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Goals, mood and performance duration on cognitive tasks during experimentally induced mechanical pressure pain

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ABSTRACT

Background: The present study tested the hypothesis that the affective and motivational context influences performance duration in the presence of pain. More specifically, the Mood-as-Input model (MAI) proposes that the interaction between goals and moods affects performance duration. When people adopt achievement goals, negative, as opposed to positive moods, signal that not enough progress has been made leading to task continuance. Negative as opposed to positive moods lead to task disengagement when adopting hedonic goals.
Methods: Participants completed three open-ended cognitive tasks while being exposed to mechanical pressure pain to a finger. Before each task, mood (positive versus negative) and goal pursuit (hedonic versus achievement) were manipulated, with mood as between-subjects and goal pursuit as within-subjects factor. Performance duration was the dependent variable and goal order and performance duration during a no-goal task were the covariates.
Results: In line with common theories on goals and mood, but in contrast to the MAI model, only main effects were found of mood and goal pursuit. Participants showed greater performance duration in an achievement than in a hedonic goal context. Moreover, they showed greater performance duration in relative positive than negative moods.
Limitations: Pain may have decreased participants' mood below a certain threshold, which in turn may have obscured the MAI interaction effect.
Conclusions: This study demonstrates that affective and motivational factors influence performance duration in a pain context.

1. Introduction

Chronic pain comprises an important problem in health care and society, due to its large psychological burden and adverse impact on societal costs (e.g., Achterberg et al., 2010; Silverstein, Welp, Nelson, & Kalat, 1998; Van Eerd et al., 2011). Influential fear-avoidance models propose that pain-related fear predicts avoidance of painful activities and eventually results in the development of chronic pain disorders (Crombez, Vlaeyen, Heuts, & Lysens, 1999; Leeuw et al., 2007; Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995; Vlaeyen & Linton, 2000; Vowles, McNeil, Sorrell, & Lawrence, 2006). However, despite their popularity, these models have been criticized as they do not explain task persistence in chronic pain (Vlaeyen & Morley, 2004).

The ergomania model (Van Houdenhove & Neerinckx, 1999) and the avoidance-endurance model (Hasenbring, 2000) have been proposed to explain task persistence besides task avoidance in chronic pain. However, these models are largely descriptive and still lack empirical support (Vlaeyen & Morley, 2004). Moreover, these models do not take into account that pain is often experienced in a motivational context (Karsdorp & Vlaeyen, 2011; Kindermans et al., 2011; Van Damme, Crombez, van Nieuwenborgh-de Wever, & Goubert, 2008). It has been demonstrated that achievement goals relative to hedonic goals increase painful task duration in patients with upper extremity pain and that both achievement goals and hedonic pain-avoidance goals are associated with increased pain and disability (Karsdorp, Nijst, Goossens, & Vlaeyen, 2010; Karsdorp & Vlaeyen, 2011). These findings indicate that the motivational context influences performance duration while in pain and is related to disability and pain levels.

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Novel affective-motivational approaches, such as the Mood-as-Input hypothesis (MAI; Martin, Ward, Achee, & Wyer, 1993; Vlaeyen & Morley, 2004), postulate that the activation of goals may not motivate behaviour in itself. Instead, goals may motivate behaviour dependent on current mood (Martin et al., 1993). Mood may signal whether the goals have been reached and whether the task should be continued or discontinued. In an achievement goal context, a negative mood signals that not enough progress has been made leading to task continuance, whereas a positive mood signals that the ultimate goal of the task has been reached leading to task discontinuance. Conversely, in a hedonic goal context, a negative mood signals that the task is no longer enjoyable leading to task disengagement, whereas a positive mood signals that the task is enjoyable leading to task continuance. Support for the MAI model has been demonstrated in the field of social psychology and perseverative psychopathologies, such as rumination and obsessive compulsive disorders (Davey, Eldridge, Drost, & MacDonald, 2007; Davey, Startup, MacDonald, Jenkins, & Patterson, 2005; Davey, Startup, Zara, MacDonald, & Field, 2003; Hawksley & Davey, 2010; MacDonald & Davey, 2005a, 2005b; Martin, Abend, Sedikides, & Green, 1997; Martin et al., 1993; Meeten & Davey, 2011, 2012; Sanna, Meier, & Wegner, 2001; Sanna, Parks, & Chang, 2003; Startup & Davey, 2001, 2003; Watkins & Mason, 2002). However, the role of the MAI models in the performance of painful tasks is less clear. A recent study testing the MAI model in patients with upper extremity pain performing a weight lifting task, did not find supportive evidence for the hypothesized goal × mood interaction (Karsdorp et al., 2010). One of the problems with this study, however, might be that the weight lifting task did not involve a clear and specific goal. Manipulating goal pursuit and mood may not have affected task performance in the absence of a clear reason for patients to lift the weight. Therefore, a study is required testing the MAI model during a painful task that also contains a specific goal.

