Research Paper

Investigating the Relationships Between Reinforcement Sensitivity and Positive and Negative Emotion Dysregulation

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ABSTRACT

Objective: The primary purpose of this study was to investigate the relationships between reward and punishment sensitivities and positive and negative emotion regulation strategies among university students.

Methods: A total of 189 students of one of the universities in Tehran City, Iran, were selected by accessible random sampling. Then, the emotion regulation scale, attention control scale, experience questionnaire, emotional regulation questionnaire, positive emotion response questionnaire, and punishment and reward sensitivity questionnaire were distributed among them to collect data. The obtained data were analyzed in SPSS software v. 26 using the Pearson correlation and multiple regression analysis.

Results: The Pearson correlation coefficient showed a significant relationship between punishment and reward sensitivity and positive and negative emotion regulation strategies. Multiple regression analysis showed that sensitivity to reward and punishment could predict positive emotion regulation strategies properly. Multiple regression analysis results indicated that sensitivity to reward and punishment could also predict negative emotion regulation strategies.

Conclusion: Sensitivity to punishment and reward were significant and common factors in emotion regulation. These results show that activation as a technique plays a significant role in the behavior that enhances the individual's search for reward. It suggests that this approach can increase reward-seeking and thus improve emotional regulation.

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Highlights

- Reward sensitivity can lead to Reappraisal Emotion Regulation Strategy;
- Punishment sensitivity can lead to Reappraisal Emotion Regulation Strategy;
- Punishment sensitivity can lead to Attention Emotion Regulation Strategy
- Reward sensitivity can lead to Acceptance Emotion Regulation Strategy;
- Punishment sensitivity can lead to Acceptance Emotion Regulation Strategy;
- Reward sensitivity can lead to Suppression Emotion Regulation Strategy;
- Reward sensitivity can lead to Rumination Emotion Regulation Strategy;
- Punishment sensitivity can lead to Rumination Emotion Regulation Strategy;
- Reward sensitivity can lead to Dampening Emotion Regulation Strategy;
- Punishment sensitivity can lead to Dampening Emotion Regulation Strategy.

Plain Language Summary

The purpose of this study was to investigate relationship between emotion regulation strategies and sensitivity to punishment and reward. This study was performed on 189 students at a university in Tehran. In general, the results showed that the sensitivity to punishment and reward can lead to various emotion regulation strategies, which in this study includes Reappraisal, Attention, Acceptance, Suppression, Rumination, and Dampening.

1. Introduction

Reinforcement sensitivity theory (RST) (Gray, 1987; Gray & McNaughton, 2000; Gray, 1970; McNaughton & Corr, 2004) focuses on the current research and is one of the most influential biological theories of contemporary personality. As a result, research in various fields has expanded to areas other than psychopathology (Corr, 2008). According to the leading theory, processes related to appetite stimuli are controlled by the Behavioral Approach System (BAS), while the response to aversion stimuli is controlled by a separate and independent Behavioral Inhibition System (BIS) (Corr, 2008). Different sensitivities of individuals to BAS and BIS lead to differences in reward processing, punishment processing, and personality. Those with high BAS tend to demonstrate more cognitive and behavioral approaches to reward promotion and the extroversion personality trait (Corr, 2008; Depue & Collins, 1999; Gray, 1987).

On the other hand, more sensitive BIS significantly impacts the behaviors and psychological processes associated with punishment and neurosis (Gray, 1970; Smits & Boeck, 2006). Given the importance of emotion regulation, recent theories emphasize the retention and social functions of emotions, the dynamic model of emotion dysregulation aspects, and multiple biological systems in emotion production (Mennin & Farach, 2007). In various disorders, the emotion dysregulation model of Mennin et al. (Mennin & Farach, 2007; Mennin & Fresco, 2009) and the (Gross & John, 2003) are the most important models that currently explain the role of emotional dysregulation.

