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Effects of Reward on Self-regulation, Intrinsic Motivation and Creativity

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This article evaluates the effects of two types of rewards (performance-contingent versus engagement-contingent) on self-regulation, intrinsic motivation and creativity. Forty-two undergraduate students were randomly assigned to three conditions; i.e. a performance-contingent reward group, an engagement-contingent reward group and a control group. Results provide little support for the negative effects of performance rewards on motivational components. However, they do indicate that participants in the engagement-contingent reward group and the control group achieved higher rated creativity than participants in the performance-contingent reward group. Alternative explanations for this finding are discussed.

Keywords: *Rewards; Self-Regulation; Creativity; Intrinsic Motivation*

Introduction

During the last three decades, researchers have tried to localise the mechanism that makes individuals persistent in creative achievement (Amabile, 1996). Both theoretical models and empirical studies are consistent with the notion that intrinsic motivation is conducive to creative performance (Amabile, 1979, 1982b, 1983; Amabile, Hennessey & Grossman, 1986; Reeve & Deci, 1996). Persons who engage in an activity for its own sake are intrinsically motivated. When intrinsically motivated, persons are motivated simply to perform an activity and to have the spontaneous experiences of interest, enjoyment, excitement and satisfaction that accompany the behaviour. Intrinsic motivation encompasses exploration, spontaneity, autonomy and interest in one's surroundings (Deci & Ryan, 1996; Deci, Ryan & Koestner, 1999).

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The aim of this study is to examine how reward contingencies affect self-determination to perform a creative activity. Research in this area has typically focused on intrinsic motivation and its determinants (Deci & Ryan, 2000) and supported self-determination theory (Deci & Ryan, 1985) in that changes in intrinsic motivation are the result of changes in perceived self-determination or perceived competence (Vallerand & Bissonette, 1992). Research on various types of extrinsic motivation and the internalisation of externally motivated behaviour, however, is scarce. An exception is the study by Grouzet, Vallerand, Thill and Provencher (2004), who found that environmental factors, such as success or failure, influenced perceptions of competence, autonomy and relatedness (psychological need factors). These factors, in turn, determined the extent to which self-determined motivation was exhibited.

Self-determination theory, like other organism models (Deci & Ryan, 1996), assumes that people are proactive to the extent that their engagement with their surroundings leads to an elaborated and refined set of internal processes and structures. One important aspect of these theories is people's natural tendency to internalise values and behavioural regulations in their social world and to make those values their own (Deci & Ryan, 2000). Being proactive, individuals adjust to the world by internalising and integrating the values and regulations that allow them to behave more effectively (Ryan, 1993).

It is through this process that extrinsically motivated behaviours that are initially externally prompted can become increasingly internalised and result in greater self-regulation (Ryan, 1982). Internalisation involves people's transformation of external regulatory processes into internal regulatory processes (Deci & Ryan, 1996; Deci, Ryan & Koestner, 1999). Integration is the process through which these internalised regulations are assimilated with one's self (Plucker & Runco, 1998; Ryan, 1993). As an external regulation becomes internalised and integrated, the person becomes more fully self-regulating of that behaviour. The person then experiences that *the perceived locus of causality* has shifted from external to internal (Deci, Ryan & Koestner, 1999; Vallerand & Bissonette, 1992).

Self-determination theory specifies four types of extrinsic motivation that result from the process of internalisation (Deci & Ryan, 1996; Ryan & Connell, 1989). The more fully a regulation has been internalised, the more it represents integration and thus provides the basis for self-determination and volitional behaving. The four types of extrinsic regulations are ordered along a continuum from being relatively controlled to relatively self-determined (external, introjected, identified and integrated regulation).

External regulation is referred to behaviours that are controlled by external demands and pressures (Deci & Ryan, 1996; Ryan & Connell, 1989). This regulation represents the lowest level of internalisation. *Introjected regulation* is controlled by demands inside the person, for example by self-esteem contingencies. Hence, both *external* and *introjected* regulation refer to controlled motivation, that is, doing an activity by obligation in order to obtain something positive or to avoid

something negative outside the activity. *Identified regulation* denotes behaviours that are chosen because the individual identifies with the importance of the value or the activity. *Integrated regulation* represents the highest level of internalisation where the individual identifies the values or the activities as an expression of one's self. Integrated regulation is also referred to be fully self-determined and, as such, is similar to intrinsic motivation. Therefore, both *identified* and *integrated* regulation represent autonomous or self-determined motivation that is, doing an externally regulated activity by choice in order to obtain something positive or avoid something negative outside the activity. The study by Grouzet et al. (2004) revealed that experiencing perceptions of competence, autonomy and relatedness will facilitate self-determined motivation, as people are likely to return freely to the activities that satisfy their psychological needs. Accordingly, also, environmental factors may have the ability to positively influence self-determined motivation. This study explores the question of whether activities conducted under performance- and engagement-contingent rewards can affect creativity by becoming internalised and integrated in individuals' self-regulation.