The aim of the present study was to test the effects of goal pursuit and mood on the performance duration during a painful task with a specific goal. Participants performed a cognitive impression formation task that has successfully been used in other MAI research (Martin et al., 1993). We predicted that participants with a negative mood would show greater performance duration when striving for achievement than hedonic goals. In contrast, we predicted that participants with a positive mood, would show greater performance duration when striving for hedonic than achievement goals.

2. Methods

2.1. Participants

Inclusion criteria were: 1) first-year student from the faculty of Health Science, Psychology or Medicine of the Maastricht University and 2) age between 17 and 30 years. Exclusion criteria were: 1) acute or chronic pain complaints (measured with the question: "Do you have any pain complaints at present?"), because previous research has demonstrated that individuals with pain show lower pain tolerance levels than individuals without pain symptoms (e.g., Peters & Schmidt, 1992) and 2) pregnancy. The ethical committee of the Maastricht University approved the study.

2.2. Design

The design of the study was a 2 Mood (negative versus positive) × 2 Goal (hedonic versus achievement) × 2 Order (hedonic first versus achievement first) factorial design, with mood and order as between-subjects factor and goal as the within-subjects factor. Goal was a within-subjects factor. The order of the achievement and hedonic conditions were randomized. A no-goal baseline condition always preceded the two goal conditions and was included as a covariate in the analysis. The within-subjects design and the inclusion of a baseline condition reduced the effects of large individual variability in pain tolerance levels and the influence of variables that may affect pain tolerance, such as age and gender (Peters & Schmidt, 1992; Peters, Schmidt, & van den Hout, 1989) Participants were randomly assigned to the four experimental conditions.

2.3. Performance duration

To assess performance duration during exposure to a painful stimulus, an electronic version of an impression formation task (Martin et al., 1993) was developed in our lab, to be used in combination with a mechanical pain stimulus. Participants were told that the experimenter was interested in the way people form impressions of other people during a slightly painful stimulus. The impression formation task consisted of a maximum of 100 descriptions of person X, which were presented on a computer screen in a fixed order for 5 s each. Participants were unaware of the total number of descriptions at the start of the task. A variety of stimulus behaviours were presented; some were positive, some were negative and some were neutral; for example "*locked himself out of his own house*," "*watched the neighbours' kids while their mother ran an errand*," and "*graduated valedictorian of his college class*." After each description, participants had to press the space bar in order to read the next description. The computer registered the time spent on the task, and the number of descriptions read by the participant. The maximum duration of the task was set at 15 min. In the present study mean task duration for the total sample ($N = 81$) was M (SD) = 2.56 min (2.45 min), ranging from 0.19 to 11.73 min. After terminating the task, participants were asked to formulate their impression of person X by choosing one of four given character descriptions on a rating sheet. Unknown to the participants there was no right or wrong answer on this task. This task was included to the experiment to mask the purpose of the impression formation task and to support its credibility. To measure task duration three times each preceded by a different goal instruction, three versions of the impression formation task were used. Each version contained different descriptions of person X and a different rating sheet.

2.4. Pain stimulus

While reading the stimulus behaviours of the impression formation task participants were exposed to a mechanical pain stimulus. The pain stimulus consisted of a constant pressure being applied to the middle phalanx of the forefinger, ring finger, or middle finger of the non-dominant hand with a Forgione–Barber pain stimulator (Forgione & Barber, 1971). A 1.7 mm wide Plexiglas wedge with a pressure of 1700 g was applied to the middle phalanx of one of the fingers. This finger was fixed in place at the base of the apparatus, which was adjustable for fingers of different sizes. Previous research has shown that this procedure elicits a gradually increasing painful sensation but does not cause tissue damage or injury (Koltyn, Werz, Gardiner, & Nelson, 1996; Peters et al., 1989).

The pain stimulus was applied continuously for the whole duration of the impression formation task. When participants decided to terminate the impression formation task they could push the stop-button and remove their finger from the Forgione–Barber pain stimulator. Note that in each of the three impression formation tasks a different finger, either the forefinger,