Mennin, Heimberg, Turk, and Fresco (2002, 2005) addressed three main factors in their emotion dysregulation model. The first factor is motivational mechanisms, which focus on functional and guiding characteristics of emotional response tendency and consider the intensity of positive and negative emotions and sensitivity to punishment and reward. The second factor is the regulatory mechanisms, which indicate the extent to which negative emotion regulation strategies are used, including adaptive emotion regulation strategies. Regulatory mechanisms

based on adaptive responses are better to fit the needs and limitations of the outside world, considering personal values and goals. A third factor is the implication of contextual learning, which indicates the extent to which flexible and widespread behaviors are promoted.

Dysfunction in these three systems is the underlying factor for developing different emotional symptoms. In other words, this model assumes that people with emotional symptoms may have a motivational maladaptation that exposes them to frequent tension conflicts caused by reward and safety-threat systems. Also, the two systems of sensitivity to reward and punishment have problems in these people, or they have a high intensity of positive and negative emotions. This problem hinders them in resolving these motivational conflicts and causes them to use less developed emotion regulation strategies such as worry and rumination. This model introduces more adaptive strategies (attention, distance, acceptance, and re-evaluation) that replace these non-adaptive strategies. If people with motivational dysfunction do not use these strategies, they will be prone to emotional cues. In other words, people sensitive to high rewards and punishments or imbalances in the motivational system and high intensity of positive and negative emotions use more ineffective or less adaptive emotion regulation strategies. These two factors cause more emotional symptoms in these people.

Emotion regulation strategies, which have been widely studied in the research, are based on negative emotions. However, the response to positive emotion and the importance of this emotional experience has been neglected. The broaden-and-build theory explains that positive emotions expand intellectual resources and reduce persistent emotional responses. So, people can achieve psychological flexibility and emotional well-being. Dampening emotion regulation and rumination emotion regulation are positive emotion regulation strategies related to psychopathology (Abasi et al., 2018). In other words, in addition to negative emotion regulation strategies, positive emotion regulation strategies are assumed to be sensitive to punishment and reward and could predict positive and negative emotion regulation strategies. The present study was the first to investigate the relationship between sensitivity to punishment and sensitivity to reward with positive and negative emotional regulation strategies. The primary purpose of this study was to investigate the relationships between RST characteristics, including sensitivity to punishment and reward and positive emotion regulation strategies, and negative emotion regulation strategies among students.

2. Materials and Methods

The current study was a cross-sectional study. The statistical population of the present study consisted of all 18-year-old and older students studying at one of Tehran Universities. Two hundred students of one of Tehran Universities' students were selected with the convenience sampling method to complete the demographic questionnaire, emotion regulation scale, attention control scale, experiences questionnaire, emotional regulation questionnaire, positive emotion response questionnaire, and punishment sensitivity and reward sensitivity questionnaire. They were also asked to write their e-mails in the questionnaire if they wanted to have the results of the questionnaires. The inclusion criteria consist of students aged 18 and 50 years old, studying at Tehran Universities, and informed consent filling the questionnaires. Distorted questionnaires or incomplete answers to them were also the exclusion criteria. Eleven people did not complete the questionnaire, so they were excluded from the study; finally, the data analysis was performed using 189 people. The obtained data were analyzed by multiple regression analysis.

Study tools

The Social Interaction Anxiety Scale (SIAS)

Mattick and Clarke (1998) developed the social interaction anxiety scale (SIAS). This 20-item self-report scale is scored on a 5-point Likert scale. Its Cronbach alpha coefficient was reported between 0.85 and 0.90, and test-retest reliability was as 0.86 at 2 weeks interval (Mattick & Clarke, 1998). The correlation of this scale with other scales of social interaction fear, avoidance of social situations, and other tools that assess social anxiety has been moderate to high (Rodebaugh, Woods, & Heimberg, 2007). In Iran, the Cronbach alpha coefficient and test-retest reliability have been reported to be 0.90 and 0.79, respectively (Tavoli et al., 2012). This scale was used to measure the severity of social anxiety disorder symptoms. The internal consistency of its Persian version was 0.91. Also, the confirmatory factor analysis showed that the factor structure of this scale is valid (Abasi, Mohammadkhani, et al., 2017).

