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The Effect of Causality Orientations and Positive Competence-Enhancing Feedback on
Intrinsic Motivation: A Test of Additive and Interactive Effects

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Abstract

Based on self-determination theory, this study investigated whether individual differences in autonomy or control causality orientation and positive competence-enhancing feedback have additive or interactive effects on intrinsic motivation. Autonomy- or control-oriented participants provided solutions to an interesting puzzle under conditions of positive competence-enhancing feedback or no feedback. Time spent solving the puzzle during a subsequent free-choice period constituted the dependent measure of intrinsic motivation. Autonomy-oriented individuals spent significantly longer on the puzzle than control-oriented participants regardless of feedback condition. Analogously, positive feedback increased time spent on the puzzle compared to no feedback regardless of causality orientation. Findings indicate that dispositional motivational orientations and feedback provided by social agents can enhance intrinsic motivation but the effects are additive rather than interactive.

Keywords: autonomy; competence; basic needs; causality orientations; self-determination theory

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Introduction

Various studies support the notion that feelings of competence and autonomy are prerequisites for an individual to experience an activity as intrinsically motivating (Koestner & McClelland, 1990; Reeve & Deci, 1996; Vallerand & Reid, 1984). In other words, only when a behavior is perceived as self-initiated and choiceful (i.e. autonomous), and a sense of mastery is experienced (i.e. competence) do individuals persist with an activity merely for its own sake and without any external reinforcement or contingency, the hallmarks of intrinsically-motivated behavior. According to self-determination theory (SDT; Deci & Ryan, 1985b, 2000), the mechanism for the influence of autonomy and competence on intrinsic motivation is through the satisfaction of basic psychological needs. Psychological needs are considered innate, universal, and necessary for optimal psychological functioning and perceived concordance between personal agency and action (Ryan & Deci, 2000; Sheldon, Elliot, Kim, & Kasser, 2001). Individuals therefore actively seek opportunities to satisfy their psychological needs. However, some individuals may be dispositionally more inclined to do so than others. The concurrent effects of dispositional tendencies and external contingencies on intrinsic motivation are the focus of the current study, which looks specifically whether these effects are predominantly additive or interactive.

Dispositional tendencies and environmental contingencies

Whether or not basic needs are satisfied in a certain context depends on the objective characteristics of the situation as well as dispositional inclinations of the individual to interpret the environment as more or less supportive of basic need satisfaction (Deci & Ryan, 2000). Certain features of the situation can carry external contingencies that either foster or undermine feelings of competence and autonomy. Feeling pressured towards a particular outcome or course of action (e.g. having to read the obligatory literature for a psychology class, as opposed

to finding and reading the articles that interest you most) is experienced as controlling and hence tends to undermine feelings of autonomy. Such situations are unlikely to satisfy the need for autonomy and may even thwart it. On the other hand, if the situation provides meaningful feedback that is informative of one's mastery of the task at hand (e.g. students receiving a grade on their essay accompanied by comments from their teacher explaining clearly what they did right as well as how they could improve), the situation is regarded as informational and tends to foster feelings of competence. Such a situation would provide an opportunity for an individual to satisfy the need for competence.

Dispositional influences in ambiguous contexts

Often the characteristics of the situation in which an individual acts including external events such as praise, criticism, rewards and external contingencies can be interpreted as either informational or controlling, depending on the circumstances (Ryan, 1982). Crucially, more often than not the environment may completely lack relevant external cues or events relevant to agency and competence. Under such ambiguous circumstances, the dispositional characteristics of an individual may have a pervasive influence on whether the situation is perceived as either supporting or undermining basic needs. In the absence of relevant external cues regarding the need-supportiveness of the environment, individuals have to rely entirely on cues from within. These internal cues reveal dispositional tendencies in its purest form, as they are not influenced by objective features of the situation. Generally, two types of dispositional tendencies, termed *causality orientations* (Deci & Ryan, 1985a) are distinguished within the self-determination framework: an *autonomy* causality orientation, a dispositional tendency to perceive actions as self-initiated and volitional, and a *control* causality orientation, a dispositional tendency to perceive actions to be under the control of external contingencies and originating from outside the self.

