MOTIVATIONAL INFLUENCES ON COGNITIVE PERFORMANCE IN CHILDREN

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Abstract: Cognitive psychologists have begun to address how motivational factors influence adults' performance on cognitive tasks. However, little research has examined how different motivational factors interact with one another to affect behavior across the lifespan.

Key words: approach, incentive, promotion, minimize, adults, performance, condition, reward, application.

Cognitive psychologists have begun to address how motivational factors influence adults' performance on cognitive tasks. However, little research has examined how different motivational factors interact with one another to affect behavior across the lifespan. The current study examined how children perform on a classification task when placed in a regulatory fit or mismatch. Nine-year-old children performed a classification task in which they either gained or lost points for each response. Additionally, children were given either a global promotion focus (trying to earn a gift card) or a prevention focus (trying to avoid losing a gift card). Previous work indicates that adults in this task tend to perform better when there is a match (or *fit*) between the overall incentive to earn or avoid losing the incentive and the task reward structure to maximize points gained or minimize points lost. Unlike adults, nine-year-olds perform better in the promotion condition than in the prevention condition regardless of task reward structure. Possible explanations for the differences between adults' and children's performance are discussed as well as possible applications for academic settings.

Motivation is a crucial determinant of action, and as a result it has been an important focus of psychological research[1]. Recently, cognitive psychologists have begun to investigate the impact of motivational incentives on cognitive performance.[2] This research has been conducted primarily using young adults as

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087182/#R10
[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087182/#R15

participants. In the current work we examine the effect of motivational incentives on children. A focus on children is important both for its implications for basic research as well as for its implications for academic situations. Children's cognitive performance is evaluated on a daily basis at school. Like adults, children are given incentives to perform their best in a variety of situations. Information about how children react to these motivational factors will be valuable in understanding how to structure classroom and testing environments to maximize students' performance.

A core distinction in the motivational literature is the one between *approach* and *avoidance* goals. Approach goals are situations in which someone is working towards a desirable end state (*e.g.* cash bonus, new car, praise from a teacher); whereas avoidance goals are situations in which someone is trying to prevent an undesirable end state (*e.g.* being fired, car accident, discipline from a teacher). Regulatory focus theory proposes that individuals also develop psychological states of readiness, or regulatory foci, when pursuing goals. A person in a *promotion focus* is particularly sensitive to gains in the environment and will, therefore, typically approach positive end states. In contrast, a person in a *prevention focus* is particularly sensitive to losses in the environment and will work to avoid negative end states. The promotion/prevention focus distinction is orthogonal to the approach/avoidance distinction. For example, two people may share an approach goal of earning a prize for good performance. One of them may regulate toward the goal in an eager, gain-promotion manner, while the other may regulate toward earning the prize in a vigilant, loss prevention manner. Thus regulatory focus theory distinguishes between two different orientations toward goal pursuit.

Children are given performance goal situations quite often. Standardized testing has become routine in primary and secondary education. This environment is likely to induce a situational performance goal, because it is unlikely that many students view a standardized test as something that can be mastered for their own intrinsic benefit. Students likely view many testing situations as compulsory events in which they must achieve a certain criterion in order to gain positive outcomes and avoid negative ones. Further, students likely regulate toward the goal of successfully completing the test in a manner that is consistent with either a promotion or prevention regulatory focus. For this reason it is important to examine the way different regulatory foci toward achieving performance goals affect learning in children.

There is some reason to believe that elementary school children will not be affected by manipulations in the same way as adults. In adults, it is the

regulatory *fit* between global regulatory foci and the local reward structure of the task that influences performance. Adults in a regulatory fit tend to perform well on tasks that require the specific application of rules and the exploration of a variety of rule-based hypotheses due to increases in task engagement that results from a regulatory fit. These same effects might be predicted for children. However, many of the brain regions associated with a regulatory fit, such as the anterior and posterior cingulate cortices, and the amygdala[3].

Recent laboratory work has shown that regulatory focus can be situationally induced. Studies conducted in our labs have employed a raffle ticket manipulation to manipulate regulatory focus situationally. Participants induced into a promotion focus had the opportunity to earn a ticket into the raffle by reaching a certain performance criterion. Participants induced into a prevention focus were given a ticket before the start of the experiment and had to avoid losing the ticket by reaching the performance criterion. Thus, the overall goal is the same-to achieve an entry into the raffle--but the way in which participants regulate toward this goal is manipulated experimentally. This method offers an excellent way to examine how regulatory focus can influence behavior. Another motivational factor to consider, in addition to the global regulatory focus, is the local manner of goal pursuit used as one is working toward achieving a goal. For example, individuals can go about attaining a goal by repeatedly gaining points and attempting to maximize cumulative gains, or by repeatedly losing points and attempting to minimize cumulative losses. The interaction between one's global regulatory focus and the manner of goal pursuit influences the degree of *regulatory fit* experienced when performing the task. When there is a fit between one's regulatory focus and the reward structure (*i.e.* promotion focus and gains reward structure *or* prevention focus and losses reward structure), people tend to experience a feeling of ease. A fit can lead people to feel more confident about their choices in a task or to experience more positive feelings regarding the outcome of a decision. We manipulated regulatory focus by giving participants the opportunity to either earn or keep a $10 gift card. For the promotion conditions, children were told that they needed to reach the bonus on a randomly selected block in order to get a $10 gift card. They were told that they would not receive the gift card if they failed to reach the bonus. For the prevention conditions children selected which gift card they would like from a number of different options[4]

