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Influence of computer feedback on attentional biases to emotional faces in children

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ABSTRACT

We examined which type of corrective feedback in a computerized task produces an optimal balance between performance and emotional reactions in children. To that end, we conducted an emotional dot-probe task. We employed three types of corrective feedback (negative, positive, or mixed) along with a control, non-feedback condition. We tested the effect of feedback on: (i) task performance; (ii) immediate emotional reactions in terms of attentional preferences toward emotional faces (happy, sad, and angry); and (iii) self-reported affective experience after the task. Results showed that children committed more errors in the non-feedback group than in the mixed and negative feedback groups. Furthermore, the mixed feedback and the positive feedback groups showed an attentional bias away from sad faces. In contrast, the negative feedback group showed an attentional bias toward angry faces and felt unhappy after the task. Thus, the preferred type of feedback in children, in terms of better performance and a positive emotional reaction in a computerized task, is mixed feedback.

1. Introduction

Computerized tasks are increasingly used in educational settings: they allow controlling the presentation of materials, registering the responses, and providing immediate corrective feedback (Jaehnig & Miller, 2007). This latter component is the main focus of the current research. As Pekrun, Goetz, Titz, and Perry (2002) indicated, computer feedback occurs both instantly and systematically—note that these are key factors in its positive reception by students (see Hattie, 2009). Computers can be programmed to track the students' responses and to redirect students to focus on correct responses (i.e., positive feedback), error responses (i.e., negative feedback) or both (i.e., mixed feedback). Although most research on feedback has examined its effect on behavior (i.e., task performance), feedback also elicits emotional reactions (see Belschak & Den Hartog, 2009, for review).

1.1. The influence of feedback on emotional processing

It has been suggested that emotional reactions can act as mediators in the relationship between feedback and performance (Ilies & Judge, 2005). Given that corrective feedback elicits emotional reactions, attention may be primarily focused on emotions rather than on elements such as task achievement (Lazarus, 1991). Therefore, an examination of how different types of feedback (positive, negative, and mixed) influence emotional reactions as well as performance in computerized tasks is important at both theoretical and applied levels.

At the theoretical level, the affective events model (Weiss & Cropanzano, 1996) proposes that corrective feedback is an event that induces emotional reactions during the task. This model assumes that feedback has a significant psychological impact both on performance and on the attitude towards the task (see Fig. 1, for a schematic depiction of the model). That is, feedback can elicit immediate emotional reactions (e.g., anger after an “ERROR” message) and these emotional reactions may affect both task performance and the self-reported affective experience after finishing the task.

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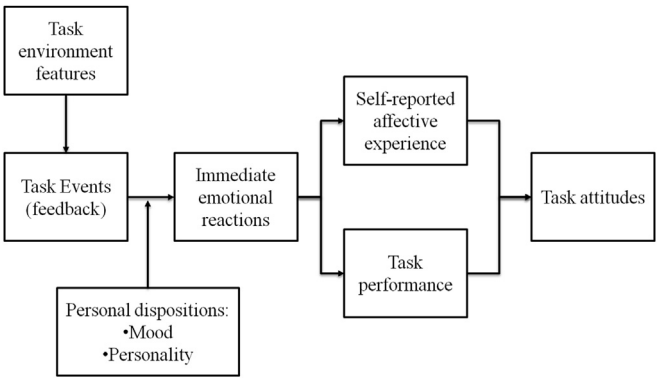

Fig. 1. Schematic depiction of the affective events model (adapted from Weiss & Cropanzano, 1996).

1.2. How to study emotional responses after feedback

While the affective experience after finishing a given task can be analyzed and verbalized in a questionnaire (i.e., a self-reported measurement), immediate emotional reactions after each response typically escape consciousness (see Reingold & Ray, 2006). An excellent strategy to capture these reactions is to examine how emotional information biases attention during the task. For instance, individuals with depression respond to faster to sad information than to happy information (i.e., a mood-congruent bias; see García-Blanco, Perea, & Livianos, 2013; Murphy et al., 1999). Importantly, immediate emotional reactions do not necessarily go hand in hand with self-reported affective experience. For example, an individual can feel anger as an immediate reaction to incorrect response but, after finishing the task, s/he may self-report a positive experience because feedback could have helped to improve her/his performance (Podsakoff & Farh, 1989).