Evidence of interactive relations

Causality orientations may interact with environmental contingencies in determining intrinsic motivation, which is an integral part of Deci and Ryan's (1985b) theorizing. Only recently has research started to empirically investigate this possibility (Hagger & Chatzisarantis, 2011). In their investigation, Hagger and Chatzisarantis (2011) combined dispositional and environmental influences on intrinsic motivation within the same experiment for the first time and showed how these influences interact. More specifically, they placed the commonly observed undermining effect of external rewards on intrinsic motivation (e.g., Deci, Koestner, & Ryan, 1999) in a dispositional context by dividing their participants into predominantly autonomy- or predominantly control-oriented ones. Participants either received a monetary reward for each successful solution of a puzzle task (reward condition) or were simply asked to move on to the next trial (no reward condition). Whereas monetary rewards have consistently been shown to undermine intrinsic motivation in previous research, this effect was only replicated for control-oriented participants. Autonomy-oriented participants, in contrast, exhibited equally high levels of intrinsic motivation in both reward conditions, implying that an autonomy causality orientation tends to shield individuals from the detrimental influence that rewards usually exert on intrinsic motivation. This research provided preliminary evidence for the interaction of environmental contingencies that support or thwart psychological need satisfaction and dispositional causality orientations on intrinsically motivated behavior.

The Present Study

The current investigation aims to build on Hagger and Chatzisarantis' previous research and increase understanding of the independent and interactive effects of causality orientations and external contingencies on intrinsic motivation. Instead of focusing on need-thwarting external contingencies, this study investigates need-supportive external events in the form of positive task feedback (Deci, 1971). Based on prior theorizing and research, we predict that both autonomy causality orientations (Thill, Mailhot, & Mouanda, 1998) and positive task

feedback (Vallerand & Reid, 1984) will increase levels of intrinsic motivation compared to control causality orientations and no feedback, respectively. Positive feedback tends to enhance perceived competence, thereby satisfying the basic need for competence and promoting intrinsic motivation.¹ Analogously, autonomy orientations tend to bias individuals' interpretation of external events as need supportive, providing autonomy-oriented individuals with more *opportunities* to satisfy basic needs, which in turn promotes intrinsic motivation.

Additive versus interactive effects. This raises the critical question as to whether these two factors influence intrinsic motivation independently or interactively. Dispositional traits are generally viewed as evoking consistent patterns of thinking, feeling and behaving across a wide range of situations (Pervin & John, 2001). Accordingly, causality orientations might affect intrinsic motivation in coherent ways regardless of whether feedback is provided or not. Although research on the concurrent effects of dispositional tendencies and external contingencies is scarce, Gagné and Deci (2005) predicted that within organizational settings, causality orientations and autonomy-supportive work climates will have additive rather than interactive effects on employees' intrinsic motivation. This prediction was based on empirical findings from medical (Williams, Grow, Freedman, Ryan, & Deci, 1996), educational (Black & Deci, 2000), and organizational research (Baard, Deci, & Ryan, 2004), that consistently found independent, additive effects of causality orientations and need-supportive contexts. In a similar vein, the satisfaction of multiple distinct needs has been shown to produce additive effects on intrinsic motivation and other positive outcomes (Sheldon & Filak, 2008).

Alternatively, dispositional tendencies and the need-supportive characteristics of the situation may produce interactive effects on the level of intrinsic motivation that an individual experiences. More specifically, positive, competence-enhancing feedback may increase intrinsic motivation to a greater extent for individuals who are control-oriented because they usually miss opportunities to exhibit need supportive behavior since they interpret situations as being under the control of external contingencies. Consequently, their sense of competence and

autonomy is likely to be lower and they might develop a greater need satisfaction deficit over time compared to autonomy-oriented individuals. The implication for this is that when a clear and present opportunity arises to satisfy their basic needs, control-oriented individuals will likely pursue it vigorously. The provision of positive feedback for engaging in a task will provide an unambiguous indication that the situation is one that provides the opportunity to satisfy needs (i.e., the need for competence, by indicating that the task performance was effective, but also to some extent the need for autonomy, if the feedback emphasizes the role of the individual as the initiator of that successful performance, for instance “Great, you are doing very well”). In sum, according to this interaction hypothesis, the effect of feedback is expected to be more pronounced in control-oriented individuals because 1) they are likely to experience a greater need satisfaction deficit than autonomy-oriented individuals due to their interpersonal bias that tends to stymie need satisfaction, and 2) the shift in perceived locus of causality toward greater volition on the task will be more pronounced in these individuals relative to autonomy-oriented individuals, who tend to get (i.e. create for themselves) more opportunities to satisfy basic needs. Empirical support for the existence of such interactive effects on intrinsic motivation comes from the study by Hagger and Chatzisarantis (2011) described previously. In a related vein, with regard to the effects that the satisfaction of multiple needs have on intrinsic motivation, indications for interactive relations have been found, in that competence seems to affect intrinsic motivation mainly only under conditions of high autonomy (Dysvik, Kuvaas, & Gagné, 2013). The present study was designed to put these competing hypotheses to the test and answer the question whether the influences of causality orientations and positive feedback on intrinsic motivation are essentially additive or interactive in nature.

