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ATTENTIONAL BIAS AS COPING MECHANISM FOR PSYCHOLOGICAL NEED
FRUSTRATION: AN ATTEMPT TO IDENTIFY THE RESTORATION AND
COMPENSATION PROCESS

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Abstract

The literature of the self-determination theory assumes that a need-thwarting situation provoke the individual to restore need satisfaction by a defensive mechanism. Although studies have found affective and behavioral aspects of this mechanism, evidence for its cognitive functionality is still limited. We hypothized an attentional bias for autonomy-related words in an Emotional Stroop task when participants experience autonomy-frustration. In addition, we expected a moderating effect of the degree in which participants have been experiencing need satisfaction versus frustration in their life. In a sample of 45 students, 30 participants were able to choose between three music tasks and 15 participants were used as control condition. The experimenter confirmed the choice of 15 participants, while the other 15 participants were obligated to do another music task. In this balanced between subject-design, the current study could not find significant evidence for the hypotheses. The results and future research are discussed.

Keywords: emotional Stroop task, need for autonomy, restoration process, compensation process

The human behavior is a fundamental notion in the field of psychology. In different domains, many authors have been trying to define and interpret the underlying processes by which people behave. For example, several studies declare different behaviors, like avoidance and social interaction, by cognitive biases (e.g. Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Ijzendoorn, 2007; Dardenne & Leyens, 1995). Others have been focusing on the causing of behaviors by environmental influences, like rewards or punishments (e.g. Skinner, 1953). In addition, Deci and Ryan presented in the Self-Determination Theory (SDT; Deci & Ryan, 1980, 1985, 2000, 2002) the concept of motivation by which individuals are *moved* to behave. In contrast with the behaviorism of Skinner (1953), the SDT acknowledges that the individual is able to reward itself when the psychological needs for autonomy, competence and relatedness are supported (Deci, 1972, Deci & Ryan, 1985). This self-rewarding behavior can be translated as intrinsically motivated behavior in which people feel enjoyment and interest for the performing task (deCharms, 1968; White, 1959; Deci & Ryan, 1985, 2000). A well-known operationalization of autonomy-support is the provision of choice (e.g. Schraw, Flowerday, & Reisetter, 1998; Zuckerman, Porac, Lathin, Smith, & Deci, 1978; Swann & Pittman, 1977). In terms of the SDT, the provision of choice implies an opportunity for the individual to match one option with their internal values and interests. Otherwise, when this choice is deprived, people experience a threat of their need for autonomy. In this situation, participants report less interest (Cordova & Lepper, 1996; Iyengar & Lepper, 1999) and spend less time on the task (Zuckerman, Porac, Lathin, Smith, & Deci, 1978). Although many studies have examined the outcomes of need-thwarting conditions (e.g. choice deprivation), there is still a lack of research on the human behavior during and after such an experience.

The assumptions of the current study are based on the concept of organismic integration (Deci & Ryan, 1985). People have an inherent proactive tendency to behave and to explore the environment. This behavior is intrinsically motivated and nurtured by the psychological needs. It is expected that a frustration of these needs disrupts this natural integration process, by which it will strengthen, rather than extinguish. People experience more energetic motivation to behave in line with the inherent interests and, therefore, in line with need satisfaction. A few studies found evidence for this idea. They found an affective (Gunz, 2008) and behavioral (Sheldon, Abad, & Hinsch, 2011) movement of participants in favor of restoring the undermined psychological need. Only one study found evidence for a cognitive aspect of this restorative movement (Radel, Pelletier, Sarrzin, & Milyavskaya, 2011). Participants who experienced deadlines and controlling language (i.e. autonomy thwarting conditions) showed faster reaction times for autonomy-related words in comparison to neutral words in a lexical

decision task. Due to this lack of cognitive research in the context of the SDT, the goal of the current study is to examine this enhanced active tendency in terms of a cognitive attentional bias.

The Restoration and Compensation Process

Based on the current literature (e.g. Deci & Ryan, 1985; Radel et al., 2011) and the General Adaptation Syndrome model of Seyle (GAS; 1946), we describe two aspects of the coping mechanism in favor of restoring need satisfaction.

The first, the *restoration process*, refers to the natural process of *fight or flight* in which people react defensively at the moment of need frustration. It is a dynamic, proactive and energetic mechanism in favor of restoring the earlier level of need experience. The individual refuses to adapt his feelings to the environmental occurings, but copes with the need frustration by restoring it. For example, defensive and vigilant participants were positively linked with non-autonomous motivation (Hodgins, Yacko, & Gottlieb, 2006). One feature of this 'alarm reaction' (Seyle, 1946) is the increasing accessibility and salient level of stimuli (Radel et al., 2011). The individual is able to focus and to select need-relevant sources in the environment (Strack & Deutsch, 2004; Bruner, 1957). For example, participants in a negative stress condition were more likely and faster to select positive and neutral words in comparison to negative words (e.g. Ellenbogen, Schwartzman, Stewart, & Walker, 2002). In terms of the SDT, a need-thwarting condition curtails individual's behavior to explore and to integrate internal and external values (e.g. Reeve & Hamm, 1999; Deci et al., 1984). For example, autonomy-related cues will be favored, while controlling-related stimuli will be declined.