Emotion Regulation Difficulty Scale

The emotion regulation difficulty scale was developed in 2004 by Gratz & Roemer. This 36-item self-report scale assesses people's emotion regulation patterns and comprises six subscales. These subscales include non-acceptance of emotional responses, difficulties engaging

in goal-directed behavior, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. This scale has good internal consistency (0.93), and the reliability of its subscales using the Cronbach alpha is more than 0.80, which is very suitable for any subscale (Gratz & Roemer, 2004). The psychometric properties of the Persian version are as follows: its reliability was obtained by the Cronbach alpha and split-half methods as 0.86 and 0.80, respectively. Its score was correlated with the score of the Zuckerman emotion questionnaire, and a significant positive correlation was found between them ($P<0.043$ and $r=0.26$, $n=59$). These results indicate that the scale of emotion regulation difficulty is valid. The internal consistency of the acceptance subscale of the Iranian version was 0.85. Confirmatory factor analysis also showed that this subscale has structural validity (Abasi, et al., 2017). The acceptance subscale was used in the current research.

Attention Control Scale

The attention control scale was first developed and used by Derryberry and Reed (2002). It is a 20-item scale. In factor analysis conducted by Derryberry and Reed (2002), three factors were identified: 1) attention change, 2) attention focus, and 3) the ability to thought control flexibility. In this study, the Cronbach alpha was reported to be 0.88 for this scale. Derryberry and Reed (2002) also indicated that attention control is inversely related to state anxiety. In another study, the Cronbach alpha of the whole scale and concentration and attention change subscales were calculated and reported as 0.84, 0.82, and 0.68, respectively (Ólafsson et al., 2011). The reliability values of retesting the subscales of concentration and attention change were 0.80 and 0.76, respectively. This questionnaire was used to evaluate one of the variables of the emotion regulation strategy of a presence called attention control (Abasi, et al., 2017).

Experiences Questionnaire

The experiences questionnaire was developed in 2007 by Fresco et al. (2007). This 20-item self-report questionnaire measures decentering and non-assimilation from negative thinking content as the change process in MBCT. Items are scored on a 5-point scale from 0 (never) to 5 (all the time). This questionnaire included two factors of decentering and rumination, whose internal consistencies were 0.83 and 0.70, respectively, using the Cronbach alpha. Also, this questionnaire had good convergent and divergent correlations in the general and clinical population samples (Fresco et al., 2007). The Cronbach alpha coefficient of the decentering subscale of the Persian version of this questionnaire in the Iranian sample was 0.82. Also, a negative relationship was found between decentering subscale and depression symptoms, rumination, depression, experiential avoidance, and emotion regulation (Taherifar et al., 2016). In this study, decentering subscale (11 questions) was used to evaluate the emotion regulation strategy of decentering.

Emotion Regulation Questionnaire

The emotion regulation questionnaire is a self-report questionnaire and consists of ten items. Gross and John developed the questionnaire in 2003 that measures the two emotion regulation strategies of suppression and reappraisal. The reappraisal subscale consists of six items (for example, I change my emotions by changing the way I think about the situation), and the suppression subscale consists of four items (for example, I do not express negative emotions when I experience them). Participants are asked to rate their answers on a scale of 1 (high disagreement) to 7 (high agreement). This questionnaire showed good internal reliability (reappraisal: 0.79 and suppression: 0.73) and good convergent validity (Gross and John, 2003). In the Italian version of the questionnaire, the internal consistencies for the subscales of reappraisal and suppression were 0.84 and 0.72, respectively. Also, during the 2-month test-retest, the reliability values of the two subscales were reported as 0.67 and 0.71 (Balzarotti et al., 2010). Mahmoud Alilou et al. (2012) reported the Cronbach alpha for the whole questionnaire and the subscales of reappraisal and suppression as 0.71, 0.73, and 0.52, respectively. The reappraisal subscale was used to evaluate the re-framing emotion regulation strategy. The internal consistency of the Persian version of the re-evaluation subscale was 0.81. In addition, the confirmatory factor analysis showed that the one-factor structure of this subscale is valid (Abasi, et al., 2017). The reappraisal subscale is used in the study.

