



## Can the attention training technique turn one marshmallow into two? Improving children's ability to delay gratification



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### ABSTRACT

The seminal Marshmallow Test (Mischel & Ebbsen, 1970) has reliably demonstrated that children who can delay gratification are more likely to be emotionally stable and successful later in life. However, this is not good news for those children who can't delay. Therefore, this study aimed to explore whether a metacognitive therapy technique, Attention Training (ATT: Wells, 1990) can improve young children's ability to delay gratification. One hundred children participated. Classes of 5–6 year olds were randomly allocated to either the ATT or a no-intervention condition and were tested pre and post-intervention on ability to delay gratification, verbal inhibition (executive control), and measures of mood. The ATT intervention significantly increased (2.64 times) delay of gratification compared to the no-intervention condition. After controlling for age and months in school, the ATT intervention and verbal inhibition task performance were significant independent predictors of delay of gratification. These results provide evidence that ATT can improve children's self-regulatory abilities with the implication that this might reduce psychological vulnerability later in life. The findings highlight the potential contribution that the Self-Regulatory Executive Function (S-REF) model could make to designing techniques to enhance children's self-regulatory processes.

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In order to delay gratification, people need to be able to employ self-regulation. That is, the ability to override and change their response to an immediate impulse or desire. Studies have shown that children who are able to self-regulate in this way are likely to experience greater success later in life (Ayduk et al., 2000; Eigsti et al., 2006; Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990). Conversely, inability to delay gratification in childhood is a risk factor for subsequent psychological pathology (Moffitt et al., 2011). Given this consistently well-supported connection, it is worthwhile to explore whether ability to delay gratification can be improved during childhood with a goal of potentially enhancing outcomes later in life. However, research has tended to overlook this extension, focussing instead on the contexts in which children are best able to delay.

Delay of gratification is a dimension of self-regulation that can be seen as a correlate of executive control (Mischel, Yuichi, & Rodriguez, 1989). In a separate line of research, studies have aimed to improve components of executive function in children

(Karbach & Kray, 2009; Minear & Shah, 2008). Rueda, Checa, and Combata (2012) delivered 10 sessions of computerised attention training to healthy five year old, Spanish children in school. Children who had received the attention training displayed faster activation of brain areas associated with executive control. Further research with four to six year old German children (Streb, Hillie, Schoch, & Sosic-Vasic, 2012) delivered computerised attention training every day for one week within school. Results indicated that children who had received the intervention displayed significant improvements in inhibition and cognitive flexibility. These studies suggest that attention training strategies in young children from non-clinical samples is feasible and may be advantageous. However, these studies stand as examples of a limited number of studies conducted in this area; they have used small samples and not specifically measured self-regulation using the marshmallow task, which we know to be a predictor of longer term outcomes.

The attention training delivered in previous research is time consuming for a classroom setting. For example, Rueda et al.'s (2012) intervention lasted seven and a half hours over five weeks. Interventions also consisted of a wide range of components intended to target various aspects of executive functioning (e.g.

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cognitive flexibility, inhibition, tracking, discrimination or conflict resolution). Whilst this provides a comprehensive intervention, this is challenging for schools to implement within their existing curriculum. Of particular importance, such multicomponent techniques are not based on any specific model linking attentional control, delay of gratification and psychological vulnerability, which is our aim.

We considered how a metacognitive therapy intervention, the Attention Training Technique (ATT; Wells, 1990) could enhance children's ability to delay gratification. This technique is based on a specific metacognitive model, the Self-Regulatory Executive Function (S-REF) model, linking executive control to unhelpful thinking styles that cause psychological vulnerability (Wells & Matthews, 1994, 1996). Specifically, Wells and Matthews argue that psychological dysfunction is caused by perseveration of unhelpful processing that occurs as a cognitive attentional syndrome. For example, perseveration of ideational processes is evident in addictive behaviours where repetitive thinking is characterised not only by worry and rumination but also 'desire thinking' (Spada, Caselli, & Wells, 2013). This thinking style prolongs internal aversive experiences leading to greater behaviours aimed at escaping anxiety, low mood or desire. The S-REF model has led to the development of treatment techniques intended to increase control over extended thinking and increase flexibility in responding to internal states. The ATT aims to enhance the capacity to disengage perseverative processing by enhancing executive control through training individuals in externally-focused auditory attention exercises (Wells, 2000). To date, the ATT has been delivered to adults, with studies indicating its effectiveness in improving symptoms in adult patients with mood disorder (Papageorgiou & Wells, 2000), social phobia (Wells, White, & Carter, 1997), and traumatic stress symptoms (Callinan, Johnson, & Wells, 2015; Nassif & Wells, 2014). Significant effects have been found after 2–6 sessions (Papageorgiou & Wells, 2000; Siegle, Ghinassi, & Thase, 2007).