Method

Overview and design

We adopted the free-choice paradigm reported by Deci (1971, 1972) to examine the effect of feedback and causality orientations on intrinsic motivation. Equal numbers of control- and autonomy-oriented participants were required to engage in an interesting puzzle task and were randomly assigned to the positive feedback condition in which they received positive, competence-enhancing feedback for successful solutions, or the no feedback condition. The dependent measure of intrinsic motivation was time spent solving the puzzle during a free-choice period after completion of the initial puzzle task (Deci, 1971, 1972).

Participants and procedure

One-hundred and sixty undergraduate psychology students volunteered to participate in the study in exchange for course credit. Equal numbers of autonomy-oriented and control-oriented participants were invited to participate, based on the results of a screening session prior to the actual experiment (see measures below).

Participants were required to engage in an interesting SOMA puzzle task under one of two randomly-assigned experimental conditions: positive competence-enhancing feedback or no feedback. The SOMA puzzle involves spatial ability and has been used in numerous studies on intrinsic motivation (Deci & Ryan, 2000). The puzzle requires the replication of a set of illustrated configurations using wooden puzzle blocks placed on the table in front of the participants. Figure 1 depicts an example configuration and its solution. During the initial puzzle task, participants in the feedback condition were provided with positive statements that were informational about their competence after each successful solution, consistent with previous experiments (Ryan, 1982). After each successful solution, participants were provided with one of three randomly-selected verbal feedback statements by the experimenter and then asked to move on to the next configuration. The statements provided were “Good job, you did really well on that one”, “Great, you are doing very well”, and “Well done, you did well that time”. Participants assigned to the no feedback condition were asked to move to the next configuration after they had found the solution.

After the completion of the initial puzzle task, participants completed a questionnaire to assess their task perceptions. Subsequently, the experimenter provided an excuse to leave the laboratory room, informing participants that they were free to do whatever they wanted in the meantime. Participants' self-chosen activities during the 6 minutes long absence of the experimenter were monitored using a hidden video camera. Intrinsic motivation was defined as the time spent trying to solve the puzzle in this so-called free-choice period.

Measures

Causality orientations. The General Causality Orientations Scale (GCOS; Deci & Ryan, 1985a) was used in an initial screening session four weeks prior to the actual experiment to identify autonomy- and control-oriented participants. Following Koestner et al. (1992), students with higher scores on the autonomy-orientation subscale ($\alpha = .85$) of the GCOS relative to the control-orientation subscale ($\alpha = .84$) were classified as predominantly autonomy oriented. Analogously, students with higher scores on the control-orientation subscale compared to the autonomy-orientation subscale were classified as predominantly control oriented (see also Hagger & Chatzisarantis, 2011).

Manipulation check and task perceptions. After completing the initial puzzle task, participants completed the 22-item version of the Intrinsic Motivation Inventory (IMI; Plant & Ryan, 1985; Ryan, 1982) that comprises four subscales measuring interest/enjoyment (7 items; e.g., "I enjoyed doing this puzzle very much"), perceived competence (5 items; e.g., "I think I am pretty good at this puzzle"), pressure/tension (5 items; e.g., "I felt tense while doing this puzzle"), and perceived choice (5 items; e.g., "I felt that it was my choice to do this puzzle"). Ratings were made on seven-point Likert-type scales ranging from 1 *not at all true* to 7 *very true*. The interest/enjoyment and perceived competence subscales constitute the manipulation check for positive competence-enhancing feedback. In addition, we expected that scores on the

interest/enjoyment scale would indicate whether the puzzle was experienced as interesting and enjoyable by participants. Ratings above the scale midpoint would provide support this claim.

Intrinsic motivation. The number of seconds participants spent trying to solve the SOMA puzzle configurations in the 6 minutes long absence of the experimenter (i.e., the free-choice period) constituted the dependent measure of intrinsic motivation. The recorded video footage of the participants was coded by an independent researcher blind to the purpose of the experiment (Hagger & Chatzisarantis, 2011).

Results

Causality Orientations

Participants' scores on the GCOS subscales were consistent with their classification as autonomy- and control-oriented. Participants classified as autonomy-oriented scored significantly higher on the autonomy-orientation scale (autonomy orientation, $M = 5.75$, $SE = 0.06$; control orientation, $M = 4.81$, $SE = 0.07$; $t(1,158) = 10.31$, $p < .001$, $d = 1.63$) while those classified as control-oriented scored significantly higher on the control-orientation scale (autonomy orientation, $M = 4.41$, $SE = 0.09$; control orientation, $M = 5.21$, $SE = 0.07$; $t(1,158) = 7.69$, $p < .001$, $d = 1.22$).