Response to Positive Emotion Questionnaire

Feldman, Joormann, & Johnson (2008) developed the response to positive emotion questionnaire to assess the response to positive emotion. This 17-item questionnaire is scored on a Likert-type scale from 1=rarely to 4= always. In the initial scale, three factors of emotion-based, self-focused emotion, and suppression emotion were obtained, and the internal validity of the three factors were reported to be 0.76, 0.79, and 0.73, respectively. The validity and reliability of this questionnaire in Iran were evaluated by Abasi et al. (2018). The exploratory factor analysis yielded two subscales of rumination on positive emotion

and suppression of positive emotion. Confirmatory factor analysis showed model fit, and the internal validity of the two subscales were 0.87 and 0.77, respectively.

The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ)

Torrubia and Tobeña (1984) first developed the SPSRQ. It measures individual differences in sensitivity to reward and punishment in individuals. It is a 48-item self-report questionnaire. The reporter will get a score between 1 and 2 on each item, and the total score will be between 48 and 96. The Cronbach alpha coefficient of this questionnaire for the subscales of reward sensitivity and punishment sensitivity was reported to be 0.76 and 0.82, respectively. This questionnaire has also reported an agreement coefficient of 81% (Torrubia & Tobeña, 1984). Sajjadi also reported the reliability coefficient of the subscales of punishment sensitivity and reward sensitivity as 0.74 and 0.70, respectively (quoted by Goodarzi and Shameli, 2010). To measure the components of reward sensitivity and punishment sensitivity, the latent variable of motivation was used in this scale. The Iranian version's internal consistency of safety and reward motivation subscales were 0.74 and 0.84, respectively. Confirmatory factor analysis also indicated that the reward and safety subscales are valid (Abasi, et al., 2017).

Study analysis

The Pearson product-moment correlation coefficient and multiple regression analysis were used to analyze the obtained data. We used SPSS software v. 26 to perform the Pearson product-moment correlation coefficient and multiple regression analysis.

3. Results

The study participants were 189 people, including 96 women (50.8%) and 93 men (49.2%). Also, 30 were married (15.9%), and 153 were single (81.0%). The students participating in this study were between 18 and 35 years old, and students with undergraduate education constituted the largest number of study participants. The demographic characteristics of the participants are presented here (Table 2).

The correlation results indicate that reward sensitivity had a significant positive relationship with all emotion

Table 1. The Participants' demographic characteristics

Variables		No. (%)
Sex	Female	96(50.8)
	Male	93(49.2)
	Total	189(100.0)
Marital Status	Single	153(81.0)
	Married	30(15.9)
	Divorced	3(1.6)
	Others	3(1.6)
Age (Y)	>20	15(7.9)
	20-25	119(63.0)
	25-30	52(27.5)
	30-35	3(1.6)
Education Level	Bachelor	92(48.7)
	Master	70(37.0)
	PhD	27(14.3)
	Total	189(100.0)

Table 2. The Correlation Matrix, Mean±SD of research variables (n=189)

Row	Variables	Mean±SD	1	2	3	4	5	6	7
1	Reward sensitivity	11.94±4.59							
2	Punishment sensitivity	11.17±6.23	-0.64**						
3	Reappraisal emotion regulation strategy	25.13±9.03	0.53**	-0.55**					
4	Attention emotion regulation strategy	17.87±8.15	0.70**	-0.57**	0.67**				
5	Acceptance emotion regulation strategy	12.47±4.74	0.61**	-0.51**	0.61**	0.74**			
6	Suppression emotion regulation strategy	11.83±3.41	0.46**	-0.61**	0.43**	0.46**	0.49**		
7	Rumination emotion regulation strategy	11.83±3.24	0.48**	-0.46**	0.57**	0.43**	0.53**	0.70**	
8	Dampening emotion regulation strategy	17.61±6.23	0.65**	-0.49**	0.56**	0.70**	0.58**	0.48 **	0.49 **

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regulation strategies (Table 2). Sensitivity to punishment also had a negative and significant relationship with all emotional regulation strategies.