Reward Contingencies

One major aspect must be considered while doing research on tangible rewards and that is if the reward is expected or not. If rewards are not expected while a person is working on a creativity task, they are not predicted to affect motivation (Lepper, Henderlong & Gingras, 1999), because the person is not likely to experience the task as being controlled by the rewards. A distinction may therefore be made between controlling and informative extrinsic motivators (see also Collins & Amabile, 1999). It has also been suggested that the cognitive style (adaptive or innovative) of the recipient may play a part in whether or not the extrinsic motivation will benefit creativity (Baer, Oldham, & Cummings, 2003).

For expected rewards, Ryan, Mims and Koestner (1983) presented a typology of reward-contingencies that have been widely assessed in later research (Hennessey, 2000): *task-non-contingent rewards*, which are given to individuals for something other than engaging in the target activities, such as participating in a study; *task-contingent rewards* which are given to individuals if they complete the target activity, such as solving the problem that is administered within this study and, finally, *performance-contingent rewards*, which are given only if the individual's performance matches given criteria or if one pushes participants to reach the top 20% in terms of performance. However, even if there is a theoretical distinction between task-contingent and task-non-contingent rewards, studies have indicated that they are experienced by reward recipients as very similar to each other (Deci, Ryan & Koestner, 1999; Pittman, Davey, Alafat, Wetherill & Kramer, 1980) and therefore referred to as *engagement-contingent rewards*.

Then, to what degree do the activities conducted under these reward-contingencies become internalised? A large amount of research examining the

effects of reward on motivation has taken place for at least three decades (Eisenberger, Pierce & Cameron, 1999; Deci, Ryan & Koestner, 1999). The focus has not been on to what degree rewards affect self-determination through the process of internalisation, instead, intrinsic motivation has been the dependent measure. By reasoning alone, this derives from the pioneer studies that examined how crucial it is for individuals to experience intrinsic motivation in order to achieve higher creativity (Amabile, 1979, 1982b, 1983; Amabile, Hennessey & Grossman, 1986), to experience a target activity as more interesting (Ryan, Mims & Koestner, 1983) and to achieve higher academic grades (Grolnick & Ryan, 1987; Ryan & Connell, 1989). Up until quite recently, few studies have examined how external events become internalised and integrated, probably because of the notion that extrinsically motivated behaviour is less crucial for performance than for intrinsically motivated behaviour.

One of the advantages of measuring self-regulated and self-determined behaviour through the process of internalisation is that both theoretical models and empirical measures differentiate extrinsic motivation into four ordered types (Ryan & Connell, 1989). This makes it possible to distinguish between different types of motivation and to specify their effects on performance. Ryan, Connell and Plant (1990), for example, tested how different levels of self-regulation affected memory retrieval in educational settings. Schiefele (1991) measured how the level of interest in education correlated with the levels of self-regulation. Both studies found an increase of their dependent measure (memory retrieval and interest) in proportion to the level of self-regulation. Vallerand and Bissonette (1992) also found that low self-regulated individuals to a larger extent drop out of college courses than high self-regulated individuals do.

Another aspect on why the internalisation approach is more appropriate is that one can never take for granted that individuals experience intrinsic motivation. Despite the fact that self-determination theory proposes that intrinsic motivation is a natural tendency for individuals to experience (Deci & Ryan, 1996), individuals sometimes engage in activities for attaining some rewards or to gain approval (Reeve & Deci, 1996) and sometimes experience a lack of motivation. Therefore, by measuring how external events become internalised into the regulatory process, one can more fully understand how the external event is experienced and, more importantly, evaluate the potential of the external event as being positive or negative for motivation and performance.

As noted earlier, external events influence individuals perceived self-determination via their controlling and informational aspects (Deci & Ryan, 1996; Reeve & Deci, 1996) and provide either positive or negative effects on performance/intrinsic motivation. According to a meta-analytic study by Deci, Ryan and Koestner (1999), some rewards have an undermining effect on intrinsic motivation. Task-contingent and task-non-contingent rewards that are referred to be engagement-contingent did not undermine intrinsic motivation, using both free-choice behavioural and self-report measures. Completion-contingent rewards (i.e. placing importance at the

completing of one or more tasks), on the other hand, led to a significant undermining of intrinsic motivation, as did performance-contingent rewards (for free-choice measures, but not for self-reports).

As could be seen, engagement-contingent rewards did not undermine intrinsic interest to perform a target activity that could be explained by its non-controlling component (Reeve & Deci, 1996). The reasons why individuals participate in such studies are not solely for external reasons, the rewards are not demanding a person to perform well and intrinsic motivation remains intact (Ross, 1975). However, completion and performance-contingent rewards did undermine intrinsic interest to perform an activity, except for self-report measurements. Completion- and performance-contingent rewards clearly have a controlling component that forces the individual to perform an activity (Hennessey, 2000). The more controlling an external event is, the less it represents values that match an individual and the less it will be internalised (Deci, Eghrari, Patrick & Leone, 1994). It seems that the crucial component for both extrinsic (in order to be internalised) and intrinsic motivation (in order to increase or remain) is the informational aspect of an external event. The more an event is experienced as controlling, the less it represents values for an increase of self-determination towards activities. Accordingly, we expect to find a larger degree of internalisation of activities conducted under engagement-contingent rewards (task-contingent and task-non-contingent rewards) than for activities conducted under performance-contingent rewards. *Hypothesis 1a*: Activities conducted under engagement-contingent rewards will be more internalised in individual's regulatory process than performance-contingent rewards.