Whilst previous studies have focused on adults experiencing psychological disorder, it is plausible that the ATT could disrupt perseverative processing routines that contribute to low impulse control in children. Because the ATT is designed to disconnect sustained processing and coping efforts from internal and external events it is likely that children who are trained in it could subsequently develop enhanced awareness of the independence between internal and external experiences and behaviour and increase their flexible choice over action. An important marker for this effect in children would be an enhanced ability to delay gratification (i.e. choose not to respond to perseverative, desire related thinking). If this effect can be demonstrated then an exciting implication is that ATT may be a candidate strategy for improving psychological wellbeing (i.e. resilience) throughout life.

## 1. Aims of the present study

Research indicates that children begin to develop inhibitory control between 5 and 6 years of age (Carlson & Moses, 2001; Nelson & Narens, 1994), and therefore the primary aim of this study was to explore whether it is possible to use ATT in young children aged 5–6 years, and whether this impacts on their subsequent ability to delay gratification. It was hypothesised that those children receiving ATT would be better able to delay gratification than those in a no-intervention control condition. The testing of this hypothesis was our primary objective.

A secondary aim was exploratory and examined whether children's ability to delay gratification was correlated with performance on a verbal Stroop task (the day/night task: Gerstadt, Hong, & Diamond, 1994), prior to and following the ATT intervention, and whether, in line with previous research in adults, ATT improves

mood in children.

Performance on the day/night task has been shown to be dependent on the development of inhibitory control; we predicted positive associations between performance on the day/night task and delay of gratification. Furthermore, we intended to use scores on this task to control for individual differences in inhibitory control when testing the effects of ATT on delay of gratification. Finally, we wanted to explore any effect of the ATT on children's performance on the day/night task following the intervention.

The following specific predictions and research questions were tested:

- Primary prediction: That 5–6 year old children who receive the ATT will be more able to delay gratification at follow-up testing than children in the no-intervention condition.
- Secondary Questions: Are children who score higher on a verbal Stroop task more able to delay gratification? Will children in the ATT condition have significantly improved mood and improved performance on the day/night task compared with those in the no-intervention condition?

## 2. Materials and method

### 2.1. Design

Within this mixed-model design, classrooms of children were randomly allocated as blocks to either the experimental condition (where children received the ATT intervention, described below) or the no-intervention condition (where children received school activities as normal). The same seven-day study protocol was used in each school. Day one (always a Monday) involved the researcher attending school to collect baseline data. Day two to five (always Tuesday to Friday) involved the teacher administering the intervention on three occasions, at their convenience (or no-intervention). There was then a two day weekend break (Saturday and Sunday) followed by the researcher returning to school on day seven (Monday) to collect follow up data.

The primary dependent variable was children's ability to delay gratification and resist a treat (candy), measured by the Marshmallow Test (Mischel & Ebbesen, 1970). The control/predictor variables for the main analysis were child's age (measured in months); number of months the child had been in school; child's mood score measured at T1 and T2 by the Faces Scale (Holder & Coleman, 2008), and; child's ability to suppress verbal responses, measured by the day/night task at T1 and T2 (measures are described below).

#### 2.1.1. Recruitment

Five classes of children were recruited from five primary schools within Greater Manchester, England. Recruitment began in summer 2012 – spring 2013 via emails to school Head Teachers. Teachers then distributed information packs and consent forms to parents. For children to be eligible to participate, they had to have parental consent and be able to read, write and understand English. The study was approved by the University of Manchester's Ethics Committee (Ref – 12203).

#### 2.1.2. Participants

One hundred children from five classes participated in the study, 59 (three classes) were randomly allocated to the experimental condition, and 41 (two classes) to the no-intervention condition. Fifty eight children were male; 42 were female. Children's age ranged from 5.20 years to 6.52 years ( $M = 5.87$  years,  $SD = 0.3$  years). The time children had been in primary school at baseline testing ranged from 2 to 7 months ( $M = 4.52$  months,  $SD = 1.8$ ). One

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