Task Perceptions

A 2 (feedback condition: positive feedback vs. no feedback) x 2 (causality orientation: autonomy vs. control) MANOVA with subscale scores from the IMI as dependent variables and feedback condition and causality orientation as independent variables revealed significant multivariate main effects for feedback condition, (Wilks' Lambda = .93, $F(4,153) = 2.90$, $p = .024$, $\eta_p^2 = .07$) and causality orientation (Wilks' Lambda = .88, $F(4,153) = 5.14$, $p < .001$, $\eta_p^2 = .12$). The feedback condition x causality orientation interaction effect was not statistically significant (Wilks' Lambda = .98, $F(4,153) = 0.80$, $p = .525$, $\eta_p^2 = .02$). Supporting the successful manipulation of positive, competence-enhancing feedback, participants in the

feedback condition perceived the task as significantly more interesting and enjoyable ($M = 5.29$, $SE = 0.12$), and rated their competence for the task significantly higher ($M = 3.72$, $SE = 0.17$), than participants in the no feedback condition (interest/enjoyment, $M = 4.81$, $SE = 0.15$; $F(1,156) = 6.73$, $p = .010$, $\eta_p^2 = .09$; competence, $M = 3.03$, $SE = 0.15$; $F(1,156) = 9.45$, $p = .002$, $\eta_p^2 = .06$). There were no statistically significant differences across the feedback conditions on the pressure/tension and choice subscales. In addition, autonomy-oriented participants ($M = 5.42$, $SE = 0.12$) reported statistically significantly higher levels of interest and enjoyment than control-oriented participants ($M = 4.68$, $SE = 0.14$, $F(1,158) = 16.22$, $p < .001$, $\eta_p^2 = .09$). There was no statistically significant effect of causality orientation on the competence, pressure, and choice subscales. Interest/enjoyment ratings of the puzzle were above the scale midpoint of 4 in both feedback conditions suggesting that participants experienced the puzzle as interesting and enjoyable.

Intrinsic motivation

Time spent on the puzzle during the free-choice period, was non-normal in distribution as observed elsewhere (Wiechman & Gurland, 2009). We therefore conducted a square-root transformation of this variable. A 2 (feedback condition: positive feedback vs. no feedback) x 2 (causality orientation: autonomy vs. control) ANOVA on puzzle time revealed a statistically significant main effect for both causality orientation ($F(1,156) = 11.98$, $p = .001$, $\eta_p^2 = .07$) and feedback condition ($F(1,156) = 4.97$, $p = .027$, $\eta_p^2 = .03$), see Figure 2. There was no statistically significant interaction effect, $F(1,156) = 1.78$, $p = .18$, $\eta_p^2 = .01$. Overall, autonomy-oriented participants ($M = 193.85$ seconds, $SE = 17.28$) and participants allocated to the positive feedback condition ($M = 174.34$ seconds, $SE = 16.70$) spent more time on the puzzles than control-oriented participants ($M = 112.41$ seconds, $SE = 15.44$) and participants allocated to the no-feedback condition ($M = 131.93$ seconds, $SE = 17.00$).² For exploratory

purposes, we also tested the simple effects of feedback condition within each level of causality orientation. No statistically significant effects were found ($ps > .060$).

Discussion

In the current study we tested whether dispositional tendencies in the form of causality orientations and environmental contingencies in the form of competence-enhancing feedback had additive or interactive effects on intrinsic motivation. Results revealed that both an autonomy causality orientation and positive competence-enhancing feedback enhanced intrinsic motivation, as indicated by time spent on the puzzle during the free-choice period. Furthermore, control-oriented participants exhibited greater intrinsic motivation on the puzzle when provided with positive competence-enhancing feedback relative to no feedback. In other words, control-oriented individuals tend to seize need-satisfying opportunities in the environment when they arise, but in the absence of external opportunities their interpretational bias seems to deprive them of ways to satisfy basic needs. The effects observed for intrinsic motivation were corroborated by precisely the same pattern of effects for feedback condition and causality orientation on task perceptions for interest and enjoyment.

