Biological Psychology 86 (2011) 65–73

Contents lists available at ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Effects of intrinsic pleasantness and goal conduciveness appraisals on somatovisceral responding: Somewhat similar, but not identical

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ARTICLE INFO

Article history:
Received 4 July 2009
Accepted 13 October 2010
Available online 26 October 2010

Keywords:
Emotion
Appraisal
Intrinsic pleasantness
Goal conduciveness
EMG
Zygomaticus major
Corrugator supercilii
Extensor digitorum
Heart rate
Skin conductance
Forehead temperature
Finger temperature

ABSTRACT

In the emotion literature, appraisals of an event's pleasantness and goal conduciveness are often considered as interchangeable and subsumed under the term *valence*. Some appraisal theories, however, emphasize that there is a conceptual difference between these two appraisals. With the current study, we investigated whether such a conceptual difference would be reflected in different somatovisceral response profiles for intrinsic pleasantness and goal conduciveness. Participants viewed unpleasant and pleasant pictures (intrinsic pleasantness) and performed either goal conducive (i.e., decreasing the size of unpleasant pictures, increasing the size of pleasant pictures) or goal obstructive (i.e., increasing the size of unpleasant pictures, decreasing the size of pleasant pictures) arm movements. Our data suggest that the two appraisals have somewhat similar, but not identical, response patterns. Thus, our results emphasize the importance of distinguishing between intrinsic pleasantness and goal conduciveness. Moreover, we find evidence that the efferent effects of the two appraisals combine multiplicatively, and that predictability of goal conduciveness may influence the impact of goal conduciveness appraisals on somatovisceral responding.

1. Introduction

Within his component process model of emotion, Scherer (1984, 2009) – for a related approach, see Smith (1989) – distinguishes between the two valence-related appraisals *intrinsic pleasantness* (genetically based or learned preferences for specific stimuli) and *goal conduciveness* (stimuli or events evaluated on the basis of whether they help or hinder the attainment of desired needs, goals, or values). For instance, a person on a diet may evaluate chocolate cake as intrinsically pleasant, but at the same time obstructive to the goal of losing weight. This example, among many others, illustrates the important conceptual difference between these two appraisals. Surprisingly, in the emotion literature, appraisals of intrinsic pleasantness and goal conduciveness are often considered as interchangeable and subsumed under the general notion of *valence*.

The somatovisceral effects of intrinsic pleasantness appraisal have been investigated in numerous studies (e.g., Cacioppo et al., 1988; Lang et al., 1993). Influences of goal conduciveness appraisal on somatovisceral responding, in contrast, have been studied only rarely (e.g., Aue et al., 2007). Furthermore, an even smaller number of studies have examined somatovisceral effects stemming from intrinsic pleasantness *and* goal conduciveness appraisals. For example, Van Reekum et al. (2004) manipulated the two appraisals in a computer game and reported that intrinsic pleasantness had little impact on the investigated somatovisceral responses. Greater skin conductance response amplitudes were found for pleasant than for unpleasant sounds. Goal conduciveness, in contrast, strongly affected somatovisceral responding, suggesting stronger resource mobilization for obstructive than for conducive events. Higher skin conductance amplitudes and higher activity at the M. extensor digitorum site were observed for the loss of a spaceship than for the attainment of the next level. Consistent with this picture, greater heart rate and shorter pulse transit time appeared for the obstructive as compared with the conducive events.

Smith and Pope (Pope and Smith, 1994; Smith, 1989) described a positive relationship between the pleasantness of an imagined scenario and activity measured at the zygomaticus major site. Activity at the corrugator supercilii site, in contrast, was an indicator of goal obstacles (related to Scherer's (2009), goal conduciveness appraisal). Finally, heart rate and skin conductance indexed the anticipated effort in a scenario, supporting the idea of these parameters reflecting individual effort and task engagement.

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doi:10.1016/j.biopsycho.2010.10.008

In an earlier study (Aue and Scherer, 2008), using a similar experimental design as in the current study, we experimentally examined the influence of intrinsic pleasantness and goal conduciveness appraisals on somatovisceral responding. This research suggested that both appraisals provoke similar response patterns for three investigated measures. A positive covariation was found for intrinsic pleasantness and goal conduciveness, on the one hand, and activity measured at the zygomaticus major site, on the other hand. Activity at the corrugator supercilii site, in contrast, varied as a negative function of both appraisals. Somewhat unexpectedly (cf. the predictions of Scherer's (2009), component process model and results in the Van Reekum et al. (2004) study), greater heart rate was observed for pleasant images as compared with unpleasant images, and conducive events were associated with a higher heart rate than were obstructive events. This result led us to the conclusion that effects of the two appraisals on heart rate may depend on stimulus proximity (as suggested by Bradley and Lang, 2000), with real-life stimuli as used in the Van Reekum et al. (2004) study yielding higher heart rate for appraisals associated with negative valence and more distant stimuli such as pictures yielding higher heart rate for appraisals related to positive valence. Related to this idea of context dependency, we hypothesized that varying the predictability of outcomes (e.g., of goal conduciveness) could modify physiological responses as well.

Moreover, our earlier study (Aue and Scherer, 2008) did not yield unambiguous results for the interaction of intrinsic pleasantness and goal conduciveness appraisals. Whereas the two appraisals combined additively for (i.e., had independent influences on) activity at the zygomaticus major site, they combined multiplicatively for activity at the corrugator supercilii site and heart rate. The aforementioned effects of goal conduciveness on corrugator activity were observed for pleasant images only, whereas effects of goal conduciveness on heart rate were apparent for unpleasant images only.

