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Individual differences in motivational self-focus modulate context-based affective attention flexibility toward goal-relevant information: an eye-tracking study

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Abstract

Flexible attention toward relevant positive or negative information depending on specific contextual affective goals underlies resilience and is thought to be modulated by individual differences in motivational self-focuses. In this study, it was tested how promotion and prevention motivational self-focuses modulate context-based affective attention flexibility toward goal-relevant emotional information. A sample of 102 participants with different promotion and prevention levels completed a novel eye-tracking task, requiring switching attention toward positive or negative goal-relevant emotional information in different motivationally relevant contexts. High promotion participants showed difficulties in affective attention switching (i.e., less flexibility) in prevention but not in promotion contexts. Conversely, high prevention participants showed difficulties in affective attention switching in promotion but not in prevention contexts. Results thus support that contextual affective attention flexibility depends on specific motivational self-focuses.

Keywords: Affective Attention Flexibility; Context; Eye-Tracking; Promotion/Prevention Self-Focus; Motivation.

1. Introduction

Daily life involves behaving in different contextual environments (e.g., going to work/class in the morning, having a meal with colleagues or friends at the cafeteria, going back to work/class after lunch), which may have different associated demands and goals to fulfill (e.g., to deal efficiently with a complex work assignment - to feel calmed -, to disconnect and have a relaxed time with others - to feel happy -, to anticipate new potentially problematic work demands and elaborate a plan to address them in advance - to avoid feeling nervous -, respectively). The ability to flexibly shift cognitions and associated behaviors between these changing contexts and their associated affective goals is thus crucial to develop adaptive responses to life stressors (Fresco et al., 2006). Specifically, adaptive functioning is thought to rely on an optimal balance between focusing on current mental-sets (cognitive stability) and shifting and updating mental-sets when the contextual demands change (cognitive flexibility; see Goschke & Bolte, 2014). Therefore, understanding the mechanisms supporting cognitive flexibility for efficient contextual goal maintenance or shifting is of high relevance to promote efficient context adaptation and stress regulation (e.g., Bonnano & Burton, 2013; Pruessner et al., 2020).

1.1. Affective attention flexibility for contextual goals

Among those mechanisms, selective attention is thought to be key for the flexible processing of relevant affective information across contexts and thus to influence optimal affective functioning (Gross, 2015; Gross & Thompson, 2007). For instance, some studies have shown that the momentary modulation of attention to temporarily maximize the processing of positive information (Sanchez et al., 2014) and/or reduce the processing of negative information (Sanchez et al., 2013, 2017) may be instrumental for the downregulation of negative moods. However, attention towards

negative or positive information may not be inherently adaptive or maladaptive in nature (Kashdan & Rottenberg, 2010), but depend on specific contextual demands and associated affective goals (Godara et al., 2020). To test this, Godara and colleagues (2020) developed a novel eye-tracking paradigm, in which participants must direct their attention as quickly as possible to the most adaptive emotional information (i.e., either positive or negative faces), depending on the momentarily active contextual goal in each trial (e.g., the distal goal "enjoy the party" associated to the proximal goal "attend to positive faces to feel well" or "avoid getting sick from eating bad food" associated to the proximal goal "attend to negative faces to avoid feeling sick", respectively, within a context comprising a dinner with colleagues). Further, contexts were repeated or changed across trials to other relevant contexts, prompting to activate other series of affective goals across contexts.

Using this paradigm, Godara et al. (2020) showed that dysphoric individuals had a clear facilitation (i.e., were more flexible) in switching attention towards negative but not toward positive goals. The opposite pattern was found for non-dysphoric individuals, who became more adept (i.e., flexible) at switching attention towards positive goals but not toward negative goals. Therefore, facilitated processing of negative or positive information emerged as a function of individual differences in dysphoric mood levels. In a similar vein, conceptual models of cognitive flexibility (e.g., Goschke & Bolte, 2014) posit that not only affective but also motivational factors may modulate context-based flexible processing. As such, the present research aimed to establish whether specific processes of affective attention flexibility, as measured by Godara et al. (2020), are furtherly modulated by related motivationally relevant factors.

1.2. Affective attention flexibility as a function of motivational self-focuses

Among potentially relevant motivational factors that could modulate affective attention flexibility, the Regulatory Focus Theory (Higgins, 1997; 1998) defines a series of motivational dimensions that may help to account for facilitated affective attention flexibility under different types of contexts and associated affective goals. This framework postulates that the coordination of psychological processes guiding context-based behaviors depends on the differential activation of promotion and prevention motivational self-focuses (i.e., SF) and their corresponding associated affective goals (Higgins, 1997). Therefore, the activation of a given motivational SF promotes a different type of self-regulation. A promotion SF would thus guide attention to preferentially process emotional information that promotes affective states in a cheerfulness-dejection emotional continuum, related to achieving certain positive goals, rewards or aspirations (i.e., feeling happy, not feeling sad; Higgins, 1997;1998). In contrast, a prevention SF would be expressed by a selective attention towards emotional information that supports affective states in a quiescence-agitation emotional continuum, related to goals of protection, security and avoidance or termination of possible negative outcomes or punishments (i.e., feeling calmed, not feeling nervous; Higgins, 1997;1998) (Higgins, 2012; 2015). Initial evidence from Shah & Higgins (2001) supports these assumptions, showing that individuals with higher levels of promotion were faster in a reaction time task in appraising information within cheerfulness-dejection categories, whereas individuals with higher levels of prevention were faster in appraising information within quiescence-dejection categories.