The second, the *compensation process*, refers to a mechanism by which the individual has end up in a cycle of experiences of need frustration. The natural tendency that supports intrinsic motivation has been undermined chronically, without the chance to restore need satisfaction. At this point, the support of psychological needs has been translated by an ongoing need-thwarting condition. In contrast with the restoration process, the individual is exhausted and has been adapting its feelings to the experiences (Seyle, 1946). Seyle (1946) assumed a progressive adaptation in which the individual learns to deal with the current situations and actually revalue the intrinsic interests and feelings. Deci (1980) called this revalued feelings 'need substitutes' to compensate the earlier feelings of need satisfaction (Deci & Ryan, 2000; Ryan, Sheldon, Deci, & Kasser, 2004). For example, children who grew up in an autonomy-undermining family are focused on extrinsic aspirations (i.e. richness, physical looks, materials), while children of an autonomy-supportive family have more likely intrinsic

aspirations (i.e. personal growth, warmth and belongingness) (Williams, Cox, Hedberg, & Deci, 2000). In addition, this stronger accessibility for extrinsic values requires a lot more energy because the underlying motivation of behavior does not match the individual's inherent nature. In case of the restoration process, the accessibility for intrinsic values requires less energy because it occurs naturally and autonomous (e.g. Moller, Deci, & Ryan, 2006; Knee & Neighbors, 2002).

Based on this literature, the current study attempts to examine the cognitive construct of attentional bias within the framework of both processes. First, we have to separate both processes by determining the overall need satisfaction versus frustration of individuals in their lifespan. It is assumed that individuals who experienced less need frustration in their life, will react more defensively to a need-thwarting condition. Therefore, we expect an attentional bias for autonomy-related cues (e.g. the word 'choice'). Second, we have to set up a design in which we can manipulate experimentally the need for autonomy and use an experimental paradigm to measure the attentional bias for different cues. One task that meets with these requirements is the emotional Stroop task (e.g. Mathews & Macleod, 1985; Strauss, Allen, Jorgensen, Cramer, 2005).

The Emotional Stroop task

The emotional Stroop task is a cognitive paradigm in which participants are instructed to name the color of the ink in which the word is presented. This cognitive paradigm is a variation on the classic Stroop task (Stroop, 1935) and has been correlated with other cognitive tasks, like the dot probe task (Mikolajczak et al., 2009) and visual search task (Matthews et al., 2008). The classic Stroop effect (Stroop 1935) is the interference of reading the word and naming the ink color, by which incongruent stimuli are named slower (e.g. the word *red* printed in the color blue) than congruent stimuli (e.g. the word *red* printed in the color red). Although, the emotional Stroopeffect (ESE) does not require such control processes for congruency conflict between the word and the ink color. The ESE refers to an interference of emotional information between task-relevant stimuli (ink color) and task-irrelevant stimuli (words) (Williams, Mathews, &MacLeod, 1996; Austin, 2005). The effect concepts the slowdown in color naming performance of emotional words (e.g. the word *murder* printed in the color blue), in comparison to the color naming of neutral words (e.g. the word *shoe* printed in the color red) (e.g. Mathews & MacLeod, 1985, Perez-Edgar & Fox, 2003, Algom, Lev, & Chajut, 2004). This slowdown has been interpreted as the result of automatic activation of emotional information during reading (Bargh, 1992; Logan, 1978; Algom & Pansky, 1996). During reading, processes of

attention are saved for perception of specific cues (Shalev & Algom, 2000). For example, the perception of autonomy satisfying versus autonomy controlling cues.

As assumed by the current study, both restoration and compensation processes imply inter-individual differences among participants. The need satisfaction versus frustration during the lifespan is expected to be a moderating effect within the attentional bias. In terms of the emotional Stroop task, several studies provided empirical evidence for such inter-individual differences. For example, Mogg and Marden (1990) found a moderating effect of semantics, rather than the categorization of 'positive' and 'negative' words. The way in which participants interpret words as more positive or negative played a significant role in their performance. In other words, the personal association with a specific word interferes with the automatic process of reading and the rational process of color naming. In the study of Riemann and McNally (1995), participants had to rate different words in terms of personal commitment ("How important is this word for you?") (Klinger, 1987). The results showed that words with a stronger personal importance showed a stronger ESE. In terms of the current article, autonomy-related words could imply a stronger personal importance for individuals who want to repair their need satisfaction, while controlling-related words will be more important for individuals who want to compensate this need satisfaction.