Rewards and Creativity

The study of human creativity has interested many researchers and thinkers over the years, not only in psychology, but more recently in economic and organisational disciplines (Garud, Nayyar & Shapira, 1997). Creativity has been highly valued as it is considered to be a good predictor of invention (Amabile, 1997; Shalley, 1991) and, as such, crucial for companies if they are to continue to grow and to prosper (DeVamia & Tichy, 1990). Creativity has, for example, also been found to promote long-term academic success (Peterson, Swing, Braveman, & Buss, 1982; Pintrich & deGroot, 1990).

The use of rewards in organisations and everyday life are surprisingly large (Hennessey, 2000), considering the detrimental effects many rewards may have on motivation and performance (Deci, Ryan, & Koestner, 1999). Research suggests that rewards for novel performance increase intrinsic motivation and creativity (Eisenberger & Shanock, 2003). However, if conventional performance is rewarded it will decrease intrinsic motivation and creativity.

There is, of course, little doubt that expected rewards have a detrimental effect on creativity, as rewards have been shown by a large amount of research (Deci, Ryan & Koestner, 1999) to have a general detrimental effect on motivation and performance.

The question is whether this relationship can actually be explained by the degree to which activities conducted under rewards are becoming internalised. Accordingly, in this study we emphasise to alter the traditional perspective of rewards by examining to what extent activities conducted under rewards become internalised in the regulatory process. In doing so, one can expect to find a relationship between the level of internalisation and the level of creativity produced. To illustrate, the more an activity conducted under a reward becomes internalised, the more it represents self-determined behaviour (Deci & Ryan, 1996; Deci, Eghrari, Patrick, & Leone, 1994; Ryan, Connell, & Plant, 1990). Consequently, creative performance should be higher for greater levels of internalisation. More specifically, persons who act in the presence of a performance-contingent reward should be more controlled by the reward and therefore produce less qualitative creative responses compared to persons who act in the presence of an engagement-contingent reward. The latter should produce more qualitative creative responses, whereas persons who do not receive any kind of reward should produce the most creative responses (Amabile, 1979, 1982b, 1983; Amabile, Hennessey & Grossman, 1986), due to the non-constrained environment. That is, no external events control why the person engages in the activity. *Hypothesis 1b*: Individuals who are offered a performance-contingent reward will show a lower level of internalisation and produce less qualitative creative responses than individuals who are offered an engagement-contingent reward. *Hypothesis 1c*: Individuals who do not receive any kind of reward will produce the most qualitative creative responses.

Methods

Participants

Forty-two (31 women and 11 men) undergraduate students in psychology at Växjö University participated in the experiment. They were recruited as participants to match the given creativity task and were randomly assigned to each condition. All students were at the end of, or have finished, their second semester in psychology. The students were asked in class whether or not they were interested in taking part in an experiment that measured their attitudes to, and experience of, scientific research. No rewards of any form were promised in connection to their participation.

Materials

Internalisation. The level of internalisation was measured using a variant of the Academic Motivation Scale (AMS-C28)© developed by Robert J. Vallerand, Luc G. Pelletier, Marc R. Blais, Nathalie M. Brière, Caroline B. Senécal and Evelyne F. Vallières (Vallerand & Bissonnette, 1992; Vallerand, Blais, Brière, & Pelletier, 1989), which assesses motivational styles towards academic activities. The AMS assesses the four types of extrinsic motivation; external, introjected, identified and

integrated regulation. This scale is an extensive version of the Academic Self-Regulation Questionnaire (ASRQ) developed by Ryan and Connell (Ryan & Connell, 1989; Grolnick & Ryan, 1987) and the main difference between the two is that ASRQ was developed for elementary schoolchildren and AMS for college students. In this study, some of the target words of AMS were replaced with words to match the given creativity task, for example the word *studies* was replaced with a word like *task*. The AMS reliability was shown to be high, with an overall Cronbach's alpha of $\alpha=.74$ (Vallerand & Bissonette, 1992) and therefore supports the self-determination continuum of the four subscales. Since only target words were replaced, there is no reason to believe that the variant of the AMS that was used in this study is any different from the original AMS. The rest of the formulations remained intact. Item correlation analysis of the version used in this study was indicated to be large, Cronbach's alpha of $\alpha=.79$, therefore yielding preliminary support to the validity of the scale (see results, for a more detailed analysis for the reliability of the scale).

In this version of the AMS, participants were instructed to rate how well 16 items were true for them in relation to this statement: "I participate in this study and carry out the research-related task because of..." Each of the four subscales consisted of four items and was ranged in a scale from 1 (not true at all) to 7 (completely true). An example of an external item was: "It is expected of me to carry out the task"; example of an introjected item was: "To show myself that I am an intelligent person"; an example of an identified item was: "I find psychological research to be important"; and an example of an integrated item was: "My psychology education will make me develop if I learn how to solve research-related tasks".