Thus, previous findings support a preferential focus and efficient processing of motivationally congruent information for each type of SF (Shah & Higgins, 2001). The preferential activation of promotion or prevention SFs could therefore influence affective attention flexibility, modulating the way that goal-relevant information is

selectively attended and efficiently processed (Klenk et al., 2011). However, to date, it remains to be tested whether such specific facilitations of processing are supported by a higher affective attention flexibility for specific motivationally-relevant information that is congruent with each specific SF (i.e., higher promotion SF relating to higher flexibility in contexts activating proximal goals within the cheerfulness-dejection continuum; higher prevention SF relating to higher flexibility in contexts activating proximal goals within the quiescence-agitation continuum).

1.3. The present study

The aims of the study were: 1) to evaluate affective attention flexibility (i.e., maintenance vs. switching in attention toward positive and negative goals) across different contexts activating affective goals that were motivationally promotion (contextualized around an emotional continuum of cheerfulness-dejection affective states) or prevention prevention-oriented (contextualized around an emotional continuum of quiescence-agitation affective states), and 2) to test how inter-individual differences in promotion and prevention SF influence efficient attention flexibility to those context-based affective goal changes. For these purposes, a novel variant of the eye-tracking task developed by Godara et al. (2020) was created, where affective attention flexibility was assessed across contexts with affective goals reflecting different promotion or prevention orientations.

In line with previous research on selective processing of motivationally relevant information as a function of motivational SFs (Shah & Higgins, 2001), we expected that context-based affective attention flexibility towards promotion and prevention goals would be influenced by individual differences in motivational SF. In the affective attention flexibility task used in this study (fully described below), changing between goals across trials required switching attention toward new information and, therefore,

by design more time was typically required to direct gaze towards new information in switching goal trials than towards repeated information in repeating goal trials (see Godara et al., 2020). Based on this design, we hypothesized that such general attentional cost effect would be reduced (i.e., reflecting facilitated attention flexibility) for specific motivational contexts of the task (i.e., promotion or prevention contextual affective goals) that were congruent with the primary active motivational SF of the individuals (i.e., promotion or prevention SF individual levels, respectively). Thus, we expected that the attentional cost would be reduced for high Promotion participants in the Promotion context, reflecting facilitated affective attention flexibility, in a motivationally-congruent Promotion context (**Hypothesis 1a)**, but not in a motivationally-incongruent Prevention context (**Hypothesis 1b)**. Conversely, we expected that the attentional cost would be reduced for high Prevention participants, reflecting facilitated affective attention flexibility, in a motivationally-congruent Prevention context (**Hypothesis 2a)**, but not in a motivationally-incongruent Promotion context (**Hypothesis 2b)**.

2. Method

2.1. Participants

A sample of 102 undergraduates (81 female, mean age = 20.9 years old) took part in the study. Sample size was determined through a priori power analyses using GPower 3.1.9.2, based on estimated expected effects sizes for three-way Context x Goal x Group interactions according to previous work with this attention task (Godara et al., 2020). Setting α at .05, power (1—β) at .80, expecting small-to-medium effect size of Cohen's *d* = .37, and controlling for two covariates (i.e., depression and anxiety levels,

see below), a sample size of 97 participants was estimated to yield adequate power to detect the expected effect size on the three-way interactions relevant to our hypotheses.

Eleven participants (10.8% of the sample) were excluded for the final analyses due to non-valid gaze data (i.e., no gaze positions recorded, n= 6; or gaze data not reflecting valid fixation data of at least 100 ms and 1 radius degree recorded, n= 5; see further details of the design below) in at least one of the attention indices of the attention task. The final sample thus comprised 91 participants. Participants provided written informed consent before their participation. All participants had normal or corrected-to-normal vision and received course credits for their participation. The study was conducted in accordance with the Declaration of Helsinki and it was approved by the Faculty Ethical Committee.

2.2. Materials

2.2.1. Questionnaires

The *Promotion/Prevention Scale* (Lockwood et al., 2002) was used to measure motivational SFs. It is an 18-item instrument, designed to assess habitual activation of motivational self-regulation focuses of promotion and prevention. The questionnaire consists of two subscales, each one based on one of the motivational SF dimensions. All items, 9 per subscale, are answered using a 9-point Likert scale ranging from "Not at all true of me" to "Very true of me". The Promotion/Prevention scale has demonstrated a high internal consistency, both for the Promotion and for the Prevention subscales (Lockwood et al., 2002). In the current study, the consistencies were high, being 0.82 for both subscales. Further control of individual levels of depression and anxiety symptoms were controlled as covariates in the study, being assessed as follows.

The *Center of Epidemiological Studies-Depression* (CESD-8; Radloff, 1977) was used to measure depressive symptom levels experienced during the last week. The

questionnaire consists of 8 items rated using a 4-point Likert scale ranging from "none or almost none of the time" to "all or almost or all of the time". The CESD-8 has shown high internal consistency in previous studies (Van de Velde et al., 2010). In the current study, internal consistency was good (α= 0.84).

The *General Anxiety Disorder scale* (GAD-7; Spitzer et al., 2006) was used to assess anxiety symptom levels experienced during the last two weeks. The questionnaire consists of 7 items rated using a 4-point Likert scale ranging from "Not at all" to "Nearly every day". Internal consistency of the questionnaire is very high (García-Campayo et al., 2010). In the current study, internal consistency was good (α= 0.85).