After examining the relationships between variables, punishment sensitivity and reward sensitivity regressed on negative emotion regulation strategies, including reappraisal emotion regulation strategy, attention emotion regulation strategy, acceptance emotion regulation strategy, and suppression emotion regulation strategy separately to figure out what percentage of the variance these two components explain. The results showed that the sensitivity to punishment and reward explained 35%, 37%, 26%, and 43% of the variance of reappraisal emotion regulation strategy, attention emotion regulation strategy, acceptance emotion regulation strategy, and suppression emotion regulation strategy, respectively. Both punishment sensitivity and reward sensitivity components had predictive power in the reappraisal and acceptance of emotion regulation strategy. However, in the attention emotion regulation strategy, only the sensitivity to punishment, and in the suppression emotion regula-

Table 3. Results of regression of punishment and reward sensitivity on negative emotions regulation strategies

Variables		B	S.E.	β	t	Sig.	F	Sig.	R	R^2	Adjusted R^2
	Constant	23.60	2.84		8.32	0.001					
Reappraisal	Reward sensitivity	0.60	0.15	0.31	3.96	0.001	50.69	0.001	0.59	0.35	0.35
	Punishment sensitivity	-0.51	0.11	-0.35	-4.52	0.001					
	Constant	13.96	1.05		13.30	0.001					
Attention	Reward sensitivity	0.09	0.06	0.12	1.63	0.10	56.34	0.001	0.61	0.38	0.37
	Punishment sensitivity	-0.29	0.04	-0.53	-6.96	0.001					
	Constant	10.67	1.08		9.88	0.001					
Acceptance	Reward sensitivity	0.22	0.06	0.31	3.83	0.001	34.14	0.001	0.52	0.27	0.26
	Punishment sensitivity	-0.13	0.04	-0.26	-3.13	0.001					
	Constant	9.69	1.83		5.31	0.001					
Suppression	Reward sensitivity	0.78	0.10	0.57	7.97	0.001	71.81	0.001	0.66	0.44	0.43
	Punishment sensitivity	-0.12	0.07	-0.12	-1.70	0.09					

PRACTICE in CLINICAL PSYCHOLOGY

Table 4. Results of regression of punishment and reward sensitivity on positive emotion regulation strategies

Variables		B	S.E.	β	t	Sig.	F	Sig.	R	R^2	Adjusted R^2
Rumination	Constant	8.76	2.20		3.99	0.001					
	Reward sensitivity	1.02	0.12	0.57	8.63	0.001	101.72	0.001	0.72	0.52	0.52
	Punishment sensitivity	-0.27	0.09	-0.21	-3.11	0.001					
Dampening	Constant	8.17	1.43		5.70	0.001					
	Reward sensitivity	0.50	0.08	0.49	6.54	0.001	62.01	0.001	0.63	0.40	0.39
	Punishment sensitivity	-0.15	0.06	-0.20	-2.67	0.01					

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tion strategy, only the sensitivity to the reward of predictive had the predictive power. In general, sensitivity to reward and sensitivity to punishment can be good predictors of negative emotion regulation strategies (Table 3).

Sensitivity to reward and sensitivity to punishment were also regressed on positive emotion regulation strategies, including rumination and dampening emotion regulation strategies. The results showed that the sensitivity to punishment and reward explains 52% of the variance of the rumination and 39% of the variance of the dampening emotion regulation strategy (Table 4). In general, the sensitivity to punishment and sensitivity to reward can predict positive emotion regulation strategies.