Validity analysis. In order to provide preliminary support of the validity of the AMS used in this study, the intercorrelation across the four motivational subscales was computed. Support for the validity of the scale would be obtained if the correlations displayed a simplex structure. A simplex structure is supported if positive correlations between adjacent subscales are obtained and these become progressively less positive and gradually negative, as the scales are farther apart. The correlation matrix appears in Table 1. As this Table shows, the pattern of correlations supports the simplex structure. The highest positive correlations were obtained between adjacent scales (e.g. integrated and identified regulation: $r=.46$),

Table 1. Correlation matrix across the four motivational subscales ($n=42$)

Subscale	Integrated	Identified	Introjected	External
Integrated	–			
Identified	.461**	–		
Introjected	.355*	.426**	–	
External	–.158	.047	.415**	–

Notes: *significant, $p<.05$; **significant, $p<.01$.

while the most negative correlations were obtained between scales at the opposite ends of the continuum (e.g. integrated and external regulation: $r = -.16$). Further, the item correlation analysis of the AMS revealed a Cronbach's alpha of $\alpha = .79$. The value-inflated factor of the sub-scales was smaller than 10, indicating that no collinearity was at hand. Overall, these results provide preliminary support for the validity of the scale.

To measure the self-determination continuum, the Relative Autonomy Index (RAT: Grolnick & Ryan, 1987, 1989) was used. The RAT is appropriate to use because it indicates whether individuals are dominantly self-determined or non-self-determined (Vallerand & Bissonnette, 1992; Vallerand, Blais, Brière & Pelletier, 1989). This is conducted by weighting each of the four motivational subscales on the self-determination continuum from external to integrated regulation and then summing the products. Integrated regulation represents the highest form of self-determination and is thus given the highest positive weight (+2). Identified regulation also represents a self-determined regulation but is lower than for integrated regulation and is therefore given a lower positive weight (+1). In contrast, introjected (-1) and external (-2) regulations represent lower forms of self-determined behaviour and are therefore negatively weighted. The RAT scale ranged from -72 to +72.

Creativity. One perspective of viewing and defining creativity is the consensual assessment technique of creativity (CAT: Amabile, 1982a). The technique asserts evaluation of products and ideas generated in real-life settings (Hennessey & Amabile, 1988). This moves the CAT in a clear opposition with the majority of theoretical assumptions and tests that traditionally have dominated the creativity area (Barron & Harrington, 1981; Piedmont, 1998; Plucker & Runco, 1998; Torrance, 1972). The technique was developed by Amabile and has been widely assessed in research (Shalley, 1995; Shalley & Perry-Smith, 2000). The clear advantage of this technique is that one can evaluate creative responses or even creative processes in real-life settings (individually or in groups), and at the same time keep a trustworthy validity (Amabile, 1982a; 1996). The technique calls for the use of expert judges. Expert judges are those familiar with the domain in which the creativity task is set. The technique is based on social judgements and uses the judges' implicit theories about what they think is creative (for a more detailed description about the technique, see Amabile, 1982a, 1996). Creativity is defined by the consensual assessment technique as follows:

“A product or response is creative to the extent that appropriate observers independently agree it is creative. Appropriate observers are those familiar with the domain in which the product was created or the response articulated. Thus, creativity can be regarded as the quality of products or responses judged to be creative by appropriate observers, and it can also be regarded as the process by which something so judged is produced.” (Amabile, 1982a)

A creativity task was designed and consisted of a research-related problem, developed to match the participant's psychology education. As can be seen, the participants were instructed to come up with as creative solutions as possible and to solve the task in a correct ethical way. We were also interested in assessing the functionality of the creative responses. An idea can be very creative but have no practical use, e.g. highly expensive, impractical or illegal. Therefore, two dependent measures were administered, creativity and functionality. The ethical value was a part of the functionality dimension. Similar creativity tasks have been used in other studies (Amabile, 1979, 1983, 1982a, 1982b; Amabile, Hennessey & Grossman, 1986; Shalley & Perry-Smith, 2000), that is, the design of the tasks has been open-ended. In fact, for the CAT of creativity to function fully, it is crucial that the task is designed to have several not predetermined exits (Amabile, 1996), thus, the final creativity task was:

- How would you design a scientific study to answer the question if an individual disposition causes a malfunctioning behaviour? Try to come up with as creative solutions as possible and the study should be designed in a correct ethical way. To help you have the following lists of equipment: (a) a laboratory along with a number of PCs, (b) a projector, (c) a copying machine to print forms with, (d) envelopes to send to the participants, (e) a portable tape-recorder with cassette tapes. It is optional to use the equipment, i.e. you are not bound to use them in order to solve the task. Besides that, you have free hands to solve the task.