To examine how feedback modulates both immediate emotional reactions and more sustained affective experiences. In the present research, we combined self-reported affective experience with the response times to emotional information in a computerized task with children. The sample was composed of children rather than adults because children regularly receive feedback from their teachers and parents. Furthermore, children are often unable to report affective experience and their descriptions may not always correspond with the adults' appreciations. The difficulty to quantify children's mood makes it difficult to choose the best corrective feedback to maintain an appropriate attitude toward the task.

1.3. Previous research on feedback and emotions in children

The influence of feedback on emotional reactions in children has received little attention in the literature. Prior research can be classified in two groups: (i) studies with contingent feedback (i.e., children receive accurate positive feedback ['Good!'] or negative feedback ['Wrong!'], depending on their performance); and (ii) studies with non-contingent feedback (i.e., children may receive positive feedback ['Good!'] or manipulated negative feedback ['Wrong!'] for correct responses, while all incorrect responses receive negative feedback). While prior contingent feedback studies have been carried out in a naturalistic context, non-contingent feedback studies have been carried out in an experimental context.

In a study with contingent feedback, Mouratidis, Vansteenkiste, Lens, and Sideridis (2008) found that when positive feedback is provided, students persisted in an activity during physical education lessons and self-report positive affective experience; however, their performance did not change. In another study with contingent feedback, Ball, Hoyle, and Towse (2010) reported that when negative feedback was provided to children during an analogical reasoning task, performance improved, but it had a negative impact on self-reported affective experience. Although these studies offer relevant information on how feedback may have positive or negative consequences on children' performance and self-reported affective experience, the influence of feedback on immediate emotional reactions is less well known (see He et al., 2013).

Prior experiments on non-contingent computer feedback in children have focused on its impact on emotions by the assessment of attentional bias with a reaction-time task together with self-reported affective experience (e.g., Beck et al., 2011). Beck et al. (2011) administered a manipulated computer game to children with and without functional abdominal pain. In each group, the participants were assigned to a negative non-contingent feedback condition or a positive non-contingent feedback condition in the computer game. An emotional dot-probe task and a self-report on their somatic symptoms were applied before and after the computer game to assess the resulting emotional reactions. (Note that, in the current experiment, we also employed a dot-probe task because it is an excellent technique for examining how emotionally relevant stimuli capture attentional resources [see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007, for a meta-analysis]). In the dot-probe task used by Beck et al. (2011), two cued words (neutral vs. emotional, i.e., pain-related) were presented simultaneously above and below on the computer screen, either at 20 ms or 1250 presentation rate (i.e., automatic vs. controlled attentional processing, respectively; see Yiend, 2010, for a review). Immediately after the words disappeared, a dot probe (target) replaced one of the two cued words. This trial could be: (i) an emotion trial (i.e., the target replaced the emotional word) or (ii) a neutral trial (i.e., the target replaced the neutral word). The participant's task was to press a button to indicate the position in which the target appeared. Faster responses in emotion trials would signal an attentional bias towards emotional words, whereas faster responses to neutral trials would signal an attentional bias away from emotional words. The results in the Beck et al. (2011) experiment indicated that, at a controlled rate, children with abdominal pain showed an attentional bias toward pain stimuli both before and after non-contingent feedback (positive or negative). However, only after non-contingent feedback (positive or negative), children with abdominal pain only showed an attentional bias toward pain stimuli at an automatic rate and self-reported higher somatic symptoms. Therefore, feedback elicited emotional reactions even at an automatic processing stage. Although healthy children did not show any attentional bias, they showed higher somatic symptoms after negative, non-contingent feedback. Thus, attentional biases and self-reported affective experience do not necessarily go together. Other studies with non-contingent feedback have also assessed their influence on self-reported affective experience (e.g., Deveney et al., 2013). Using a 9-point Likert scale, Deveney et al. (2013) compared the influence of non-contingent feedback and contingent feedback on self-reported valence, arousal, and frustration in healthy and chronically irritable children. Both groups of children felt unhappier, more frustrated, and performed less accurately during non-contingent than contingent feedback, but no differences emerged from arousal self-reporting. Therefore, valence and arousal should be considered as two different aspect of affective experience.

Although non-contingent feedback experiments offer valuable information on affective/cognitive processes, it is unclear whether the increase in unhappy mood (Deveney et al., 2013) or pain-related biases and self-reported symptoms (Beck et al., 2011) were due to the negative feedback or to the frustration caused by