2.2.2. Apparatus

A Tobii Tx-120 infrared eye-tracker was used to measure participants' eye movements at a frequency of 120 Hz. Participants first completed a 9-point grid calibration test before completing the actual task. During the entire procedure, they were seated in an anatomic chair with a distance of 60-65 cm between the eye-tracker and their eyes. E-prime Professional 2.0 software (Schneider et al., 2012), Tobii Studio software (2.0.6) and E-prime extensions for Tobii (i.e., Clearview PackageCalls) were used to coordinate the stimuli presentation and the parallel gaze assessment. Tobii Studio software was used to extract raw eye movement data to compute first fixation reaction time indices, indicating the time elapsed since the stimuli appearance to make the "first fixation on a goal-relevant stimulus". Visual fixations were defined and computed based on the Tobii I-VT Fixation Filter algorithm, defined as a minimum duration of 100 ms and a maximum fixation radius of 1 degree.

2.2.3. Attention Flexibility Task

Stimuli. As in Godara et al. (2020), all emotional stimuli were extracted from the Karolinska Directed Emotional Faces (KDEF; Goeleven et al., 2008) and Radboud Faces Database (RaFD; Langner et al., 2010). KDEF stimuli were selected based on representative scores of valence in KDEF (Caucasian, Adult, Frontal subset), with sixty pictures of negative categories (angry, disgust, sad and fearful emotions; $M_{Negative}$ = 5.74, $SD_{Negative}$ = 1.70) and thirty-seven pictures of the positive category (happy emotion; $M_{Positive}$ = 6.10, $SD_{Positive}$ = 1.63), and controlling for equal levels of arousal ($M_{Negative}$ = 3.61, $SD_{Negative}$ = 1.81; $M_{Positive}$ = 3.72, $SD_{Positive}$ = 1.91). Similarly, based on representative scores for valence in the RaFD (Caucasian, Adult, Frontal subset), the stimuli set in the task was completed with forty-three negative category (fearful, disgust and angry emotions; $M_{Negative}$ = 2.03, $SD_{Negative}$ = 0.20) and twenty-five positive category (happy emotion; $M_{Positive}$ = 4.20, $SD_{Positive}$ = 0.30) stimuli, with equal levels of arousal ($M_{Negative}$ = 4.10, $SD_{Negative}$ = 0.33; $M_{Positive}$ = 4.10, $SD_{Positive}$ = 0.04). As for the contexts used in the task, based on Godara et al. (2020), two context images were selected and associated with descriptive context texts (see Figure 1 below). Context images were selected from Google Images, that were marked as “Labeled for reuse” and “Labeled for noncommercial reuse”.

Task. To make the task as ecologically valid as possible, contexts comprised social situations that undergraduates encounter in their daily life. The two textual contexts and images were chosen to represent a “party with friends” and a “presentation at the university” (see Figure 1 for further details). The combination of textual and visual information was used to generate informative relevant contexts where participants could immerse themselves. Unlike Godara et al. (2020), contexts were designed to be specifically relevant to motivational promotion or prevention SFs. Thus, the “party with friends” context was designed to be identified from a promotional

perspective (affective goals related to an emotional continuum between cheerfulness-dejection), whereas the "presentation at the university" context was designed to be identified from a prevention perspective (affective goals related to an emotional continuum between quiescence-agitation; Higgins, 1997;1998).

Figure 1. Context and goal combinations used in the Attention Flexibility Task.

Context	Goal	Context Image
"Party with Friends" To enjoy the party, it is best to look at those of my friends who seem to be having a good time. To resolve a conflict/problem with my friends and not feel bad about it, it is best to pay attention to those who seem sad or upset.	(Promotion Goal to Positive Information) (Promotion Goal to Negative Information)	
Cheerfulness ⟷ Dejection		
"Presentation at the University" To be calm and feel safe during my presentation, it is best to look at those of my colleagues who have more positive expressions. In order not to get nervous, it is best to quickly resolve questions that may arise during my presentation, looking at those of my colleagues who have more negative expressions.	(Prevention Goal to Positive Information) (Prevention Goal to Negative Information)	
Quiescence ⟷ Agitation		

Each context had two different associated distal goals, associated with a proximal goal of either directing attention to positive or negative information in the