[3] Aaker JL, Lee AY. Understanding regulatory fit. *Journal of Marketing Research.* 2006;43:15–19.
[4] Liberman N, Molden DC, Idson LC, Higgins ET. Promotion and prevention focus on alternative hypotheses: Implications for attributional functions. *Journal of Personality and Social Psychology.* 2001;80:5–18

before the experiment began. The card was placed beside the computer they conducted the experiment on, and they were told that they would lose the gift card if they did not reach the bonus criterion on a randomly selected block of trials in the task. However, if they reached the bonus then they would not lose the gift card. Participants in both conditions were aware of the possibility of obtaining the gift card, including what specific gift cards were available, before the experiment began. At the end of the experiment all children were given a small toy for participating, and they were allowed to take/keep their gift card if they reached the bonus criterion.

There are several possible reasons why children performed better when given a promotion focus incentive than when given a prevention focus incentive. Children who are approaching adolescence have shown a tendency to give greater weight to potential positive outcomes than potential negative outcomes[5]. This would explain the improved performance for children given a promotion focus incentive. Additionally, children may not have as much experience with prevention-type situations and therefore, may not be motivated by that manipulation. It can be argued that children's environments (school and home) are largely goal-oriented from a promotion perspective. For example, children in school are encouraged to perform well to achieve good grades, to receive praise from teachers and parents, or to get special prizes for good behavior and grades. While children clearly are presented with situations in which they attempt to avoid a negative consequence (e.g. time-out, elimination of privileges, etc), they probably experience more promotion situations. Furthermore, children's games and activities are very approach-oriented (e.g. be the fastest, get the most points).

Another reason for the promotion-focus advantage is that the prevention focus seemed to create more anxiety. Children in the prevention focus conditions knew that they would have to return the gift card if they did not reach the bonus criterion and that pressure seemed to be greater than the promotion manipulation in which children started with nothing and were trying to earn the gift card. It is certainly possible that children are not used to being in that type of situation (avoidance orientation) and that may affect children's performance in this task. While it is possible that increased anxiety is a reason for our results, it is important to note that we did not manipulate anxiety or stress; we manipulated participants' situational regulatory focus. We also did not explicitly measure anxiety or stress levels so it is difficult to tell whether participants in a prevention focus had higher levels of anxiety than participants in a

[5] Elliot AJ. Approach and avoidance motivation and achievement goals. *Educational Psychologist.* 1999;34:169–189.

promotion focus.[6] Participants in the promotion focus condition were also in jeopardy of leaving the experiment without a gift card, so the only reason why they should be less anxious is because they prefer to regulate toward goals in a promotion focus rather than a prevention focus.

Finally, one possible reason for the difference between our results and those with young adults is the difference in the global incentive manipulation. We used a gift card as an incentive because it is possible that children do not understand the concept of a raffle. Adults had a chance to earn an entry where they had at least a 10% chance of winning $50. Thus the expected value of the raffle ticket could be as low as $5 whereas the expected value of the gift card was $10. This could be a potential reason why we found a main effect of the global incentive focus in children and not in adults. However, the expected values for both the raffle and the gift cards were both relatively low compared to prospects that have been shown to cause loss aversion in adults. Many of the prospects given to participants in behavioral economics experiments have expected values of hundreds of dollars[7]. It is unlikely that the small difference in incentives led to the divergent findings between children and adults. This investigation is the first to address how children perform on a classification task in which they are placed in a regulatory fit. This is also the first investigation of motivational factors to apply computational models to children's data. Our approach allowed us to quantitatively specify the types of strategies children used to solve the task. While research is accumulating on how adults perform in these situations, no one has addressed the development of these motivational factors. Clearly children show a different pattern of results from adults; they perform better in a promotion focus than a prevention focus whereas adults perform best when there is a match between their regulatory focus and the reward structure of the task. While it is possible that children's academic and home environments may account for these differences, it is likely that the neurobiological systems responsible for these effects with adults are simply not fully developed in children of this age as brain development is still occurring in elementary school and throughout adolescence.

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