The first aim of the current study was to replicate and extend the results that we had obtained in our earlier study (Aue and Scherer, 2008). Given the conceptual affinity of intrinsic pleasantness and goal conduciveness, we expected somewhat similar response patterns for these appraisals because both project onto the valence dimension. On the other hand, if, on a conceptual level, it makes sense to distinguish between intrinsic pleasantness and goal conduciveness, it seems reasonable to assume that such a distinction will have different somatovisceral effects as well. Because goal conduciveness can be supposed to be more strongly related to actions, one could, for instance, expect stronger effects on cardiovascular and electrodermal activity for the goal conduciveness as compared with the intrinsic pleasantness appraisal.

The second aim of this study, therefore, was to examine the degree of similarity of somatovisceral responses for the intrinsic pleasantness and goal conduciveness appraisals. For this reason, we increased the number of evaluable somatovisceral responses. In addition to the already examined variables in our earlier research (Aue and Scherer, 2008) – activity at the zygomaticus major site, activity at the corrugator site, and heart rate – we included another four variables: activity at the extensor digitorum site, skin conductance, forehead temperature, and finger temperature. Activity at the extensor digitorum site and skin conductance have been related to goal conduciveness before (Van Reekum et al., 2004). Forehead and finger temperature have both been associated with valence, in particular with negatively-valenced emotions (fear and anger; Levenson et al., 1990; McIntosh et al., 1997; Stemmler, 2004; Zajonc et al., 1993). Therefore, skin temperature could be of potential interest in the study of intrinsic pleasantness and goal conduciveness as well.

A third aim concerned the study of the potential influence of the degree of predictability of goal conduciveness on somatovisceral responding. Does something that can be foreseen provoke bodily changes that are as dramatic as those produced by something that cannot be foreseen? The latter case seems to call for stronger urgency of response preparation and thus should rely on automatic, prototypical response preparation, and it could possibly be associated with stronger cardiovascular responses. Finally, as evident from the results of our earlier study (Aue and Scherer, 2008), further research is needed to clarify the nature of the intrinsic pleasantness–goal conduciveness interaction (additive versus multiplicative effects), and also whether this nature differs for different investigated somatovisceral variables or different degrees of predictability.

Participants in the present study viewed unpleasant and pleasant pictures (intrinsic pleasantness appraisal) and were instructed to perform either an arm flexion or an arm extension. Following these arm movements, the presented stimuli increased or decreased in size. Unpleasant images have been linked to withdrawal tendencies; pleasant images to approach tendencies (e.g., Lang et al., 1993). Therefore, individuals can be expected to have the goal to maximize pleasant stimulation and to minimize unpleasant stimulation. Consequently, the decrease of unpleasant and the increase of pleasant stimuli should be experienced as goal conducive, whereas the increase of unpleasant and the decrease of pleasant stimuli should be experienced as goal obstructive (goal conduciveness appraisal). Verbal reports in our earlier study (Aue and Scherer, 2008) and a pilot study as well as reaction times in the current study confirmed this hypothesis. To examine the effects of different degrees of predictability of goal conduciveness or obstruction on somatovisceral responses, we added an anticipation manipulation. In one condition, participants could easily anticipate the resulting effect of an arm movement on stimulus size (i.e., goal conduciveness), whereas in the other condition, they did not know until after stimulus onset which arm movement they had to perform and therefore could only minimally anticipate the resulting effect on picture size.

2. Method

2.1. Participants

Forty-two female University of Geneva undergraduates, aged between 18 and 29 years ($M = 22.3$; $SD = 3.04$), participated in this study. They were recruited in an introductory psychology course and via ads posted in the university. They were either paid 15 CHF (30 participants) for their participation, or they took part in the context of an introductory psychology course (12 participants). Exclusion criteria for participation were (a) medical treatment, (b) pregnancy, (c) drug abuse, and (d) age below 18 or above 35 years. All participants had normal or corrected-to-normal vision.

For the following reason we decided against a mixed-gender study to avoid artifacts and increase statistical power: while there is no evidence that would lead one to expect gender differences for the appraisal mechanisms under study, gender differences have been reported for physiological responding (e.g., Mendelsohn and Karas, 2005, for cardiovascular, and Greenwald et al., 1989, as well as Lang et al., 1993, for facial electromyographic variables). As in many other Psychology studies, female participants were used as they are more readily available as participants.

2.2. Stimuli and task

For each experimental block, 10 unpleasant and 10 pleasant pictures were chosen from Lang, Bradley, and Cuthbert's (1999) International Affective Picture System (IAPS) and an own picture evaluation study (see Appendix). Ten neutral images served as filler items. Unpleasant and pleasant pictures were matched for extremity (deviation from scale mean [5]), subjective arousal and complexity. Participants had to perform either an arm extension or an arm flexion (i.e., pushing or pulling a joystick). Following these arm movements, the images either increased or decreased in size, thus visually giving the impression of approach or withdrawal. The increase of unpleasant images and the decrease of pleasant images were considered goal obstructive. Conversely, the decrease of unpleasant images and the increase of pleasant images were considered goal conducive (based on reports in a pilot study and an earlier study; Aue and Scherer (2008); see also manipulation check in Section 3).

The experiment consisted of three blocks that were presented in counterbalanced order.