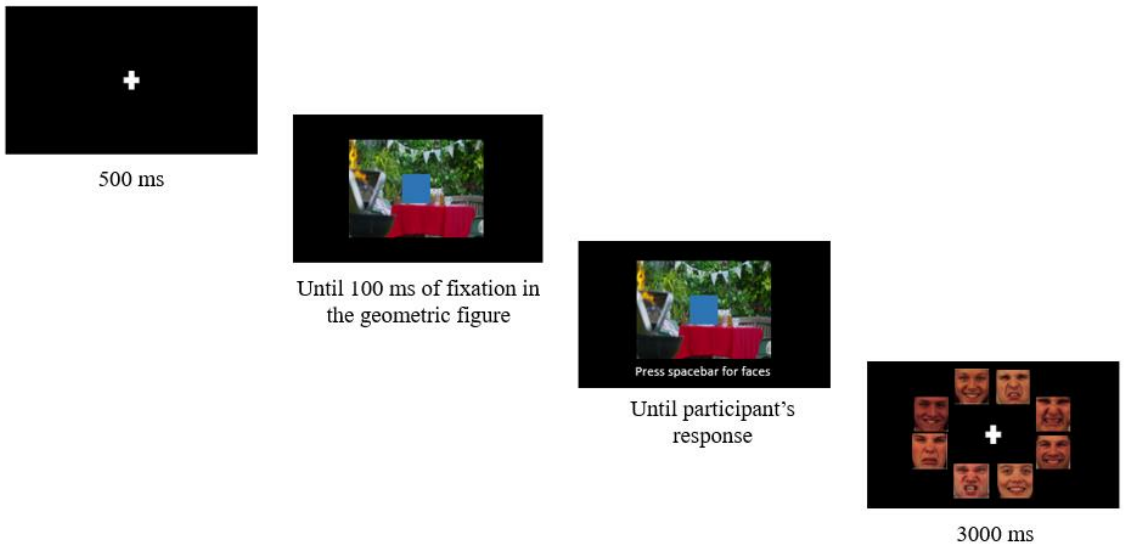
ongoing environment. In the context “party with friends” (i.e., promotion context), one distal goal prompted to focus on enjoying the party to feel happy, activating a proximal goal of looking to positive stimuli, whilst the other distal goal prompted to focus on resolving a conflict with friends to not feel sad, activating a proximal goal of looking on negative stimuli. In the context “presentation at the university” (i.e., prevention context), a similar procedure was followed, in such a way that there was a distal goal prompting to feel calm and safe during the presentation, activating a proximal goal of looking to positive stimuli and another distal goal prompting not to get nervous by quickly resolving questions that may arise from the audience, activating a proximal goal of looking at negative stimuli. Every goal had an associated geometric figure (blue square or blue circle), indicating which goal had to be activated in that particular context for that specific trial. The blue square figure in the context “party with friends” was associated with the positive goal, while the blue circle figure was associated with the negative one. In the context "presentation at the university", the order was reversed, associating the blue circle to the positive goal and the blue square to the negative one. This counterbalancing procedure was implemented to avoid the possibility of simply associating a specific figure with an emotional component in every context. Therefore, we could assure that participants processed the combination of context-goal-emotional components in every trial of the task.

The task consisted of 64 trials. Each trial started with a fixation cross in the center of the screen for 500 ms. After this, one of the context images (“party with friends” or “presentation at the university”) appeared with one of the geometric figures (“blue square” or “blue circle”) in the center of the image, indicating the specific goal in that trial. This combination was presented on the screen during 3000 ms, and participants had to direct their eye-gaze in the figure for at least 100 ms, before a text

("Press Spacebar for faces") appeared, giving participants the possibility to continue with the task. Participants could look at that screen (with the context image, the associated goal figure, and the text) as long as they needed to remember the correct response (e.g., "party with friends" + blue square = enjoy the party and look to positive faces). Participants were asked not to continue with the task until they were sure about their answer and to keep watching the figure until pressing the spacebar. When participants pressed the button, once a visual fixation in the center of the screen was detected by the eye-tracker, 8 emotional faces (4 positive and 4 negative) appeared around the center of the screen and participants had to direct their eye-gaze/attention, as quickly as they could, to the correct goal-relevant emotional stimuli, depending on the combination of the context image and goal figure. Each trial ended after 3000 ms of free viewing of emotional faces (see Figure 2).

The design of the task was pseudorandomized, having the same number of repeat/switch context and goal changes across trials. The trial sequence was adapted from Godara et al. (2020), with the same number of trials for each Context Type (Promotion, Prevention) x Context Condition (Repeat, Switch) x Goal Type (Positive, Negative) x Goal Condition (Repeat, Switch) combination: repeat context-repeat goal to positive, repeat context-repeat goal to negative, repeat context-switch goal to positive, repeat context-switch goal to negative, switch context-repeat goal to positive, switch context-repeat goal to negative, switch context-switch goal to positive and switch context-switch goal to negative.

Figure 2. Schematic of each trial sequence in the Attention Flexibility Task



*Attention Indices***.** The "First Fixation to goal-relevant emotion" was defined as the attention dependent variable (i.e., time elapsed since the onset of the faces' appearance until a valid visual fixation is detected within any of the pre-established goal-relevant emotion faces, i.e., positive or negative, in each trial). This variable was first obtained for each of the 64 trials, indicating the speed at which participants were able to look at the goal-relevant faces (either positive or negative), depending on the given context image and associated goal-figure in each trial. Reaction times shorter than 100 ms in the first fixation variable were removed. The remaining first fixation RT data were averaged for each context-goal condition: motivational context type (party or presentation), context condition (repeat-switch context), goal type (positive, negative), and goal condition (repeat-switch goal). Following our hypotheses, we were interested in the effects of individual differences in motivational SF dimensions on Context Type x Goal Condition interactions. Consequently, internal consistencies were computed for the relevant indices under study, with Cronbach's alphas reflecting good reliability for all of them: Promotion context – goal repeat: α= .60; Promotion context – goal switch: α= .67; Prevention context – goal repeat: α= .72; Prevention context – goal switch: α= .75.

2.3. Procedure

Participants first completed an online survey including self-report questionnaires (i.e., assessments of depression, anxiety and motivational SFs), together with the fulfillment of a digital informed consent. The day immediately after, participants performed the individual experimental session. They were first instructed about the attention task they had to perform, and they were given all the time they needed to learn the different context image x goal figure combinations. After this, a practice phase was completed to ensure all combinations were adequately remembered, followed by the eye-tracking calibration test. Participants then completed the actual affective attention flexibility task and finished performing a final knowledge check test to re-ensure that all context image x goal figure combinations had been adequately activated during the performance of the task. No participant showed problems in learning the procedure and completing the task according to the learned context x goal combinations. Full details of these further controls are provided in the Supplement.

3. Results

Mean, standard deviation and Cronbach's alpha for each variable are shown in Table 1.