The Study

In general, the current article questions the impact of need frustration on the aching for need satisfaction and attempts to identify the cognitive aspect of how individuals handle with this experience. The hypotheses are based on the current level of need satisfaction and frustration during the lifespan and the desire for more need satisfaction or less need frustration. We hypothize that participants in the autonomy-thwarting condition have longer reaction times (i.e. attentional bias) for autonomy-related words. In addition, we predict a moderating effect of need satisfaction versus frustration during the lifespan. When participants report higher need frustration, they are expected to have longer reaction times for controlling-related words. Participants who report higher need satisfaction are expected to have longer reaction times for autonomy-related words.

The Pilot Study

The current study provides the deprivation versus provision of choice as operationalized manipulation of the need for autonomy. The meta-analysis of Patall, Cooper and Robinson

(2008) concludes three options as most effective to support individuals' autonomy. To maintain the participant's intrinsic motivation, the current study had to find three activities that will be experienced as equally joyful (i.e. need for autonomy) and challenging (i.e. need for competence). Therefore, we examined a list of activities using a pilot study.

Methods

Participants.   We collected data from 48 undergraduate psychology students recruited the University of Ghent.

Procedure. At the beginning of a college, all students in the auditorium were invited to complete a short online questionnaire in which ten different activities were described. Participants were asked to rate the degree of *attractiveness* and *challenging* on a 5-point Likert scale, ranging from 1 (*totally not attractive* and *very boring*) to 5 (*very attractive* and *too challenging*). At the end of the questionnaire, participants had to choose one of the ten activities, which they rated as the most attractive and less attractive one.

Table 1

Frequency of means attractiveness and challenging of activities in Pilot Study

Activity	Mean attract	Means chall	The most attractive	The least attractive
1. Video clips	3.79	2.46	0	8.3
2. Picture mix	4.02	3.54	8.3	4.2
3. Picture history	3.65	3.83	0	16.7
4. Label recognition	3.94	3.65	18.8	0
5. Child pictures	3.67	3.65	4.2	2.1
6. Fragments	3.79	3.52	20.8	2.1
7. Short fragments	4.06	3.69	20.8	0
8. Applications	3.19	3.58	0	29.2
9. Album covers	3.62	3.85	8.3	10.4
10. Fluent speech	3.52	3.90	18.8	27.3

Note. *attract* = attractiveness; *chall* = challenging. Results of *the most attractive* and *the least attractive* are in percent (%).

Results and Discussion. The frequency table (table 1) shows the means for both attractiveness and challenging rates. The right columns show the percent of participants that reported the activity as the most and least attractive activity. More participants rated activities 1, 3, 8, 9 and

10 as the least attractive one, compared to the percentage of participants who rated these activities as the most attractive one. Activities 4, 6 and 7 are rated the most attractive ones by the highest percentages of participants in comparison to activities 2 and 5. For these activities, we have tested differences between the individual *attractiveness* and *challenging* scores. Using a Related-Samples Friedman's Two-Way Analysis of Variance by Ranks test, we retained the null hypothesis for *attractiveness* (p = .31) and *challenging* (p = .75). This means that activities 4, 6 and 7 have the same distributions (means inclusive). We conclude the activities 'Label Recognition', 'Fragments' and 'Short Fragments' as sufficient joyful and challenging activities for the current experiment.

The Main Experiment

Participants. Participants were 6 male and 39 female undergraduates, registered in psychology at the University of Ghent. They had a mean age of 18.76 years (*SD* = 1.33; range: 18 – 24). Their participation yields a credit toward the completion of an introductory psychology course. The current study has a balanced between-subject design in which participants were divided over three conditions: *frustration, satisfaction* and *neutral* (N = 15).

Measures

Personality. Participants had to complete a digital questionnaire for receiving an authorization code. This questionnaire contained a shortened version of the Big-Five Factor Markers of the International Personality Item Pool, based on Goldberg (1992). Participants had to rate twenty-five statements using a 5-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strong agree). Because this was only used in favor of the credibility of the manipulation, the results are not used for data-analysis.

Psychological need satisfaction. The questionnaires contained the Basic Psychological Needs Scale (BPNS; Chen et al., 2015) to measure satisfaction versus frustration of the participant's basic psychological needs. In the first questionnaire, participants were asked to match a list of statements with their experiences of life. The list consists of 24 items, with 8 items referring to the need for autonomy (e.g. "I feel like my choices reflect who I really am"), 8 items referring to the need for competence (e.g. "I feel capable in the things I do"), and 8 items referring to the need for relatedness (e.g. "I feel the people I care about, also care about me"). For every psychological need, 4 items were used to measure need frustration and 4 items were used to

measure need satisfaction. The second questionnaire measures participants' feelings of need satisfaction versus frustration after the manipulation. Because we emphasize the need for autonomy and competence in our manipulation, the need for relatedness was not included. The list consists of 8 items, with 2 items referring to need frustration and 2 items referring to need satisfaction. All items in the questionnaire were rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In the current study, Cronbach's alpha was .41 for the total score of psychological need satisfaction in the first questionnaire. In the second questionnaire, Cronbach's alpha was -.339.

