Emotion Regulation during Learning

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Abstract. Learning episodes are rife with emotional experiences, so it is critical that learners regulate negative affective states as they occur. In the present study, learners were instructed to use two forms of cognitive reappraisal to regulate negative emotions that arose during a one hour learning session. Our findings suggest that cognitive reappraisal is an effective strategy for regulating emotions during learning and can help learners achieve better comprehension scores than a do-nothing control.

Keywords: Emotion, emotion regulation, cognitive reappraisal, ITSs.

1 Introduction

Although it is widely known that emotions such as boredom, anxiety, and frustration can negatively impact engagement, task persistence and learning gains [1,2], it is unclear how best to help learners regulate these emotions as they arise. Previous research, outside of learning contexts, has demonstrated that cognitive reappraisal is one of the most effective ways of regulating negative emotions [3]. Cognitive reappraisal involves changing the perceived meaning of a situation to alter its emotional content. The goal of the present study was to examine whether cognitive reappraisal is useful for managing negative emotions during learning. If so, then ITSs can be equipped with the capacity to teach these strategies to help learners regulate negative emotions as they arise.

The present study analysed the effect of cognitive reappraisal on learners' self-reported emotions and performance outcomes. We hypothesized that learners who were instructed to use cognitive reappraisal would report less negatively valenced emotions and achieve better comprehension than learners who received no explicit instruction on the use of cognitive reappraisal.

2 Method

Participants were 103 individuals who volunteered for monetary compensation on Amazon Mechanical Turk™ (AMT). All participants who completed the experiment were paid $5.00. Participants were randomly assigned to one of three cognitive reappraisal conditions: *deep* (N = 38), *shallow* (N = 33), or *no* reappraisal (control, N = 32). Participants in the deep and shallow reappraisal conditions were asked to imagine that they were applying for a job at a powerful law firm and were required to fulfill

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one special task in order to get the job. Participants in the *deep reappraisal* condition were instructed to imagine that their task was to read a document and check for comprehensibility. Participants in the *shallow reappraisal* condition, on the other hand, were instructed to imagine that their task was to check the document for typos and grammatical errors. Participants in the *control* condition received no instructions about cognitive reappraisal.

In a web-based learning session consisting of 18 trials, participants were asked to learn about the U.S Constitution and Bill of Rights, answer questions about what they learned, and report their affective states at multiple points.

The U.S Constitution and Bill of Rights were presented one page at a time, with approximately 500 words per page. After reading each page, participants were presented with a multiple choice question about what they had just read. Following every page, participants were prompted to report their affective states along the dimensions of valence and arousal on the Affect Grid [see 4].

3 Results

We calculated each participant's mean (across the 18 trials) valence and arousal self-report scores from the Affect Grid. The results yielded a significant effect for valence, F (2, 99) = 3.90, MSE = 1.95, partial η^2 = .072. Planned comparisons revealed that participants in the deep (M = 5.47, SD = 1.15) and shallow (M = 5.68, SD = 1.18) reappraisal conditions reported more positive valence than the control condition (M = 4.76, SD = 1.46). We also found a significant effect of condition on participants' self-reported arousal, F (2, 99) = 4.22, MSE = 2.05, partial η^2 = .078. Participants in the deep (M =5.26, SD = 1.29) and shallow (M = 5.51, SD = 1.22) reappraisal conditions reporting more arousal than participants in the control condition (M = 4.52, SD = 1.75).

Figure 1 indicates that learners who use cognitive reappraisal are not only more likely to experience positively valenced emotions; they are also more likely to experience *activating* positive valence like alertness and engagement; these emotions are positively correlated with learning outcomes [2]. Learners who do not use cognitive reappraisal may be more likely to experience negatively valenced, *deactivating* emotions like boredom which is negatively correlated with learning [1].

Proportional scores on the multiple choice questions served as a measure of reading comprehension. We found a marginally significant effect of condition, F (2, 94) = 2.74, MSE = .025, p = .07, partial η^2 = .055. Planned comparisons revealed that participants in the deep (M = .799, SD = .118) and shallow (M = .793, SD = .991) reappraisal conditions achieved significantly higher comprehension scores than those in the control condition (M = .740, SD = .116).

Taken together, these findings indicate that the use of cognitive reappraisal can lead to more positive activating emotions (i.e. positive valence and high arousal) [2] and better comprehension than using no reappraisal.

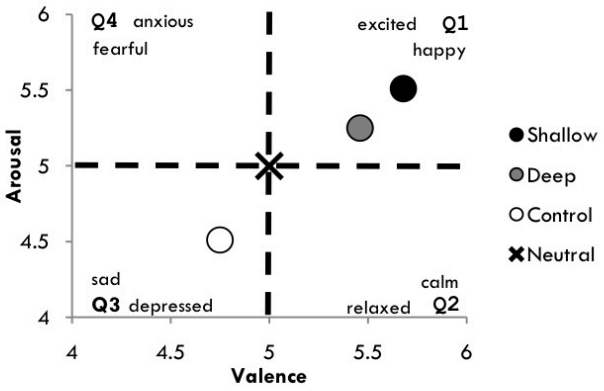

Fig. 1. Mean valence and arousal scores mapped on the Affect Grid

4 General Discussion

We conducted an experiment to test the effect of cognitive reappraisal on affective states and comprehension scores during a reading comprehension task. In general, we found that cognitive reappraisal can be a useful method for regulating emotions and improving comprehension.

These findings have implications for the development of affective-sensitive computerized learning environments and ITSs. According to our findings, intelligent tutoring systems could benefit from not only detecting learner affect, but also providing and scaffold useful emotion regulation strategies that can increase positive emotions, arousal, task-persistence, and learning.

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