Table 1. Mean, standard deviation and Cronbach´s alpha of the variables in the study.

Variable	**Mean (*SD*)**	**Cronbach's Alpha**
Age (years)	20.97 (*2.55*)	
Sex (percentage of female participants)	79.1%	
Depressive symptom level, CESD-8 (range 0 to 24)	7.85 (*4.23*)	.84

Anxiety symptom level, GAD-7 (range 0 to 21)	7.57 (*3.84*)	.85
Promotion SF level (range 9 to 81)	57.75 (*10.52*)	.82
Prevention SF level (range 9 to 81)	48.95 (*14.05*)	.82

Notes. CESD-8 = Center for Epidemiologic Studies - Depression Scale 8 item version; GAD-7 = General Anxiety Disorder scale; SF = Self-focus

Preliminary correlation analyses were conducted to test the relations between the self-reported measures in the study. Correlation analyses showed that Promotion and Prevention SF levels were positive and significantly correlated ($r = .284$; $p < .01$) Further, Promotion SF was negative and significantly correlated with depressive symptom ($r = -.289$; $p < .01$) but not anxiety symptom levels ($r = .01$; $p = .89$). In contrast, Prevention SF was positive and significantly correlated with both depressive symptom ($r = .384$; $p < .001$) and anxiety symptom levels ($r = .482$; $p < .001$). Given this medium level of covariance between SF levels and emotional symptom levels, and with the aim of evaluating unique modulatory effects of each motivational SF in affective attention flexibility processes, depressive and anxiety symptom levels were included as covariates in the main analyses.

In order to test our hypotheses, the main analyses thus comprised a 2 (context type: promotion, prevention) x 2 (context condition: repeat, switch) x 2 (goal condition: repeat, switch) x 2 (goal type: positive, negative) x 2 (promotion SF level) x 2 (prevention SF level)[1] mixed analysis of covariance (ANCOVA) with the indices based on "first fixation on goal-relevant emotion" as dependent variables, while controlling

[1] The analyses reported in the main manuscript consider motivational groups, as created based on median split of the 102 participants in each SF variable. Participants with values higher than the median in the promotion and prevention subscales (58 and 50, respectively) formed the High Promotion/Prevention Groups, respectively. Participants with values lower or equal than the median in the promotion and prevention subscales formed the Low Promotion/Prevention Groups, respectively.

for depression and anxiety levels as covariates [2]. The between-subject factors were promotion and prevention SF levels, whereas context type, context condition, goal condition and goal type were the within-subject factors.

Table 2 shows the full set of main and interaction effects in the model that are relevant to our hypotheses (i.e., "context type" x "goal condition" x "SF levels"). No other motivational SF-based effects were expected for other types of interactions within the model (e.g., specific attentional costs for positive vs. negative information processing, without considering motivational contexts and active goals) and thus these effects are merely exploratory. A full set of the tested 2 (context type) x 2 (context condition) x 2 (goal condition) x 2 (goal type) x 2 (promotion SF level) x 2 (prevention SF level) mixed ANCOVA is reported as a Supplement.

Results showed a main effect of "goal condition", $F(1, 85) = 10.51$, $p = .002$, $\eta_p^2 = .11$. This main effect was qualified by two significant three-way interactions: "context type" x "goal condition" x "promotion SF level", $F(1, 85) = 4.71$, $p = .03$, $\eta_p^2 = .05$, and "context type" x "goal condition" x "prevention SF level", $F(1, 85) = 5.15$, $p = .03$, $\eta_p^2 = .06$. Based on these interactions, the specific hypotheses were tested through post-hoc analyses.

Table 2. Main relevant results from the repeated measures ANCOVA.

	Time to First Fixate on relevant stimuli	
	F	η_p^2
Depression Symptoms	.9	.01
Anxiety Symptoms	.06	.001
Context Type	1.06	.012
Context Type x Promotion	0.132	.002
Context Type x Prevention	2.58	.029

[2] Depression and anxiety symptomatology levels were included as covariates in the model to control for their possible confounding effects in attention flexibility performance in the task, as evidenced by Godara et al. (2020), and in general emotional attention preferences toward negative vs. positive information, as extensively evidenced in previous research (e.g., Armstrong & Olatunji, 2012).

Goal Condition	10.51**	.11
Goal Condition x Promotion	0.274	.003
Goal Condition x Prevention	0.159	.002
Context Type x Goal Condition	3.69	.04
Context Type x Goal Condition x Promotion	4.71*	.05
Context Type x Goal Condition x Prevention	5.15*	.06

* $p < .05$; ** $p < .01$; η_p^2 = partial eta square

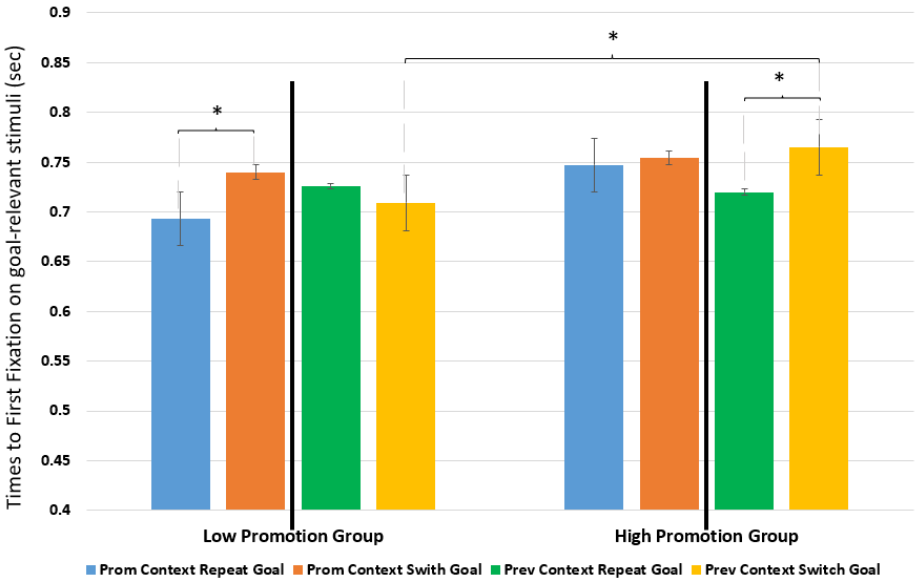
3.1. Hypotheses 1: Affective attention flexibility as a function of promotion SF levels.