Intrinsic Motivation. A validated instrument (McAuley, Duncan, & Tammen, 1989) to measure the impact of the manipulation between conditions is the Intrinsic Motivation Inventory (IMI; Ryan, 1982). The instrument is administered to assess intrinsic motivation and other motivation-related constructs (Ryan, 1982). The second questionnaire contains 27 items, divided into six subscales: interest/enjoyment of the task (6 items) (e.g. "I enjoyed doing the music task very much"), perceived pressure/tension during the task (4 items) (e.g. "I feel pressured while performing the music task"), perceived competence for the task (6 items) (e.g. "I did the music task very well"), perceived feeling of choice while performing the activity (6 items) (e.g. "It was my own choice to do the music task"), perceived internal locus of causality (2 items) (e.g. "I felt a personal importance for doing the music task"), and the feeling of volition while performing the activity (3 items) (e.g. "While I was performing the music task, I felt relaxed"). All items of the questionnaire were rated on a 5-point scale, ranging from 1 (*not true at all*) to 5 (*very true*). For the total score of Intrinsic Motivation, Cronbach's alpha was .48.

Need desire. In the second questionnaire, participants were asked to report how strong they desire to experience less need frustration and more need satisfaction (Chen et al., 2015). It contains 16 items, 4 items referring to the desire for more autonomy satisfaction (e.g. "At this moment, I desire to feel a sense of choice and freedom in the things I undertake"), 4 items referring to the desire for more competence satisfaction (e.g. "I desire to feel that I'm capable at what I do"), 4 items referring to the desire for less autonomy frustration (e.g. I desire to feel less dictated to perform activities I should not choose"), and 4 items referring to the desire for less competence frustration (e.g. "I desire to feel less uncertain about my capacities"). This instrument provides the opportunity to reflect the reaction times toward certain stimuli with the conscious experience of the need frustration and the additional desires. All items of the questionnaire were rated on a 5-point scale, ranging from 1 (*not true at all*) to 5 (*very true*). In the current study, Cronbach's alpha was .87 for the total score of Need desire.

Emotional Stroop task. The emotional stimuli are selected from several studies and hence validated (e.g. Radel et al., 2011; Vansteenkiste & Ryan, 2013). They contained five categories: neutral, positive, negative, autonomy satisfaction and autonomy frustration (Appendix 1). All categories were balanced (N = 12 items) and matched in word type (1 verb, 8 adjectives, 3 nouns). Every stimulus (i.e., a particular word in a particular ink color) was presented in each color (red, green, blue, yellow). Therefore, the complete task consisted of 480 trials (5 categories x 12 items x 4 colors x 2 blocks). The task is displayed on a 13-inch screen. The responses were given on a keyboard and were counterbalanced. 23 participants used the buttons S (red), D (yellow), J (blue) and K (green), 22 participants used the buttons S (blue), D (green), J (red) and K (yellow). Each trial (Figure 1) consisted of a fixation cross ("+") presented for 300 ms, followed by a stimulus. The maximum time for a response was 2000 ms. Each stimulus was presented visible for 1000 ms, followed by a blank screen for 1000ms. From the moment a response was given, the task switched to the intertrial interval. When there was no response given after 2000 ms, a message was presented the participants were too late. At last, the intertrial interval was randomly between 600 and 1000 ms, to avoid a stable rhythm and to maintain the participant's attention. Participants first completed a training block of 20 trials in which colored sequences of X (e.g. XXXXX) were presented randomly. Afterwards, instructions on the screen introduced the real task and repeated the keyboard instructions. The task contained 12 breaks (between 40 items) in which the keyboard instructions were repeatedly presented. Using the space bar, participants were able to continue. Because the emotional word and the ink color of the stimulus cannot be congruent, we measure the attentional bias of the presented word and not the congruence or incongruence effects in the task. The performance score is based on the correspondence between the expected and the given response (1 = correct, 0 = incorrect).

Figure 1

Overview progress of a trial in time (ms)
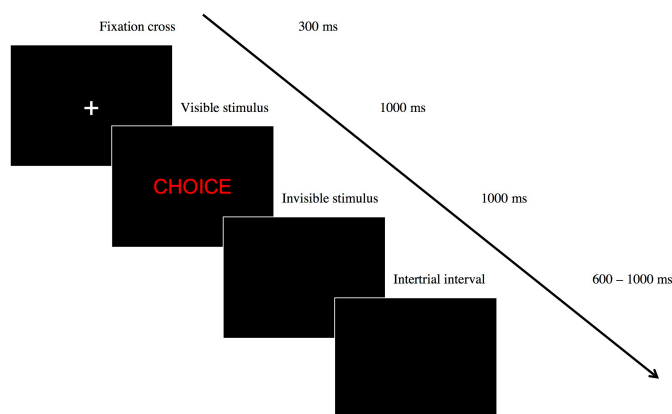
Note. From the moment the response was given, the trial moved over to the intertrial interval.