4. Discussion

The results showed that sensitivity to punishment and sensitivity to reward could predict negative emotion regulation strategies, including reappraisal, attention, acceptance, and suppression emotion regulation strategy, and positive emotion regulation strategies, including rumination and dampening emotion regulation strategy. The study findings are consistent with the findings of Abasi, Pourshahbaz, Mohammadkhani and Dolatshahi (2017), Aghajani et al. (2021), Kelley et al. (2019), Voigt et al. (2009), and Leone and Russo (2009) and show that sensitivity to punishment and reward have a significant relationship with emotional regulation strategies.

Trew (2011) stated that BAS (equivalent to reward sensitivity and reinforcement) is associated with positive emotions, so it plays a significant role in the etiology of depression. In other words, a low BAS leads to a lack of activation and activity orientation, resulting in a decrease in the experience of positive experiences. Consistent with the present study, Wytykowska, Fajkowska, and Domaradzka (2021) found that ruminant strategies and positive reappraisal mediate the relationship between sensitivity to punishment and negative emotion. People who experience negative emotions (such as depression and anxiety) have difficulty breaking away from these negative emotions and engaging in mood change strategies (Rottenberg & Bylsma, 2014). Also, Hasking (2006) showed that coping strategies could mediate the relationship between punishment sensitivity and eating disorders. Hundt et al. (2013) concluded that avoidance and emotion-focused strategies mediate between sensitivity to punishment and depression, anxiety, and worry. People with high sensitivity to punishment seem to have bigger problems regulating negative emotions (Tull et al., 2010), leading to more ineffective avoidance and emotional strategies than effective strategies such as problem-based strategies like reappraisal, attention, acceptance and distancing emotion regulation strategies. These findings are consistent with the reinforcement sensitivity theory (RST) model, which states that people sensitive to punishment focus on the negative, threatening, and punitive aspects. This constant focus on punishment causes the person to frequently resort to emotion-reducing strategies to reduce them.

On the other hand, Hundt et al. (2013) stated that reward-sensitive individuals impulsively use a variety of emotion regulation strategies, so when they use emotion-focused strategies and experience their short-term and beneficial effects, they continue to use them. However, they also experience long-term adverse consequences, such as negative emotions. On the other hand, the study of Izadpanah and Ghafournia (2016) on German adolescents showed that high BAS (of course, if the BIS is low) is associated with more effective emotion regulation strategies, and individuals can regulate their emotions better. In addition, the Sun et al. (2020) study, like the present study, suggests that adaptive strategies are mediators of emotion regulation between BAS and depression and anxiety. It can be

mentioned that the search for rewards associated with high mood leads to more efficient emotional management to achieve goals. Conversely, as mentioned, sensitivity to punishment is associated with a negative mood, which decreases the ability to regulate emotion in response to threats (Izadpanah & Ghafournia, 2016).

Finally, O'Connor et al. (2014) study shows that high threat sensitivity and low reward sensitivity are associated with social anxiety and that low use of effective emotion regulation strategies such as reappraisal mediates this relationship. They mentioned that inactivity of the BAS system decreases the search for social rewards, so the person uses fewer effective strategies in dealing with social environments and does not feel comfortable in social interactions, and is anxious. Overall, these findings support the approach that cognitive processes are an essential mediator in the relationship between RST characteristics and the development of psychopathology (Gomez & Cooper, 2008; O'Connor et al., 2014).

5. Conclusion

Our results suggest that sensitivity to punishment and reward are both significant and common factors for positive and negative emotion regulation strategies. These results show that activation as a technique plays a significant role in the behavior that enhances the individual's search for reward, suggesting that this approach can increase reward-seeking and thus improve emotional regulation.

The results of the present study should be considered along with its limitations. The first limitation of the present study is the cross-sectional nature of the research method. Longitudinal research is vital because previous longitudinal studies have yielded different results than cross-sectional studies. The second limitation of the present study is the sample group that only allows the generalization of the study's results to the student community. We suggest that further research use other healthy examples such as adults, the elderly, or patients such as major depression, generalized anxiety disorder, or eating disorders. A third limitation of this study was the nature of its self-report data. So, we recommend that future research use structured interviews.

Ethical Considerations

Compliance with ethical guidelines

There was no ethical consideration to be considered in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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