Scoring creativity. The participant's responses were scored and analysed using the CAT technique. Three independent graduate students in psychology served as expert judges. The judges were recruited because they had the relevant degree in psychology to determine the grade of creativity and functionality in each response (see Amabile, 1982a, 1996 for a more detailed description of judges). The responses were scored from 1 (non-creative and non-functional) to 7 (highly creative and highly functional). The interjudge reliability for the judge's ratings was computed using the intraclass correlation (ICC) method (Bartkro, 1966; Shrout & Fleiss, 1979). The ICC sets the judges to be a random effect, which is the opposite of the standard coefficient alpha. The advantage of not setting the judges to be a fixed effect, is that the judges ratings can be generalised to a larger population of judges from which the judges were drawn (Amabile, 1996). However, results from the ICC and the coefficient alpha often yield similar results. The interjudge reliability across the judges had a value for creativity of .62 and for functionality of .46. The mean of the three judges ratings were then set to indicate the creativity and functionality in each response.

Procedure

The AMS questionnaire and the creativity task were offered to all students taking their second semester in psychology. Another group of students who had finished

their second semester were also offered a chance to participate. Those who decided to participate in the study were then randomly assigned to each condition, i.e. performance-contingent reward group, engagement-contingent reward group or a control group. The participants were initially instructed that the aim of the study was to investigate their attitudes and experience towards studying and working with research. Being psychology students, they encounter such matters throughout their entire education. They were also instructed that they would have to discuss and to solve a research-related problem, with no mention being made of creativity or any kind of information connected to the AMS. Creativity has been found to be an emotionally charged word (Ruscio, Whitney & Amabile, 1998) and the use of such a word initially could seriously have harmed the study.

Participants in the performance- and the engagement-contingent reward group were first offered a salient reward. Participants in the control group were not offered a reward. The reward consisted of a Ballograph pen with Växjö University's emblem printed upon it. Similar rewards have been widely used in research with surprisingly large success and often rewards have a limited value of only \$2 (Deci, Ryan & Koestner, 1999).

Participants in the performance-contingent reward group received a written instruction that the reward was to be given to them if their achievements in solving the task ended up at the top 20% of all responses. Participants in the engagement-contingent reward group received a written instruction that the reward was to be given to them if they participated in the study. They were also instructed that the reward was to be given to them at one of the following lectures in their education program. After any reward offering was made, the participant filled out the AMS and the creativity task. They also filled out some demographic data: gender, total length of college education and their name. I wanted to make sure that the length of each participant's total college education (other than psychology) didn't have anything to do with their scores on creativity. All participants completed the AIVIS questionnaire and the creativity task in less than one hour and were then dismissed. The participants who were offered a reward also received that.

At a later stage, the judges received instructions that they would have to score each response level of creativity and functionality based upon Guilford's (1967) definition of creative solutions:

“(1) Judge on a scale from 1 (non-creative) to 7 (highly creative) whether you think the solution is creative in the sense that it culminates to original ideas. (2) Judge on a scale from 1 (non-functional) to 7 (highly functional) it's practical use including ethical, cost, legal and time absorbing values.”

The judges were also instructed that the two measurements should be rated independently of each other and, importantly, to rate everything written in each response, including any proposed methods and discussions. Information about which condition, gender, total college education and scores on AMS for each

response was not available to the judges. Further, the judges independently analysed the responses in opposite order, all according to the CAT (Amabile, 1982a, 1996).

Results

Controlling background variables. From here on, the Relative Autonomy Index (RAI) represents the four motivational subscales combined. A 2 x 3 (Gender x RAI, Creativity and Functionality) univariate analysis of variance was conducted to ensure that no gender differences influenced the scores on RAI, creativity and functionality. Results indicated no main effect for gender on RAI ($F[1, 41]=0.126$; $p=.72$), creativity ($F[1, 41]=1.65$; $p=.21$) and functionality ($F[1, 41]=.22$; $p=.64$). Further, Gender x RAT interaction was non-significant on creativity ($F[1, 41]=1.089$; $p=.47$) and functionality ($F[1, 41]=0.72$; $p=.674$).

Descriptive statistics. Participants in the performance-contingent reward group displayed a mean score in self-regulation (RAI) of $M=1.14$ (range: -24 to $+21$), creativity of $M=3.42$ and functionality of $M=3.80$. Participants in the engagement-contingent reward group had a mean score in self-regulation of $M=9.71$ (range: -14 to $+29$), creativity of $M=4.42$ and functionality of $M=4.26$. The participants in the control group had a mean score in self-regulation of $M=11.57$ (range: -5 to $+29$), creativity of $M=4.47$ and functionality of $M=3.97$. Descriptive statistics for the three groups on self-regulation (RAI), creativity and functionality appears in Table 2.