Procedure

Participants could sign up for an experiment in the context of 'music psychology'. An authorization code was sent after competing an online personality questionnaire. At the day of the experiment, participants were individually invited to come into the laboratory. The participant was introduced to the session in which he/she will complete two questionnaires, a computer task and a music task. Next, participants were given a wrong idea of which effect will be measured in the current study. They were told that the goal of the experiment was to clarify the link between certain cognitive processes and the perception of music, and identify the moderating role of the person's personality. We used this deception in favor of the experimental manipulation.

Participants in the *frustration* condition were introduced to the activities out of the pilot study. Using a choosing form, they were able to choose which music task they would like to do. Next, they were instructed to the first questionnaire, followed by the Emotional Stroop task. The participant was seated in front of the computer screen and keyboard. Before starting the computer task, the experimenter explained he has been analyzing the results of the previous online personality questionnaire while the participant was completing the first questionnaire. He explained that it would be better to do another music task instead of the one that was chosen at the beginning of the experiment. After that, the experimenter instructed the computer task.

The same procedure was used for participants in the *satisfaction* condition. Before the computer task, the experimenter told that some of the participants will be able to do their choice and others will not, based on the online personality test. In their case, it was no problem at all to do the music task the participant has chosen. After that, the experimenter instructed the computer task.

In the *neutral* condition, participants were instructed to the computer task. There was no opportunity to choose and there was no referring to the online questionnaire.
Participants had to complete the Emotional Stroop task. They were informed to report the correct ink color of the presented word using the keyboard. Positions of the fingers for the buttons S, D, K, L were proposed in the computer task and separated printed-paper. After the instructions, each participant completed the training phase, followed by the experimental phase. When the participant reported to be ready, they were asked to seat before a separated screen. The experimenter took place behind the computer to guide the music task. All three music tasks (*label recognition*, *fragments, short fragments*) were programmed in Microsoft Powerpoint. In the task *Label recognition*, the participant had to guess the incomplete logo that was presented on the screen. In *Short fragments*, the participant was asked to guess the song out of which the

short fragment was taken. If they could not guess the 0.5 sec fragment, they had the possibility to hear 1 second of the song. In the task *Fragments,* participants heard 15 fragments of music for 25 sec. They had to describe the fragment's mood, the name of the genre, a well-known instrument and a given color. At least, the participant had to complete the second questionnaire. At the end of the experiment, a feedback was given about the real purpose of the experiment. Not the music task but the computer task was used to measure reaction times on different stimuli, after provision or deprivation of choice. Participants were thanked for their participation and received a credit.

Results

We hypothized that a manipulation of the need for autonomy (choice provision versus choice deprivation) would result in an attentional bias for different kind of stimuli. Specifically, we expected a moderating effect of the need satisfaction during the lifespan. On the one hand, we predicted a stronger attentional bias for autonomy-related words when individuals experience need satisfaction in the lifespan. On the other hand, we expect that the manipulation results in a stronger desire to experience less need frustration and more need satisfaction. At least, the effect on the intrinsic motivation of participant is used as a manipulation check.

Preliminary analyses

Background characteristics. First, we examined differences in the background variables of the participants between the different conditions. Using t-tests, we found no significant differences between conditions for gender, age, pre-autonomy satisfaction and frustration, pre-relatedness satisfaction and frustration, pre-competence frustration and pre-need satisfaction and frustration (i.e. *pre*-manipulation). There was significantly more preference in the satisfaction condition (M = 4.08, SD = .56) in comparison to the neutral condition (M = 3.65, SD = .78), t (28) = 1.75, $p <$ *0.10,* and the frustration conditions (M = 2.93, SD = .72), t (28) = 4.88, $p < 0.05$. In addition, participants in the neural condition had more preference than participants in the frustration condition, t (28) = - 2.60, $p < 0.05$. Further analyses were controlled for variable *preference*. There was also significantly more pre-competence satisfaction in the frustration condition (M = 3.83, SD = .48) than in the satisfaction condition (M = 3.32, SD = .56), t (28) = 2.71, $p < 0.05$.

Correlation analyses. Descriptive statistics and correlations for each variable of the first questionnaire (i.e. pre-manipulation) are presented in table 2. The correlations provide

preliminary support for need satisfaction and need frustration. The satisfaction of the psychological needs is negatively associated with their frustration. In line with the literature of the SDT, the correlations also provide evidence for the coherence between the three psychological needs. For example, the satisfaction of the need for autonomy is positively associated with the total need satisfaction.