In terms of between-group comparisons, post-hoc follow-ups of the context type x goal condition x promotion SF level interaction showed a significant difference between high and low Promotion SF individuals for the goal switch condition in the prevention context. Specifically, when participants had to switch goals in the Prevention Context ("presentation at the university"), low compared to high Promotion SF participants were able to fixate faster on the goal-related faces, $F(1, 85) = 4.13$, $p = .04$, $\eta_p^2 = .05$. The rest of the between-group comparisons were not significant, all F's < 3.3; p's > .07; $\eta_p^2 < .04$.

As for within-group comparison, results indicated that low Promotion SF participants had no difficulties for goal switching (i.e., no differences in first fixation times in the repeat vs. switch goal conditions), in the Prevention Context ("presentation at the university"), $F(1, 85) = .78$, $p = .38$, $\eta_p^2 = .009$, but they had difficulties (higher times to first fixate goal-relevant stimuli in switch vs. repeat conditions) in the Promotion Context ("Party with friends"), $F(1, 85) = 4.7$, $p = .03$, $\eta_p^2 = .05$. As for high Promotion SF individuals, they had no difficulties in goal switching (i.e., no differences in first fixation times in switch vs. repeat goal conditions) in the Promotion Context ("party with friends"), $F(1, 85) = .09$, $p = .76$, $\eta_p^2 = .001$, but they had difficulties (i.e., longer fixation times in goal switch vs. goal repeat conditions) in the Prevention

Context ("presentation at the university"), $F(1, 85) = 4.32$, $p = .04$, $\eta_p^2 = .05$ (see Figure 3).

Figure 3. Between and within-group differences depending on Promotion SF levels in goal switching in both contexts (Promotion Context = "party with friends" on the left, and Prevention Context = "presentation at the university" on the right).



Notes: Prom = Promotion; Prev = Prevention; *= significant at $p < .05$

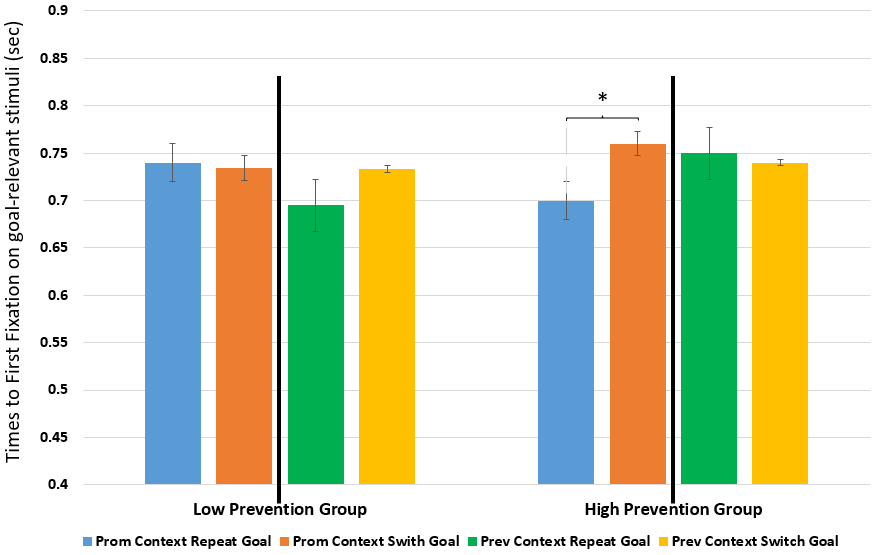
3.2. Hypotheses 2: Attention flexibility as a function of prevention SF level.

In terms of between-group comparisons, post-hoc follow-ups of the significant context type x goal condition x prevention SF level interaction did not reveal significant between-group differences between prevention SF level groups, all F's < 3.3; p's > .07; $\eta_p^2 < .04$.

As for within-group comparisons, in the case of individuals with low Prevention SF levels, they did not show attentional costs associated with the change of goals (i.e., higher times to first fixate goal-relevant stimuli in switch vs. repeat conditions) in the promotion context, $F(1, 85) = .7$, $p = .79$, $\eta_p^2 = .001$, or in the prevention context, although in this case there was a congruent marginally significant trend, $F(1, 85) = 3.13$, $p = .08$, $\eta_p^2 = .04$. As for participants with high Prevention SF levels participants

required significantly more time for goal switching vs. repeat in the Promotion Context ("party with friends"), $F(1, 85) = 6.42$, $p = .01$, $\eta_p^2 = .07$, but these differences were not found in the Prevention Context ("presentation at the university"), $F(1, 85) = .22$, $p = .64$, $\eta_p^2 = .003$[3].