Reward groups and internalisation. A multivariate analysis of variance (type of reward group x the four motivational subscales) was conducted on type of reward group as independent variable and the scores on the four motivational subscales as dependent

Table 2. Mean scores and standard deviations of the three groups on RAI, creativity and functionality

Condition	n	Response ^a		
		RAI ^b	Creativity	Functionality
Performance reward group	14			
M		1.14	3.42	3.80
SD		14.50	0.83	0.71
Engagement reward group	14			
M		9.71	4.42	4.26
SD		13.22	0.75	0.95
Control Group	14			
M		11.57	4.47	3.97
SD		10.91	1.18	0.87

Notes: The RAI scale represents four motivational subscales combined; ^athe responses were ranged from min. 1p to max. 7p; ^bthe RAI scale was ranged from min. $-72p$ to max. $+72p$. The higher score, the greater the self-regulation.

variables. Results indicated no significant differences on external ($F[2, 41]=.480$; $p=.62$), introjected ($F[2, 41]=.01$; $p=.99$) and identified regulations ($F[2, 41]=1.81$; $p=.18$) between the three reward groups. However, a marginal significance was obtained on integrated regulation ($F[2, 41]=2.73$; $p=.08$) between the three reward groups. Participants in the control group had a mean score on integrated regulation of $M=18.85$ p whereas participants in the engagement and performance-contingent reward group had a mean score of $M=16.07$ p and $M=14.71$ p respectively. Post hoc (Tukey) analysis indicated a marginal difference between the control group and the performance-contingent reward group on integrated regulation ($p=.09$), indicated no difference between the performance and the engagement-contingent reward group ($p=.96$) and no difference between the engagement-contingent reward group and the control group ($p=.16$). Mean scores and standard deviations of the three groups scores on the four motivational subscales appear in Table 3.

An overall univariate analysis of variance (type of reward group x RAI) was also conducted on type of reward group as independent variable and the RAI as the dependent variable to test whether there was a difference between the three groups on their total scores on self-regulation (RAI). Results indicated only a marginal significance between the three groups total scores on self-regulation ($F[2, 41]=2.57$; $p=.089$). Post hoc (Tukey) analysis indicated a marginal difference between the control group and the performance-contingent reward group on self-regulation, RAI ($p=.10$), no difference between the performance and the engagement-contingent reward group ($p=.20$) and no difference between the engagement-contingent reward group and the control group ($p=.92$).

Reward groups, creativity, and functionality. A multivariate analysis of variance (type of reward group x creativity and functionality) was carried out on type of reward group as independent variable and the scores on creativity and functionality as

Table 3. Mean scores and standard deviations of the three groups on the four subscales of self-regulation

Condition	<i>n</i>	External regulation	Introjected regulation	Identified regulation	Integrated regulation
Performance reward group	14				
<i>M</i>		15.85	13,71	16,42	14,71
<i>SD</i>		5.15	4,58	3,73	2,75
Engagement reward group	14				
<i>M</i>		13.85	12,42	17,42	16,07
<i>SD</i>		4.92	5,54	4,66	5,43
Control group	14				
<i>M</i>		15.00	13,57	17,28	18,85
<i>SD</i>		4.15	4,75	3,70	6,43

dependent variables in order to see if the three reward groups differed in creativity and functionality. As hypothesised, there was a significant difference between the three groups on creativity ($F[2,41]=5.48$; $p=.01$) but not for functionality ($F[2, 41]=1.01$; $p=.37$). The highest mean scores in creativity were obtained by participants in the control group, $M=4.47$, followed by participants in the engagement-contingent reward group, $M=4.42$ and finally, $M=3.42$ for participants in the performance-contingent reward group. Post hoc (Tukey) analysis indicated a significant difference between the engagement and the performance-contingent reward group ($p=.02$), a significant difference between the control group and the performance-contingent reward group ($p=.01$) and no difference between the control group and the engagement-contingent reward group ($p=.99$).

Note that the level of creativity was not significantly correlated with the level of functionality: $r=.24$; $p=.12$. This means, for example, that the responses could be highly creative but non-functional or non-creative but highly functional.

Mediation analysis. Self-regulation was thought to act as a mediator between the reward groups and the responses creativity and functionality. In the present study, it was hypothesised that the effects of reward contingencies on the responses creativity and functionality were affected through the process of internalisation. The four subscales of self-regulation were therefore examined in regression analysis for potential mediation roles in reward's impact on creativity and functionality. However, the levels of self-regulation did not predict creativity nor did it predict functionality. Results of the two regression analyses appear in Table 4. It must be noted that a complete mediation analysis investigating the relationships between all the relevant variables was not carried out, partly due to the discouraging results.

Table 4. Summary of regression analysis for variables predicting creativity and functionality

Variable	B	SE B	β
Creativity			
External regulation	-3.19	.043	-.077
Introjected regulation	4.17	.045	.195
Identified regulation	-1.95	.048	-.401
Integrated regulation	-2.33	.039	-.119
Functionality			
External regulation	-3.99	.034	-.219
Introjected regulation	3.02	.037	.172
Identified regulation	-2.91	.039	-.142
Integrated regulation	-2.49	.031	-.016

Notes: B=regression coefficient; SE B=standard error of B; β =standardized regression coefficient. Creativity regressed simultaneously on all regulation coding processes and was non-significant, $R^2=0.03$; $R^2_{adj}=-0.075$, $F(4, 37)=0.288$; $p=0.884$. Functionality regressed simultaneously on all regulation coding processes and was non-significant, $R^2=0.48$, $R^2_{adj}=0.055$, $F(4, 37)=0.464$; $p=0.762$.

