Taking approach-avoidance research a step further

Bouman, D.

2020

document version
Publisher's PDF, also known as Version of record

Summary

Approaching pleasant and avoiding unpleasant situations are important adaptive human behaviours. In the past decade, experimental designs have started implementing whole-body movements to investigate how emotional situations prime approach and avoidance behaviour. In this thesis I investigated the effects of emotional stimuli on goal-directed stepping behaviour in a series of experiments, and how these effects related to current theories of approach-avoidance (AA) behaviour.

In **chapter 1** I provided a theoretical basis for AA behaviour, and described how it has been studied, including the history and emergence of the whole-body approach. After discussing postural control and stepping behaviour, I gave an overview of the topics addressed in this thesis. These were viewing duration, the asymmetric nature of AA effects in whole-body studies, and the difference between motivational and cognitive accounts of whole-body AA behaviour.

In the experiment described in **chapter 2**, viewing duration was manipulated in order to assess its effect on AA behaviour. The main question was: does processing emotional images for a short time before stepping affect stepping behaviour differently compared to processing it for a longer period of time? Participants viewed highly arousing pleasant and unpleasant images for a short (100-500 ms), medium (1-2 s) and long (3-4 s) period of time, after which they made a single forward step on a force platform. Viewing duration affected step size and peak velocity regardless of valence: a larger step size was found for short duration viewing compared to medium and long duration and a higher peak velocity for short duration compared to long duration viewing. Only reaction time – the time it took participants to initiate their response – showed a significant interaction between viewing duration and emotional content. For the short viewing duration, neutral images were responded to faster than both emotional categories. This difference disappeared entirely for the longest viewing duration: the reaction time slowed when viewing duration increased for neutral images and speeded up for the emotional images. I argued that a loss of alertness could account for these findings. High-arousal pleasant and unpleasant images had the exact opposite effect, starting with slower reaction times for the short viewing duration and quicker reaction times for the longer viewing duration. In this case, the impact of the emotional content may have captivated attention to such a degree that it interfered with step initiation when viewed for a short time, whereas longer viewing diminished the impact of the image.

In whole body AA studies, approach facilitation in response to pleasant stimuli is a robust finding. But the converse effect, namely avoidance facilitation in response to unpleasant stimuli, has not been a consistent finding. The study reported in **chapter 3** focused specifically on backward steps to assess avoidance responses in isolation. In addition to frequentist statistics, Bayesian statistics were used to verify whether there was evidence for the null-hypothesis, i.e. no effect of emotional valence on backward steps. Neutral images, as well as high-arousal pleasant and unpleasant images were shown. Participants always stepped backwards after the image disappeared from the screen. Reaction time, APA and peak velocity did not show significant statistical differences in response to the emotional content of the stimuli. For reaction time and APA, Bayesian statistics yielded moderate evidence supporting the null-hypothesis of an absence of emotional effects on these variables. For peak velocity, moderate evidence existed for the two emotional categories having identical effects, while the evidence for neutral images differing in their effect from the emotional images was inconclusive. Step size did show a significant difference between the different stimulus categories, in that a larger backward step was made in response to pleasant compared to neutral images. The Bayesian statistics provided strong evidence for this difference and moderate evidence for the similarity between pleasant and unpleasant stimuli. In addition, an exploratory analysis of sway path length (during quiet standing before the step) showed that high-arousal stimuli elicited more sway 200 ms after image offset compared to the neutral images. This study thus provided the first evidence of an absence of emotional impact on some of the spatio-temporal variables in a whole-body avoidance response. This absence of emotional effects and – in the case of larger step size in response to pleasant images – an effect in an unexpected direction, may be due to the nature of the avoidance response. I suggested that backward stepping might therefore be unsuitable to study avoidance tendencies.

Emotion and cognitive theorists disagree on the mechanisms behind AA behaviour. Emotion theorists claim that the emotional stimuli automatically trigger approach and avoidance motivational states, resulting in approach and avoidance tendencies. Cognitive theorists argue against the automatic link between emotional stimuli and AA behaviour and instead point to the intended outcome or goal of the behaviour as the main motivator for AA responses. In the experiments discussed in **chapter 4**, participants stepped sideways based on cognitively coded

approach (‘towards’) or avoidance (‘away from’) instructions, which could either increase or decrease the distance to a happy or angry face. In Experiment 1, participants responded to the emotional content of the stimuli and in Experiment 2 the emotional content was made implicit, in that the gender of the faces was the stimulus feature that participants had to classify and respond to. Besides the main analysis for emotional content, distance and cognitive labeling, an exploratory analysis based on gender and emotion was performed, since the participants responded to the gender of the faces in Experiment 2. The results for Experiment 1 showed a significant effect of label by emotion for reaction time, but also a significant distance by emotion effect for peak velocity. This suggested that the initiation of the step is more affected by cognitive manipulations, while the execution of the step is more affected by the distance to the emotional stimulus. The effects for emotion were absent in Experiment 2, in which the emotional content of the stimulus was not relevant to the task. In contrast, the exploratory analysis of gender showed only one significant effect for Experiment 1, while gender affected every dependent variable in Experiment 2. These experiments showed that a combination of cognitive and motivational factors affect AA behaviour when emotion is a task-relevant feature in whole-body AA behaviour. However, when emotion is not relevant to the task, its effects are not as strong. This challenges the idea of automaticity, that is central to motivational theories of AA behaviour.

Chapter 5 reviewed the studies of the previous chapters in a broader scientific context.

Viewing duration. I discussed the effect of viewing duration on stepping behaviour and found support for the idea that it affects reaction time to a greater extent than the spatio-temporal variables of stepping behaviour, both in my own study and in other studies. The mechanism behind this may be reappraisal, i.e. a cognitive mechanism that diminishes the impact of highly emotional stimuli. Comparing the effects of implicit and explicit reappraisal on whole-body AA effects is an interesting topic for future studies.

Avoidance. Since backward stepping seems to be more resistant to emotional influences, I speculated that the nature of backward steps might be inappropriate for studying avoidance responses and suggested an alternative, namely backward leaning, which could be studied as an avoidance response.

Cognition vs. motivation. Both cognitive and motivational accounts of AA behaviour have received partial support in the literature. I therefore suggested that both mechanisms play a role in AA behaviour, with cognition affecting response selection (reaction time), and motivational aspects such as distance change might have a more profound effect on step execution.

Beside the themes of the previous chapters, I discussed methodological aspects of the experimental set-up of whole-body AA studies, such as initiation cue, stimulus choice, and the distinction between gait initiation and execution. I also discussed future directions in this research domain. I feel that a promising next step would be the application of the whole-body AA paradigm in studying emotional and postural disorders in a clinical setting, possibly with the use of virtual reality. In all likelihood, this would take AA research yet another step further.