Table 2

Descriptive statistics and Pearson correlations for pre-measured variables

	M	*SD*	AS	AF	BS	BF	CS	CF	NS	NF
AS	3.83	.45	-							
AF	2.24	.73	-.18	-						
BS	4.19	.62	.44**	-.25	-					
BF	1.69	.67	-.37*	.24	-.67**	-				
CS	3.58	.60	.49**	-.22	.36*	-.61**	-			
CF	2.54	.78	-.17	.44**	-.34*	.54**	-.67**	-		
NS	3.87	.43	.77	-.28	.79**	-.73**	.80**	-.52**	-	
NF	2.16	.57	-.30*	.73**	-.52**	.74**	-.64**	.86**	-.64**	-
Pref	3.56	.83	.21	.12	.02	-.10	-.13	.20	.02	.11

Note. AS = pre- autonomy satisfaction; AF= pre-autonomy frustration; BS= pre-relatedness satisfaction; BF= pre-relatedness frustration; CS= pre-competence satisfaction; CF= pre-competence frustration; NS= pre-need satisfaction; NF = pre-need frustration; Pref = preferences.

* $p < .05$.   ** $p < .01$

Main analyses

Task motivation. Based on the literature, an autonomy-supportive versus autonomy-thwarting condition result in respectively an increased versus decreased intrinsic motivation. To check the current manipulation, we analyzed the participants' intrinsic motivation and five other motivation-related constructs. This check is important for verifying the effects of choice manipulation on a possible attentional bias for specific stimuli. Although we observe a trend, results suggested that both satisfaction (*M*= 4.22; *SD*= .42) and frustration (*M*= 4.09; *SD*= .38) condition do not significantly differ from the neutral condition (*M*= 4.07; *SD*= .62) in scores for *pleasure/enjoyment* (F (2, 39) = 0.159, $p < .05$). This indicates no effect of the manipulation in scores for intrinsic motivation. There was only one significant main effect found for the motivational construct *perceived choice*. Autonomy-supported participants reported a higher perceived choice (*M*= 4.48; *SD*= .42) in comparison to neutral (*M*= 3.21; *SD*= .82) and

autonomy-frustrated participants (*M*= 3.10; *SD*= 1.00) (F (2, 39)= 4.24, *p > .01*). This effect of *perceived choice* result in overall significant differences between conditions on the IMI (Wilks's λ = .49), F (12, 68) = 2.46, *p < .01*). No significant interaction effects were found. In addition to the differences between conditions, the same results were analyzed for the different music activities. In line with the pilot study, the activities do not significantly differ in *pleasure/enjoyment* (*M*= 4.13; *SD*= .48) (F (2, 42) = 2.02, *p > .05*) and *competence* (*M*= 3.42; *SD*= .77) (F (2, 42) = 2.44, *p > .05*). In general, the results suggest significantly differences between the different activities on the IMI (Wilks's λ = .73), F (12, 74) = 1.04, *p > .05*).

Need satisfaction versus frustration. In line with the IMI, the results of the experienced post-need satisfaction versus frustration confirmed no effect of the manipulation. Neither the conditions (Wilks's λ = .81), F (8, 72) = .98, p > .05) nor the activities (Wilks's λ = .74), F (8, 78) = 1.58, p > .05) differ in experienced autonomy and competence frustration versus satisfaction after choice provision or deprivation. Also, no significant interaction effects were found.

Need desire. Our hypothesis predicted that the degree in which participants' experienced pre-need frustration versus satisfaction (i.e. during the lifespan) has a moderating effect in the experience of post-need frustration (i.e. after manipulation). We performed linear regression analysis to examine the effects of condition (choice provision versus deprivation), need satisfaction (pre AS, pre AF, pre BS, pre BF, pre CS, pre CF, pre NS, pre NF) and need desire (more autonomy and competence satisfaction, less autonomy and competence frustration). Participants who reported more autonomy frustration during their life reported more desire for *more competence satisfaction* (F (2, 42)= 4.04, *p < .05*), *less autonomy frustration* (F (2,42)= 7.47, *p < .001*) and *less competence frustration* (F (2,42)= 4.44, *p < .05*). In addition, participants who reported more competence frustration during their life reported more desire for *less autonomy frustration* (F (2,42)= 4.46, *p < .001*) and *less competence frustration* (F (2,42)= 8.08, *p < .001*). In contrast, when participants reported more competence satisfaction in the first questionnaire, they reported negatively desires for *less autonomy frustration* (F (2,42)= 2.88, *p < .05*) and *less competence frustration* (F (2,42)= 7.14, *p < .001*). Although these results indicate main effects of need frustration in the lifespan, there were no interaction effects found. This indicates that the history of an individual's need frustration results in specific desires, whether they currently experience need frustration or not. The lack of this effect could also be due to the weak effect of manipulation, although participants in the frustration condition reported a significantly stronger desire to more autonomy satisfaction (*M*= 4.07; *SD*= .75) in

comparison to neutral participants (*M*= 3.75; *SD*= .67) and autonomy supported participants (*M*= 3.48; *SD*= .63) (F (2, 39) = 4.15, *p < .05*).

