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Boosted by closure! Regulatory focus predicts motivation and task persistence in the aftermath of task-unrelated goal closure

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Abstract

Past research has found that regulatory closure, that is, successful goal striving regulated either under a promotion or prevention focus, has important consequences in terms of motivational activation and mobilisation of cognitive resources in subsequent tasks, but it mostly investigated motivation in the same or similar tasks to the one for which closure was achieved. Drawing from an energisation-deactivation hypothesis, we investigated the effect of closure on performance and persistence in *unrelated* subsequent cognitive tasks. Across four studies, we found that promotion closure had an energising effect leading to: quicker decision times in lexical tasks (Studies 1–2), increased persistence and greater originality (Study 3), and greater visuospatial memory performance (Study 4). In contrast, prevention closure had a deactivating effect leading to reduced performance and persistence. No systematic differences arose in situations of non-closure. We discuss results and implications with respect to both regulatory closure and regulatory fit theoretical approaches.

KEYWORDS
goal activation, goal attainment, goal pursuit, regulatory closure, regulatory focus

1 | INTRODUCTION

In their goal pursuit, people may regulate themselves on the basis of two fundamental and independent motivation systems: promotion versus prevention (Higgins, 1997). According to regulatory focus theory, a *prevention* focus is related to security needs and the accomplishment of "oughts" (obligations and duties). It implies attention to the absence/presence of negative outcomes and results in quiescence/agitation-related emotions (Higgins et al., 1997; Shah & Higgins, 2001). Therefore, strategies associated with this focus are based on vigilance (Crowe & Higgins, 1997). A *promotion* focus on the other hand is related to nurturance needs and the accomplishment of "ideals" (hopes and aspirations). It implies attention to the absence/presence of positive outcomes, involves eagerness strategies, and results in dejection/cheerfulness-related emotions. Regulatory focus impacts several aspects of goal pursuit and goal perseveration. For example, being regulated by a promotion focus facilitates action initiation (Freitas et al., 2002), whereas being regulated by a prevention focus facilitates persistence in action when getting close to the goal (Fuglestad et al., 2008). Moreover, attaining a goal under a promotion versus a prevention focus has very different consequences on subsequent mobilisation of cognitive resources. This has been referred to as "regulatory closure".

2 | REGULATORY CLOSURE

The goal literature shows that when individuals attain an aspired-to goal, they can disengage from it and allocate cognitive resources to another competing goal instead (Kruglanski et al., 2002; Schwörer

et al., 2020; Shah, 2005). However, how much individuals move away from an attained goal seems to depend on the regulatory focus during goal pursuit. Experimental results show that prevention closure (i.e., attaining an "ought" goal or successfully avoiding negative outcomes) has a relaxing effect on the individual, putting him or her in a "deactivating state that disengages rather than engages the individual" from the task at hand and the associated goal domain (Baas et al., 2011, p. 796). In contrast, promotion closure (i.e., attaining an "ideal" goal or successfully achieving positive outcomes) has an energising effect on the individual, who as a result maintains and invests more cognitive resources towards the task and in the given goal domain. This relaxing versus energising effect has been explained by referring to the specific emotional response associated with each focus (Baas et al., 2011). Prevention success is associated with relief and calmness (Higgins et al., 1997; Shah & Higgins, 2001), which are low-arousal emotions (Carver, 2004; Russell & Barrett, 1999). On the other hand, promotion success triggers cheerfulness and excitement, which are high-arousal emotions.

Previous work has investigated the effects of regulatory closure (operationalised by giving positive performance feedback) in terms of persistence working on, and performance in subsequent related tasks (i.e., disengagement versus persistence within the same goal domain). For example, prevention-oriented participants performed worse in a second visual search test after having received positive performance feedback on a first similar test, than after having received negative feedback. In contrast, promotion-oriented participants performed better after having received positive than negative feedback (Shu & Lam, 2016). Imagining or experiencing success in a prevention-framed task also lowered participants' engagement and performance in a subsequent related task, whereas imagining/experiencing success in a promotion-framed task increased subsequent performance (Van Dijk & Kluger, 2004, 2011; see also Förster et al., 2001; Idson & Higgins, 2000; Shu & Lam, 2011).

Another line of research extended these initial studies by investigating regulatory closure not just as eliciting disengagement or persistence in the same domain, but as a potential energising force triggering engagement at a general level, thus showing effects in unrelated tasks as well. Specifically, Baas et al. (2011) studied the effect of a general state of regulatory closure on performance in creativity tasks (see also Baas et al., 2008). Participants were asked to recall a past event where they had experienced a promotion success (gain) or prevention success (non-loss) before completing a creativity task, unrelated to the past event recalled. Creativity dropped following the recall of a prevention success, as compared to a promotion success. In contrast, creativity was not different when participants were asked to recall a past episode of either promotion failure (non-gain) or prevention failure (loss).