Figure 4. Between and within-group differences depending on Prevention SF levels in goal switching in both contexts (Promotion Context = "party with friends" on the left, and Prevention Context = "presentation at the university" on the right).



Notes: Prom = Promotion; Prev = Prevention; *= significant at p < .05

4. Discussion

The main aim of this study was to test whether context-based affective attention flexibility is influenced by individual differences in promotion and prevention motivational SFs. For this purpose and based on the task developed by Godara et al.

[3] Further analyses considered specific comparisons between repeat vs. switch goal trials, for each stablished hypothesis (high promotion SF in promotion context, high prevention in prevention context), differentiating conditions of context repetition and context switch for each type of context. In both cases, the hypothesized flexibility effects (i.e., lack of general cognitive cost observed for repeat vs. switch for high promotion individuals in promotion contexts, for high prevention individuals in prevention contexts) was found in both context repetition and context switch conditions, all F's < .66, all p's > .42, all ŋp2 < .008. However, separate analyses of the Context Type x Goal Condition x SF interactions when the data were restricted to only context repetition trials did not support significant interaction effects in specific occasions of repetition of context: F's < 2.56, all p's > .11

(2020), we developed a variant of this affective attention flexibility task that allowed to assess the ability to switch attention between emotional goals across specific motivationally-relevant contexts. Contexts represented ecological social naturalistic situations and were manipulated to be interpreted according to motivational SFs defined in Higgin's theory (1997;1998), thus generating a promotion context (expressed in terms of goals related to cheerfulness-dejection) and a prevention context (expressed in terms of goals related to quiescence-agitation).

First, in line with Godara et al. (2020), a general attentional cost was evidenced in switch compared to repeated goal trials. Thus, participants needed more time to fixate the given goal-relevant emotional face type when there was a goal change compared to when the goal was repeated. As expected, this effect was modulated by differences in the type of context (i.e., promotion, prevention) and individual differences in motivational SFs. In line with our hypotheses, results indicated that participants characterized by a predominant activation of different motivational SFs (i.e., promotion or prevention) were more flexible, based on the velocity needed to first attend (fixate) the goal-relevant stimuli in each trial, specifically in the context that was congruent with their habitual motivational SF. High promotion participants did not show significant differences (i.e., attentional costs) between the trials with repetitions of goals and those in which there was a change of goals in the motivationally-congruent promotion context (i.e., for context-based affective goals related to "feeling happy" or "not feeling sad"), showing facilitated affective attention flexibility in this context. In contrast, high promotion participants showed significant differences between repeat and switch trials in the prevention context, where they needed more to fixate the goal-relevant stimuli when there was a goal switch compared to when the goal was repeated. Conversely, high prevention participants showed the reversed pattern. In this case, results indicated

that, in the prevention context (i.e., for context-based affective goals related to "feeling calmed" or "not feeling nervous"), high prevention participants did not show significant differences in the time needed to first attend (fixate) the goal-relevant stimuli in the conditions with repeated goals and change of goals, showing facilitated affective attention flexibility in this motivationally congruent context. In contrast, in the promotion context, the times to first fixate on goal-relevant stimuli of high prevention participants were longer in the condition of goal change compared to the condition of goal repeat. Current data suggests that the capacity to flexibly adjust attention to affective goals within different types of motivationally relevant contexts is modulated by the predominantly active motivational SF of the individuals. When there was congruence between the habitual motivational SF and the ongoing motivational context, participants were able to switch affective goals efficiently, as evidenced by facilitated affective attention flexibility in those specific contexts. These results are in line with previous findings reported by Shah & Higgins (2001), who found that participants with a predominantly active promotion SF were more efficient (i.e., faster) in appraising contextual objects in terms of cheerfulness-dejection, which is the emotional continuum associated with this promotion SF, whereas participants characterized by a predominantly active prevention SF were more efficient in appraising contextual objects in the prevention-based quiescence-agitation emotional continuum. The present findings suggest that motivational SF not only facilitate affective processing of specifically congruent motivational contexts but that one mechanism for such contextual efficiency in processing can be a facilitated context-based affective attention flexibility.

Our results support the relevance of studying affective attention as a context-based dynamically changing process. Unlike previous studies in which attention towards positive and negative information are studied through general free viewing

paradigms, without considering the role of contextual variables (Armstrong & Olatunji, 2012), the study of context-based affective attention flexibility allows for a deeper investigation of temporally adaptive patterns of information processing that may causally contribute to efficient stress management and emotion regulation (Godara et al., 2021; Sanchez et al., 2017). General individual differences in biased cognitions (i.e., tendencies to preferentially attend, interpret and remember specific affective information) has been shown to causally influence (dys)functional emotion regulation processes (e.g., Joormann & Vanderlind, 2014). However, current research on stress and emotion regulation highlights how context is an essential variable to adequately understand of the mechanisms allowing for flexible use of regulatory behaviors (Bonanno & Burton, 2013; Aldao et al., 2015; Sanchez-Lopez, 2021). Methods such as the one developed by Godara et al. (2020) and its adaptation in the current study are well-suited to study the flexible modulation of affective attention processes as a function of time-varying contexts and associated affective goals, and therefore to test their role as proximal mechanisms of emotion regulation flexibility. Future research should thus investigate whether enhanced affective attention flexibility for contexts that are congruent with a given emotional state and/or a given motivational SF supports more efficient motivationally-relevant goal fulfillment (e.g., gains' achievement or promotion of happy moods vs. loss' avoidance or prevention of anxious moods), depending on specific contextual demands (see, for instance, Sanchez-Lopez, 2021). In line with this, recent frameworks (Scholer et al., 2019) argue that an approach motivation may not always be beneficial, just as an avoidance motivation may not always be dysfunctional in every context. Therefore, future research should not only study the adaptiveness of motivationally-based mechanisms of flexible processing but also extend the knowledge on when and how they can turn dysfunctional. Such studies

may help to establish, for instance, whether contextual affective inflexibility contributes to elevated stress vulnerability in the form of increased depression and/or anxiety risk (Klenk et al., 2011; English et al., 2017; Millgram et al., 2019).