However, no significant interaction effect of causality orientation and feedback condition on intrinsic motivation was found, suggesting that autonomy- and control-oriented individuals are equally responsive to positive competence-enhancing feedback. Although previous research provided evidence that causality orientations can interact with environmental contingencies to undermine intrinsic motivation (Hagger & Chatzisarantis, 2011), as predicted by self-determination theory (Deci & Ryan, 1985b, 2000), this finding does not generalize to environmental contingencies that tend to support intrinsic motivation such as positive competence-enhancing feedback.

Implications

The additive effects found in the present study indicate that autonomy-oriented individuals are equally sensitive to the effects of positive feedback, and respond in the same

way, as control-oriented individuals under conditions of positive feedback. The urge for need satisfaction seems not to cease with increasing levels of satisfaction of those needs. This gives rise to the assumption that autonomy and competence needs might lack an upper limit, a point at which saturation is reached and needs are temporarily satisfied. Although some psychological models suggest that very high levels of autonomy and competence may become detrimental for psychological functioning and well-being beyond a certain threshold (e.g., Warr, 1987), the present findings do not lend support to this general idea. However, to fully understand the dynamics of levels of need satisfaction and intrinsic motivation, more research on this question is needed.

Analogously, current findings also seem to indicate that control-oriented individuals display similar responses to the opportunity to gain competence and feel autonomous, and satisfy their basic psychological needs, as autonomy-oriented individuals. Therefore, although the opportunities arise, it seems that their response is proportional to that of autonomy-oriented individuals. Current findings corroborate the notion within self-determination theory that the provision of competence-enhancing feedback will promote intrinsic motivation even among individuals with a tendency to perceive situations and behaviors as generally controlling and thwarting of psychological needs.

The current findings also have implications for domains in which intrinsic motivation plays an important role, including educational and organizational settings. For instance, feedback-based motivational strategies seem to work the same way in different individuals and can therefore be used as a general approach to enhance intrinsic motivation. In addition, teaching individuals to adopt an autonomy-orientation toward tasks and assignments may further increase intrinsic motivation in the long run, while the beneficial effects of positive feedback still apply.

Limitations and Future Research

One limitation of the study is that we did not include satisfaction of psychological needs as a control variable or mediating factor. However, previous research lends support to the mediating mechanism put forward in the present study, by showing that perceived need satisfaction mediates the effect of motivational climate and need support on intrinsic motivation in sport and school-based physical education settings (Jõesaar, Hein, & Hagger, 2011; Standage, Duda, & Ntoumanis, 2005).

A further limitation is that we did not include a need-thwarting, controlling feedback condition. In contrast to the informational, need-supportive type of feedback used in the present study that tends to promote intrinsic motivation, controlling feedback more closely resembles external rewards in its functions and mechanism, reinforcing the externally controlled contingencies of the situation. Therefore, controlling feedback would be expected to undermine intrinsic motivation in a similar fashion to monetary rewards. To speculate, under conditions of controlling feedback we would have expected an interactive effect of causality orientations and feedback condition on intrinsic motivation consistent with the findings by Hagger and Chatzisarantis (2011). An autonomy orientation would be expected to offer some degree of 'protection' from the undermining effect of controlling feedback on intrinsic motivation. We look to future investigations to examine the effect of controlling feedback on intrinsic motivation among individuals with autonomy and control causality orientations.

Conclusion

Taken together with the findings of Hagger and Chatzisarantis (2011), this line of research indicates that individuals are equally responsive to situations that support autonomy, while only control-oriented individuals are responsive to controlling contingencies like rewards because autonomy-oriented individuals are afforded protection such contingencies. It seems that autonomy, whether in the individual (in the form of causality orientations) or environment (in the form of autonomy-supportive contingencies like positive feedback) produces positive effects on intrinsic motivation. In contrast, a lack of autonomy in the individual or environment

tends to undermine intrinsic motivation. From a practical perspective, the findings indicate that it is more difficult to undermine intrinsic motivation than to enhance it.

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Footnotes

¹ Although task performance in itself can also be interpreted as a form of implicit task feedback, in this context we refer to task feedback as the overt and explicit provision of feedback by a social agent.

² Following Wiechman and Gurlands' (2009) recommendations we repeated our analysis using Moses' (1952) two-sample non-parametric test for scores stacked at either end of the distribution. Consistent with ANOVA findings, the test revealed significant effects for feedback ($p < .001$) and causality orientation ($p < .001$) on puzzle time.

Figure Captions

Figure 1. The SOMA puzzle blocks along with an example configuration and its solution (displayed in the top left corner).

Figure 2. Intrinsic motivation, as indicated by time in seconds spent on the puzzle during the free-choice period, as a function of causality orientation (autonomy versus control) and feedback condition (positive feedback versus no feedback).