Reaction times. Means and standard deviations are presented in table 3. The mean reaction times for each word category were analyzed with Repeated measures ANOVAs. Between factors were the condition and the counterbalancing, the within factor was the word category with 5 levels. No main effects were found of word categories (F (8, 156) = 1.06, *p > .05*) and conditions (F (2, 39) = 1.74, *p > .05*). These results indicate that participants, whether they were frustrated or supported in their autonomy, do not differ in their performance on the different word categories. Besides, no significant condition x pre-need satisfaction effects were found for reaction times. In addition, no main effect was found for counterbalancing (F (1, 43) = 0.037, *p > .05*). Although we have a balanced randomized design, significant counterbalancing x word category effects were found for reaction times (F (4) = 2.466, *p < .05*). By plotting, we found a prominent difference for positive words, but we could not interpret this theoretically.

Although no ESE was found for specific stimuli, Figures 2 shows an interesting tendency between the conditions in the overall performance. The *neutral* participants performed the worst on all word categories (*M*= 594.66; *SD*= 41.10), followed by the *frustrated* participants (*M*= 584.40; *SD*= 46.45) (Table 3). *Satisfied* participants showed the best performance (*M*= 566.24; *SD*= 27.58), apart from word category. Although this between-effect was not significant (F (2, 42) = 2.02, *p > .05*), it is interesting for further research.

Table 3

Means (standard deviations) of participants' reactions times (ms) over conditions

	Condition		
Category	Autonomy satisfaction	Neutral	Autonomy frustration
Neutral	565.74 (27.68)	597.47 (41.61)	584.82 (52.65)
Positive	568.79 (30.69)	591.99 (41.00)	582.78 (44.99)
Negative	568.33 (31.61)	591.87 (43.11)	586.67 (48.26)
Satisfaction	564.05 (26.83)	596.15 (46.66)	583.44 (43.42)
Frustration	564.27 (31.61)	595.84 (43.02)	584.31 (46.87)
M (ms)	566.24 (27.58)	594.66 (41.10)	584.40 (46.45)

Figure 2

Graphic overview reaction times (in ms) and word categories over conditions
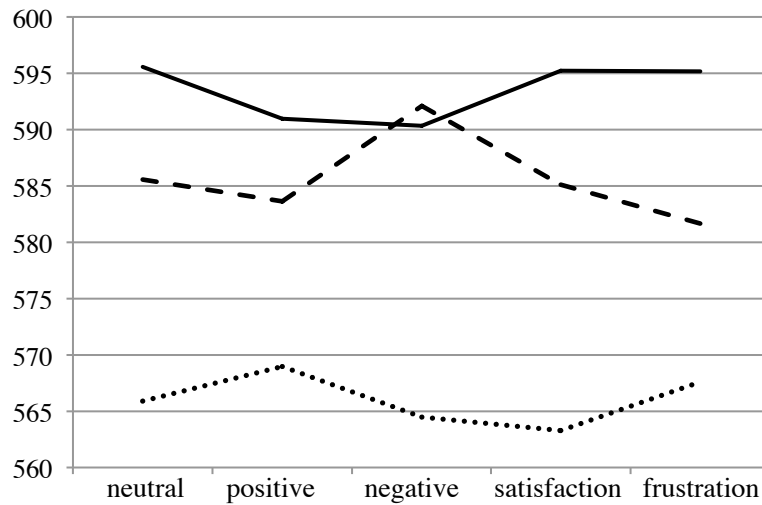
Note. full line = neutral condition; striped line = frustration condition; dotted line = satisfaction condition.

DISCUSSION

The current study examined the idea of an attentional bias as part of a mechanism to cope with autonomy frustration. In addition, it is assumed that this coping mechanism is affected by the previous experiences of need frustration and need satisfaction during the lifespan. The current study found no evidence for this hypothesis. Both the between-conditions (neutral, autonomy-frustrated, autonomy-supported) and the within-conditions (neutral, positive, negative, control-related, autonomy-related words) showed no significant differences. Nevertheless, the idea of an attentional bias for autonomy-related words, as part of restoring or compensating autonomy-frustration, may not be repudiated. First, autonomy-supported participants showed the best performance on all word categories, followed by the autonomy-frustrated and the neutral participants. Based on these findings, it could be hypothized that the provision of choice (i.e. autonomy-support) results in better performance, compared to no choice (i.e. neutral). When this choice is deprived (i.e. autonomy-frustration), the task motivation is 'harmed' which results in a similar performance as the neutral participants. Second, the current study had an insufficient power. Using the G*Power Version 3.1 software for performing statistical power analysis (Faul, Erdfelder, Buchner, & Lang, 2009), a total sample size of 102 participants was found. Hence, the present study (N = 45) has insufficient statistical power (1 – β err prob = 0.36). The experiment should be redone by future research with more participants in each

