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BRIEF REPORT

Don't Wait for the Monsters to Get You: A Video Game Task to Manipulate Appraisals in Real Time

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A pacman type video-game paradigm is introduced for the manipulation of appraisals in an ongoing active-coping task. Differences in current appraisal conceptions and their implications for experimental approaches to the manipulation of appraisals are discussed. Furthermore, the advantages of using concurrent physiological measures are outlined. The features of the game *aMAZE* and a shell program called *PLAYGAME* are described. The programs are available at no cost for researchers interested in using the paradigm.

Our research investigates the information processing responsible for the elicitation of emotion, that is, changes in the components of the emotional response (physiological, expressive, subjective) and the preparation of the individual for adaptive action. Many researchers refer to these emotion-eliciting processes as appraisals, which are, according to Arnold (1960) or Lazarus (1968), direct, automatic, and largely without involving conscious reflection. In the last two decades, several researchers (e.g. Frijda, 1986; Roseman, 1991; Scherer, 1984; Smith & Ellsworth, 1985; Smith & Lazarus, 1993) have elaborated on the appraisal process. Although the individual theories differ with regard to details, they share a surprising number of features (see Scherer, 1988). The most crucial being that emotional responses are considered the result of a dynamic transaction between the individual, his/her needs, beliefs, goals and concerns, and the environmental demands. In this view, emotional responses are elicited when the evaluation of the individual-environmental relation has implications for the individual's well-being. It is through the appraisal process that the personal meaning of a particular person-environment relationship is determined. Hence, it is not the objective characteristic of an event

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that determines the nature of the emotional responses, but rather, it is the personal evaluation of the event in relation to the individual concerns.

Several authors have reported data from the analyses of self-reports which are consistent with appraisal theory (e.g. Frijda, Kuipers, & ter Schure, 1989; Manstead & Tetlock, 1989; Roseman, Wiest, & Swartz, 1994; Scherer, 1993; Smith & Ellsworth, 1985; Smith, Haynes, Lazarus, & Pope, 1993). However, in testing their hypotheses few researchers have actually tried to manipulate appraisals experimentally and to measure not only changes in subjective experience but also physiological or expressive responses. Thus, it is not surprising that research conducted within appraisal theory has been criticised on methodological or conceptual grounds (Lazarus & Smith, 1988; Parkinson 1997; Parkinson & Manstead, 1993).

One of the major critiques concerning the study of the emotional process using retrospective techniques is that current evidence might reflect more participants' intuitive theories on emotion, rather than information directly related to the appraisal process. Furthermore, it has been suggested, that retrospective self-reports of physiological changes occuring during emotion are strongly influenced by stereotypes (Rimé, Philippot, & Cisamolo, 1990), and that individuals have difficulties in judging retrospectively their own (facial) expressive reactions (e.g. Barr & Kleck, 1995).

Thus, to counter the problem of reconstructive bias, one could study the appraisal process of individuals who are engaged in an ongoing situation, provided the situation is well controlled and is relevant for the individual. In this context, the reliance on self-report should be limited considering that much of the appraisal process is not conscious (e.g. Scherer, 1993) and that concurrent self-reports might interfere with the ongoing situation. Hence, we suggest a strategy for studying the appraisal process, involving systematic manipulations of individuals' appraisals by varying aspects of the experimental situation in which individuals are involved while monitoring multiple dependent variables, rather than measuring self-reports alone (see also Cacioppo & Tassinary, 1990; Campos, Mumme, Kermoian, & Campos, 1994).

The use of physiological parameters as markers of the various outcomes of the appraisal process is justified to the extent to which they reflect the physiological demands of the specific actions or tendencies that the outcomes of the appraisal process motivate. In fact, proponents of appraisal theory emphasise the notion that the different components of the emotional responses are organised around the adaptive task they serve (e.g. Frijda, 1986; Lazarus, 1968; Scherer, 1984; Smith, 1989). For instance, changes in cardiovascular activity are considered to reflect the metabolic demands associated with spending effort in attempting to cope actively with the situation (e.g. Obrist, 1976). Consequently, several researchers have associated changes in various parameters of cardiovascular activity with the amount of effort a person is spending during problem-solving tasks (e.g. Tomaka, Blascovich, Kelsey, & Leitten, 1993; Wright, Contrada, & Patane, 1986). However, these studies have been conceived outside the framework of appraisal theory. Thus, although some results are consistent with some of the hypotheses generated within appraisal theory, these latter were not tested directly.