Discussion

This study tried to yield information not previously available in the literature on human performance: the first detailed specification of particular self-regulated behaviours that were hypothesised to predict observable creativity in actual products made by participants and the first account in mediating self-regulation on rewards impact on creativity. The method of measuring self-regulation used in this study did not, however, uncover those self-regulated factors that were related to creativity. These self-regulated factors were not found to predict the variance in creativity in regression analyses. This study aimed to contribute to the research in self-regulation in another way as well. Former studies have only investigated the impact of self-regulation in educational settings (Ryan, Connell & Plant, 1990; Sansone & Harackiewicz, 1996; Schiefele, 1991; Vallerand & Bissonette, 1992), while this study is, to our awareness, the only experimental one.

Reward Groups and Self-regulation

The only difference between the three groups on RAI was obtained between the control group and the performance-contingent reward group. There was no difference between the groups on the four subscales of self-regulation except for integrated regulation (external, introjected and identified regulation). There was a marginal difference between the performance-contingent reward group and the control group also on integrated regulation. The regression analyses also indicated a positive effect of introjected regulation on creativity, but not of the other forms of self-regulation. However, the manipulation with reward contingencies to affect the level of self-regulation could have been too weak to be manifested in the AMS measurement. Some theorists have suggested that the undermining effect of rewards on motivation and creativity, this unwillingness or inability to experiment with creative ideas, can be explained by a simple “diffusion of attention” or “competing response” model (Reiss & Sushinsky, 1975). In other words, individuals who are promised a reward are distracted by their excitement about the soon-to-be-delivered effect. However, for methodological reasons, the soon-to-be-delivered effect of rewards was not administered in this study. The participants were instructed that the reward was to be given to them at a following lecture. This could be one potential reason why the three reward groups displayed nearly the same level of self-regulation. Support for validity of the version of the AMS used in this study was acceptable, so the conclusion is therefore taken that the manipulation of rewards could have been too weak to be manifested in the AMS measurement. For instance, lottery tickets, a DVD gift certificate or a gift where the price cannot easily be determined, might have resulted in stronger findings than the pen with the University logo. Still, the results are important as they lean towards an interesting outcome, that is, the marginal difference in integrated regulation between the performance-contingent reward group and the control group.

Creativity

Participants in the control group and the engagement-contingent reward group had significantly higher score in creativity in relation to participants in the performance-contingent reward group. Participants in the control group and the engagement-contingent reward group were, on the other hand, not significantly different in creativity from each other. These findings are supported by the meta-analytic study by Deci et al. (1999). Offering individuals a performance-contingent reward will make the individual less motivated to experiment with creative ideas in relation to individuals who are not offered such a reward. Offering individuals an engagement-contingent reward was found not to undermine motivation and, therefore, participants in the engagement-contingent reward group and the control group should have the same level of motivation to experiment with creative ideas. Some theorists, including Deci and Ryan (e.g. Deci & Ryan, 1996), have also theorised that performance-contingent rewards are more likely to be controlling and affect individuals in a negative way in performance than do engagement-contingent rewards. The results on creativity in the present study yield support for such arguments.

It was hypothesised that the manipulation with rewards would affect the participant's self-regulation, with performance-contingent rewards inducing a lower level of internalisation than engagement-contingent rewards and mediating the level of self-regulation on creativity. Results indicated that no such mediation existed, but it was clear that the participants in the performance-contingent reward group had a lower score in creativity than participants in the engagement-contingent reward group and the control group. If self-regulation didn't mediate the motivational aspects of reward contingencies, what did? It may be explained by a lack of adequate methods to capture the levels of self-regulation and its mediation effect on creativity. It can, however, also be explained by an interference with an unknown dimension.

The Salience of Autonomy as a Mediating Dimension

The unknown dimension could be *autonomy*. Large amounts of research have investigated the impact of reward-contingencies on intrinsic motivation (Deci et al., 1999) and have found an undermining effect on intrinsic motivation by performance-contingent rewards but not by engagement-contingent rewards. Lack of autonomy has been the major explanation (Feist, 1999). In the present study, such an undermining effect caused by performance-contingent reward but not for engagement-contingent reward could have taken place that mediated the effect of motivation on creativity. However, this was not controlled for.

An explanation could be that rewards, unlike experienced success and failure (see Grouzet et al. 2004), have the ability to trigger intrinsic motivation, but not self-regulation. A reason for this could be that self-regulation is dependent to a higher extent on performance feedback. It may also be proposed that psychological factors like *competence* and *relatedness* are produced not to the same extent as

autonomy by the introduction of rewards. Even if we assume that *autonomy* may be a common product of both reward and experienced success/failure, this factor alone may not be forceful enough to set the whole process of self-regulation in motion.

Creativity and Functionality

The main reason to separate the functionality value from the creativity value was to receive a more specific structure of the three groups' self-regulated style and its impact on creativity and functionality. That is, low self-regulated individuals should achieve a low score in creativity and functionality. If the individual didn't care to experiment with creative ideas, the individual should also be more carefree with, for example, time consuming and ethical standards. Creativity and functionality were not significantly correlated with each other, so no such conclusions can be drawn. Further, the four motivational subscales were also found not to predict the proportions of the functionality variance in regression analysis. However, it must be noted that the interjudge reliability concerning both these variables was quite low, which makes it difficult to draw any clear conclusions about their interrelation.