condition. Third, weak evidence was found for the manipulation, which resulted in no effect on the participants' intrinsic motivation. Another explanation for this finding may be the implementation of the choice manipulation in a laboratory context. Although we attempt to impel the believability by the online personality questionnaire, the participants might be skeptical about the provision of choice. The meta-analysis of Patall, Cooper and Robinson (2008) found a greater impact of choice in natural settings. Choices may be experienced as more authentic, while a laboratory context providse better control of confounding factors. Future research could do the experiment in a laboratory context within a natural setting, in favor of a stronger manipulation (e.g. a class room in an elementary school). Four, the current study did not validate autonomy-related and frustration-related words. Although these are based on the current literature, we don't know if these are really observed as autonomy- of frustration-related. Furthermore, the validated effects of negative and positive words by Radel et al. (2011) cannot be found. Future research should use a pilot study to test the construct validity of the presented word categories.

The current study set up a design in which the findings for need restoration (i.e. attentional bias for autonomy-related words) could be based on reaction times and self-report questionnaires. The Emotional Stroop task assumes reading as an automatically cognitive process within which the emotional meaning of words interferes. By this task, the restoration process for need satisfaction could be measured at an unconscious level. At a more conscious level, the second questionnaire measured the participants' desires for less need frustration and more need satisfaction. We predict stronger desires for participants who experience more need satisfaction in their life after choice deprivation (i.e. autonomy-frustration). In contrast with our hypothesis, participants reported a stronger desire for *more competence satisfaction* (F (2,42)= 3.40, *p* < *.05*), *less autonomy frustration* (F (2,42)= 7.31, *p* < *.001*) and *less competence frustration* (F (2,42)= 7.48, *p* < *.001*) when they experienced more need frustration in their life. In terms of the current study, this finding could be due to the weak manipulation. Participants did not experience a frustration of their autonomy and, thereby, were not impelled to restore autonomy satisfaction (i.e. stronger desire for less frustration and more satisfaction).

CONCLUSION

The literature of the SDT (Deci & Ryan, 1985) has expanded the concept of basic psychological needs for autonomy, competence and relatedness for many decades. Although many studies have been focusing on need-supporting and need-thwarting social conditions, research of their

functionality in a need-thwarting situation is still limited. Based on the SDT and the GAS model (Seyle, 1946), the current study proposes an attentional bias for need-relevant stimuli in favor of restoring need satisfaction. In addition, it is assumed that this coping mechanism of need frustration is affect by the experiences of need frustration versus need satisfaction during the lifespan. First, individuals react in a defensive way in favor of restoring the thwarted need, as a consequence of lifelong need satisfaction (i.e. the restoration process). Second, when the social context have provided a permanent undermining of the psychological needs, an adaptation mechanism appears by which the individual is more likely focused on need substitutes (i.e. compensation process). In the current study, the results suggest no significant differences between participants, whether their choice was provided or deprived. Besides, no significant differences were found between word categories (*neutral, positive, negative, satisfaction, frustration*) within conditions. Furthermore, no moderating effect was found for experiences of need frustration and need satisfaction during the lifespan. Though, autonomy-supported participants showed the best overall performance (in ms) in comparison to autonomy-frustrated and neutral participants (see Figure 2). The lack of significant effects can be due to a weak manipulation of the participants' need for autonomy and an insufficient power. Nevertheless, the current study provides the first attempt to find evidence for an attentional bias as a coping mechanism for psychological need thwarting.

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APPENDIX

Appendix 1

Categories and stimuli presented in the Emotional Stroop task (translated from Dutch to English).

Autonomy satisfaction	Autonomy frustration	Positive	Negative	Neutral
Want	Must	Cuddle	Murder	Walk
Voluntary	Obligated	Happy	Pain	Green
Free	Dictated	Funny	Violent	New
Natural	Enforced	Delicious	Queasy	Broad
Authentic	Compulsory	Cheerful	Dying	Long
Motivated	Forced	Positive	Crying	Handy
Joyful	Authoritarian	Pleasant	Sad	High
Myself	Pressure	Friendly	Miserable	Little
Interest	Control	Healthy	Unhappy	Intelligent
Choice	Test	Love	Bad	Shoe
Option	Command	Paradise	Death	Bike
Pleasure	Supervision	Flower	Disaster	Pump