Although there are currently not many studies that have used physiological changes as indicators of the appraisal process, their results are encouraging. For example, Smith, Ellsworth, and Pope (1990) used skin temperature as a measure in the context of a series of math problems, and Pecchinenda and Smith (1996) used skin conductance in a study involving anagrams. The results of these studies are promising first steps in manipulating individuals' appraisals. Yet, their paradigms are somewhat static and fail to represent the richness of an ongoing interaction in which sudden events occur. Here, typically individuals' reactions need to be quick and swift to adapt to and succeed in a given task. In contrast, typical passive laboratory tasks frequently actively counteract and dampen the natural action tendencies associated with specific appraisal outcomes. In consequence, the physiological measures, which are chosen as indirect indicators of preparatory actions or action tendencies, are less likely to provide the discriminatory power required for testing the underlying hypotheses.

Based on these notions we have developed a video game to facilitate the study of appraisals in ongoing situations. Obviously, video games have frequently been used before, mostly as elicitors of "stress" (e.g. Turner, Carroll, Hanson, & Sims, 1988; but see also MacDowell & Mandler, 1989). Frequently, responses to playing a game under arbitrary "stressful" conditions could be compared with the responses to other cognitive stressors, such as arithmetic tasks, without actually manipulating task parameters. In those cases in which the task parameters were manipulated, it was mostly to change the objective task difficulty, regardless of how individuals appraised the situation.

We intended to create a paradigm that allows to manipulate different facets of the experiemental situation that would affect different appraisals in a variety of ways. The program *aMAZE* is loosely based on the video game pacman and is briefly described below.[1]

aMAZE is a game running on MS-DOS-compatible computers. Its scenario is based on the popular pacman game. The player is directing a symbol in a maze using the keyboard or a joystick. The maze can contain little dots that earn points as the player moves over them "eating" them in the process. There can also be "monsters" (computer-generated opponents) which usually try to chase and catch the player-symbol. If the monster catches the player-symbol the player looses points. However, there are also special dots, the so-called power pills, which, when taken, earn the player a bonus and allow him/her to be invulnerable for a short time. When powered up, the player can chase and catch the monsters in which case he/she gains an extra bonus.

Most elements of the game can be controlled by the experimenter in advance, such as: the number, the speed, and the behaviour/intelligence/strategy of monsters, the bonus/penalty for catching a monster or for being caught by a monster, the speed of the player, the number and position of power pills, the power pill bonus, the size and shape of the maze, as well as the duration of the episode. Ideally, varying these parameters allows manipulating appraisals related to perceived obstacles, namely,

[1] Fellow researchers who are interested in using the program should contact the authors for a copy.

appraisals of motivational congruence. Varying the resources available affects the players' appraisal of coping potential and their expectations of succeeding. Furthermore, a variety of events can be pre-programmed to occur at specific times into the game or at certain conditions. These events can include changes in game parameters, such as speeding up or slowing down monsters or the player symbol. More drastic events can also be introduced, such as producing erratic behaviour of the joystick, sudden loss of points, or sudden termination of the game (Kappas, 1995b).

All parameters are pre-set in an ASCII file they can also contain information concerning instructions to be given on screen as well as the general appearance of miscellaneous elements of the game interface. *aMAZE* also includes a subroutine that allows the automatic presentation of up to two independent questionnaires before and two questionnaires after the game. The program creates an output file that comprises a copy of the settings of the game, the self-report/questionnaire data before and after the game, a performance summary, as well as a "transcript" of the game with the positions of the player and the monsters in the maze recorded several times per second. Furthermore, the *aMAZE* program communicates various information via the parallel port to external devices, such as psychophysiology equipment, to synchronise recordings and events with the game (Kappas, 1995a).

The functionality of the program is augmented using the shell program *PLAYGAME*, which allows top script a whole experiment including baselines and a multiple block structure with randomisation of the sequence of games within blocks, as well as the inclusion of external programs. *PLAYGAME* also permits to compute average performance within a block and to compute automatically a goal that the player (optionally) has to reach for the next block. Thus, it is possible to manipulate the objective difficulty of the game, taking into account the skill level of the player.

Given the many options of manipulating variables within a game or across a series of games using *aMAZE* and *PLAYGAME*, it becomes obvious that no single study can be conceived of to validate the use of this paradigm in manipulating appraisals. We have started to use the program by introducing specific fixed events (Kappas, 1995b), manipulating the speed of monsters and the number of points to achieve (Kappas & Pecchinenda, 1996; Pecchinenda & Kappas, 1995) and combining the video game task with a secondary forced-choice reaction time task (Pecchinenda, Kappas, & Smith, 1997). Our first experiences with this paradigm have been encouraging as we could show reliable effects of our manipulations on appraisals of coping potential.

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