Methodological Implications

Although the way of measuring self-regulation didn't result in the desired outcome, this way of defining and viewing motivation is an important step further in the area of motivation research. For example, if individuals do not experience intrinsic motivation, how can external events, such as rewards, be examined for potential roles in motivation? By measuring how an external event becomes internalised and integrated in the regulatory process, one can understand how the external event is experienced and more importantly, evaluate the potential of the external event as being positive or negative for motivation and performance. Self-regulation is also theorised and empirically supported to consist of four subscales (Vallerand & Bissonnette, 1992) and by assessing those, one can examine different levels of self-regulation and specify their effects on motivation and performance. However, there may be other ways of measuring self-regulation than with questionnaires. One study (Ruscio, Whitney, & Amabile, 1998) used different behavioural coding processes and verbal protocols in assessing different predictors of creativity. Behavioural coding may uncover variables that participants simply cannot report accurately, for any number of reasons (Ericsson & Simon, 1984). Likewise, verbal protocol analysis of concurrent verbalisations can identify thought processes that the participants may hardly have been aware of. Self-regulation could easily be examined in behavioural and verbal protocol analysis, which could provide an alternative way of measuring self-regulation. A structured interview could also have been used as has been demonstrated by Zimmerman and Martinez-Pons (1986).

The method of examining creative performance using the consensual assessment technique is found to be a reliable research tool to any psychological researcher interested in relating social-psychological, personality or other types of variables to actual observable outcomes (Amabile, 1982a, 1996). Not only can the task be designed to match a certain target group, it has also the advantage of measuring real-life performances. It is also worthy of note that, although the use of the consensual assessment technique of studying creative processes or performances does have advantages, there are several limitations as well. Developing creativity tasks is very challenging and time consuming to evaluate. In addition, it may be difficult to apply this assessment technique to products that are at the frontier of a particular domain of endeavour. Consider, for example, revolutionary theories in science. It would be difficult to apply this method to assess the creativity of these products because it is precisely their revolutionary nature that makes it difficult for experts to agree on the level of creativity evident.

For assessing self-regulation, we used a version of the AMS. However, it must be noted that there are alternative scales that also seem appropriate for this purpose. The reason is that, in the present study, the factors that were manipulated (i.e. the reward conditions) were situational, that is, here-and-now, whereas motivation in psychological research may be regarded as more contextual (i.e. a group of situations). The difference between situational and contextual levels is well explained, in, for instance, Vallerand (1997). Most importantly, the use of a state motivation scale may have produced other results. Indeed, while using such a scale, Guay, Vallerand and Blanchard (2000) found negative effects of performance rewards on identified regulation and on intrinsic motivation. Thus, by using a more state-sensitive scale, we could have discovered some significant findings on SDT regulation components. Still, it may be argued that it is difficult to make such propositions by inferring from one single study.

It could also be alleged that the AMS has limitations in assessing the internalisation of rewards. For instance, according to Self-Determination Theory (Deci & Ryan, 1985), the environment in terms of conditions (e.g. a reward) may appear somewhat problematic to internalise. Often, individuals instead internalise the reasons to do a task (or behaviours). Also, integration is a form of internalisation/self-regulation that is difficult to detect at the situational level.

One further observation is that we did not have access to a multiple set of measurement points (pre- and post-test) to verify to what extent the activity conducted under the rewards was integrated or not. In addition, because participants' initial levels of intrinsic motivation towards the task were not assessed, only a partial view could be provided of the internalisation process.

Finally, it must be noted that we used quite a restricted sample of university students in the experiment, which makes it imperative to follow up these preliminary results by additional experiments/field studies. In general, the findings were in the predicted direction, however, they were not significant. The sample was small and, hence, the power relatively low. Thus, the existence of a Type II error cannot completely be ruled out.

Future Research

The main challenge in the area of self-regulation is to develop several instruments to examine different regulational styles. There are several limitations with using pen-and-paper instruments to assess task engagement. By avoiding this, there are many opportunities for future research to build on and expand the findings of the few studies that have examined self-regulation and its determinants. The present study once again showed that by altering external events, such as rewards, to have a controlling and an informational feature, one can expect to find interesting patterns in creative performance. By assessing both self-regulation and the knowledge about the controlling and informational nature of external events, one can break the sets in what predicts creative performance. In the immediate future, there are many opportunities to expand creativity research by applying the latest findings in self-regulation (Ryan, Connell, & Plant, 1990; Schiefele, 1991; Vallerand & Bissonnette, 1992) into new unexplored social-psychological domains. Some theorists (Vallerand & Bissonnette, 1992) have also found it worthy to examine intrinsic motivation along with extrinsic self-regulation and theorise that they could coexist. This may be a fruitful construct to incorporate into future investigations of this kind. Almost every study in the field of motivation has restricted its investigations to intrinsic motivation (Deci & Ryan, 2000).

Finally, if researchers are to better understand the workings of social-psychological processes in creativity and more confidently suggest implications for applied fields such as organisational psychology, the field must move toward drawing such links with real-world performances and real-world outcomes.

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