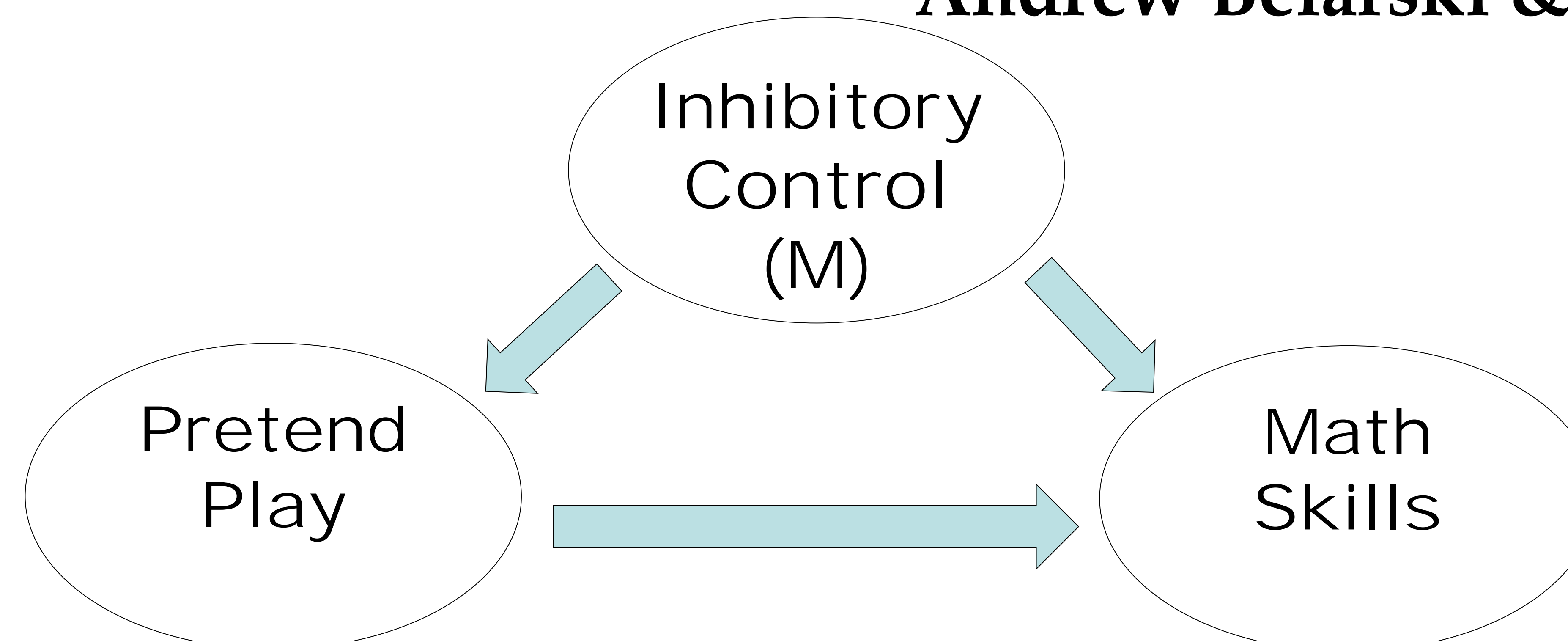


Figure 1. Inhibitory Control is a potential mediator in the relation between pretend play and math skills in early childhood. More research is needed to empirically confirm inhibitory control as a mediator.