Context-based affective attention flexibility is a relatively new conceptualization aimed to better understand individual variability in affective functioning. This framework thus needs to be extended with further research to establish the implications of attention flexibility in information processing for consequent emotion regulation flexibility, in line with current proposals (e.g., Bonanno & Burton, 2013; Coifman & Bonanno, 2010; Godara et al., 2020). Therefore, next steps in the field should consider the cognitive, emotional or psychophysiological consequences that context-based affective attention flexibility has for individuals with different affective and motivational characteristics, such as the predominance of specific motivational promotion or prevention SF. In addition, research can benefit from the development of new experimental manipulations to improve the flexible component of context-based affective attention, in order to test whether this generates improvements in the effectiveness to interpret and process different contextual demands (for example, when changing goals within and across contexts) and/or reducing difficulties in the flexible processing of emotional information (e.g., difficulties in attentional disengagement from negative material in individuals with depression, Sanchez et al., 2013, 2017). In line with this, Godara et al. (2021) recently developed an affective attention flexibility training through a task focused on goal changes between contexts applying music reinforcements based on the contextually active emotional goal. Using this approach, trainees demonstrated increased affective attentional flexibility and were able to maximize attention to positive or negative information depending on the active goals in a stress task comprising context-based goal changes.

Our results further indicate that the predominant activation of one given motivational SF over the other one produced greater cognitive efficiency (i.e., improved affective attention flexibility) in some motivational contexts compared to others. Thus, in line with predictions from Higgins's theory (1997; 1998), another interesting venue would be to evaluate "motivational flexibility", i.e., the ability to change (switch) between motivational SFs, to generate adaptive and concrete processing based on the characteristics of the environment and the goals associated with it. Consequently, beyond motivational trait-based contextual flexibility markers, further research could extend our approach to study how momentary contextual demands influence the actual temporal activation of specific motivational SFs, and the influence of the latter on how affective attention is flexibly adjusted in response to specific contextual demands.

In sum, our results may inform new venues of future research. They were established with sufficient statistical power to test our main hypotheses concerning 3-way interactions and were based on reliable attention indices using a novel eye-tracking task. Yet, these findings should be considered with caution due to certain limitations. First, the sample was composed mainly of women, and further research should extend the study of context-based affective attention flexibility to more balanced samples and heterogeneous populations. Moreover, despite that our hypotheses were tested based on planned contrasts of 3-way interactions, they implied multiple comparison analyses that could generate an inflation of risk for type 1 error. In addition, the main results should be interpreted with certain caution since the supported flexibility phenomena found did not seem to be specific for conditions were the motivationally-relevant context for each type of SF remained constant (i.e., conditions of repeat context). The hypothesized flexibility effects (i.e., lack of general cognitive cost observed for repeat vs. switch for high promotion individuals in promotion contexts, for high prevention individuals in

prevention contexts) was found in both context repetition and context switch conditions. Further Context Type x Context Condition x Goal Condition x SF interactions were not significant, which might be due to a lack of statistical power to test additional 4-way interactions. Moreover, separate analyses of the Context Type x Goal Condition x SF interactions when the data were restricted to only context repetition trials did not support significant interaction effects in those specific occasions of repetition of context. Thus, our findings do not fully clarify whether the observed faster responding on the corresponding relevant trials for each type of SF may have occurred because participants high in the corresponding SF were faster to adopt the new task-set within specific contexts, and/or because they had faster disengagement of task-sets across contexts. For all these reasons, future studies are warranted to replicate the present results, also extending our set of planned contrasts, in order to clarify the specificity of SF-related flexibility patterns in larger samples. Furthermore, although former evidence supports that individuals tend to differ in the type of motivational SF they predominantly activate across situations (Klenk et al., 2011), the interpretation and processing of specific contexts is affected by the characteristics of the own situation. In our study, we experimentally manipulated such contexts in a way that interpretations and related affective goals were pre-established and matched to specific types of SF. Yet, to fully understand the interplay between motivational factors, contexts and goal-related affective processing, the evaluation of motivation as a trait is only an initial step, and further research integrating state measures of these variables is warranted. Moreover, despite the use of ecologically relevant motivational contexts in our study, they were framed into the performance of an experimental task. Whereas this is a necessary step to understand affective attention flexibility under controlled conditions, the future study of the interplay of motivation and attention within and across contexts

could benefit of also using other types of assessment techniques such as ecological momentary assessment procedures (see, for instance, Shiffman et al., 2008). These methods would allow to further assess temporal changes in motivation SF states and their associations with momentary affective attention preferences as they unfold across different contexts during daily life functioning.

4.1. Conclusion

Overall, our work opens a series of new avenues for the study of context, motivation and attention flexibility. Our results provide initial support for the hypotheses that motivation (based on the activation of different types of promotion and prevention motivational SF) can influence contextual affective attentional flexibility. Taken together, these findings may help to better understand the functioning of affective attentional flexibility, considering the importance of motivational individual differences and contexts.

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