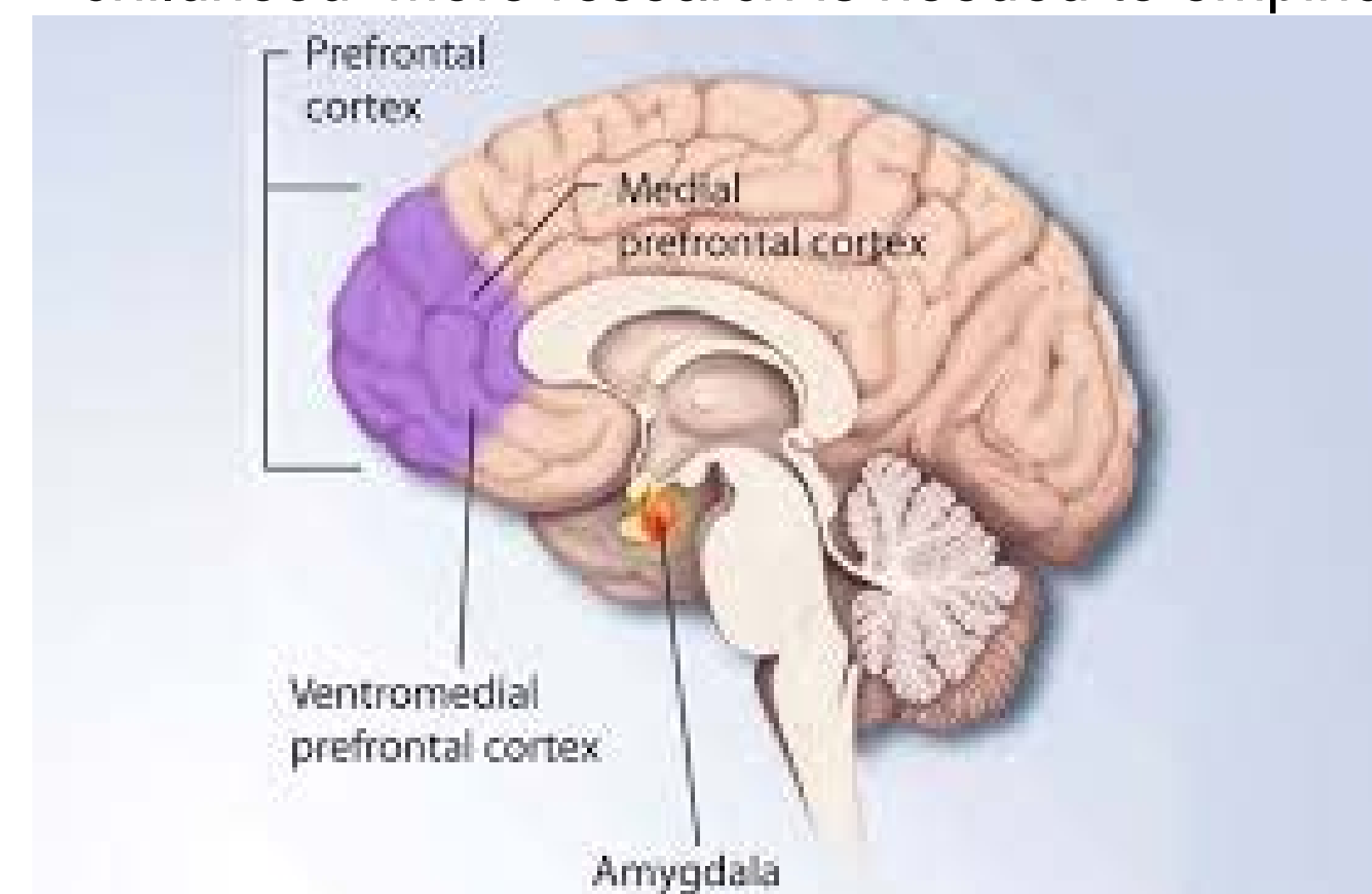


Figure 2. Prefrontal cortex location in the brain



Figure 3. Child exhibiting inhibitory control by refraining from cupcakes

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Biological Similarities

Mathematical ability and pretend play share biological similarities. The prefrontal cortex is a region of the human brain located on the anterior frontal lobe and is responsible for cognition and decision-making.

Inhibition has been linked to the prefrontal cortex (Rubia et al., 2003). Neurons in the prefrontal cortex are also activated while doing math in early childhood (Willoughby et al., 2012). Additionally, the practice of mathematics has been found to cause growth and development of the prefrontal cortex (Willoughby, Kupersmidt, & Voegler-Lee, 2012; Blair et al., 2005).

A relevant relation is present with pretend play as well. Previous research has suggested that a deprivation of pretend play is associated with less activity, stunted development, and weakened synapses in the prefrontal cortex (Lillard, 2017).

Conclusions

Through mathematical ability and pretend play's common correlation to inhibitory control and executive function, similar relative strength of relation between hot and cool inhibitory control, and shared activity region in the brain, it is evident that math and pretend are linked in early childhood. Future research should focus on finding a mediating effect from inhibitory control empirically.