The authors explained this latter effect by pointing to research demonstrating that an unfulfilled goal is associated with a discrepancy-related tension (Förster et al., 2005) indicating that the individual needs to keep working towards the accomplishment of the goal (Gollwitzer et al., 2013; Gollwitzer et al., 1982; Wicklund & Gollwitzer, 1982). This is assumed to happen regardless of the focus: promotion failure results in frustration and anger, and prevention failure results in fear and anxiety—different but equally arousing negative emotions, all indicating that more effort is still needed (Carver, 2004, 2006; Higgins, 1997; Russell & Barrett, 1999; Shah & Higgins, 2001). Moreover, self-reported feelings of activation were found to mediate the effect of regulatory closure on creativity performance (Baas et al., 2011).

In sum, Baas and colleagues' studies (2011) suggest that promotion closure has an activating effect that translates into higher motivation to invest cognitive resources towards another task, whereas prevention closure translates into deactivation and subsequent disengagement from the task. In contrast, both promotion and prevention non-closure should keep the individual in an activated state, translating into higher investment of cognitive resources. Yet, these studies focused solely on creativity, which is known to be affected by regulatory focus—a large body of research showing an advantage of promotion over prevention in creativity tasks (without considering closure; e.g., Friedman & Förster, 2001, 2005; Sacramento et al., 2013; Wu et al., 2008). Authors suggest that promotion focus is associated with cognitive flexibility and divergent thinking, which are determinant of success in creativity tasks (see Amabile, 1996; De Dreu et al., 2008). As a consequence, different rates of success observed after promotion closure versus prevention closure in creativity tasks could be due at least partly to qualitatively different cognitive processing of these tasks (such as cognitive flexibility and divergent thinking).

The differences observed by Baas et al. (2011) could hence represent a complex mix between the closure versus non-closure situation and differences in cognitive thinking intrinsically linked to the foci, rather than a sole difference in the general state of energisation due to closure. The purpose of the present research is to analyse the effect of regulatory closure on performance in several different tasks of a different nature, where mobilisation of cognitive resources facilitates performance but cognitive flexibility and/or divergent thinking are not needed, in order to rule out the alternative explanation based solely on these latter processes. We argue that replicating over a variety of tasks the differences observed by Baas and colleagues in creativity tasks would produce stronger evidence strengthening the claim that it is indeed heightened energisation that underlies the effects of promotion/prevention closure.

3 | OVERVIEW OF THE STUDIES

3.1 | Overview and hypotheses

We present a set of four studies that test the interactive impact of regulatory focus (promotion vs. prevention) and goal closure (closure vs. non-closure) on mobilisation of cognitive resources in an unrelated subsequent task. The set of studies uses several tasks grounded in completely different cognitive abilities to ensure validity of the claim of an energisation effect corresponding to a greater mobilisation of cognitive resources *in general*, irrespective of the specific cognitive process underlying success in the task. Indeed, we propose that the difference between promotion and prevention closure does not arise from specific cognitive processes activated under one focus but rather from this more general energisation effect. We consider energisation

as representing both motivational *direction* and *intensity*; that is, both higher arousal and greater on-task effort (Humphreys & Revelle, 1984).

In other words, the effect first identified with creativity tasks should appear on a variety of tasks, regardless of the specific cognitive processes called into action. Therefore, we consider a range of different (verbal and visuospatial) tasks in which we assess speed (decision time), accuracy, originality, memory span, and/or persistence, as a function of regulatory focus and closure. Given the marked differences in specific underlying cognitive processes, we argue that a similar result across these tasks could hardly be explained by a differential activation of all specific cognitive processes involved, but much more parsimoniously so by a greater mobilisation of resources in general, that is, a motivational energisation effect. As such, a replication of the regulatory closure effect across a range of different tasks (beyond mere creativity) would produce stronger evidence in favour of a motivational energisation explanation. It would hence advance the current state of research by ensuring that the effect is not limited to a specific set of cognitive processes mobilised to succeed in creativity tasks but depends in fact on a more generalised motivational mechanism.

We expect promotion closure to have an energising effect on participants and thus to lead to higher performance and persistence in the subsequent unrelated task as compared to prevention closure, which should have a de-energising effect. In contrast, with respect to a non-closure hypothesis, the unfulfilled goal should lead to similar levels of performance and persistence in conditions of non-closure for both participants with a promotion and a prevention focus. Let us note briefly that the non-closure hypothesis might seem at odds with a regulatory fit hypothesis (Higgins, 2000, 2006), an issue to which we turn in the general discussion in the light of the present findings. To summarise, we expect a regulatory focus × closure interaction effect, and a simple effect of focus in the closure condition specifically (Studies 1–4). In two of the studies (Studies 2 and 3), we also include a control condition with no closure information to ensure that any effect is indeed due to the state of goal closure and is not evinced by default. Although the hypotheses focus on the two simple effects of focus (in the closure and non-closure conditions), we also report the two simple effects of (non-)closure for each study (in the promotion and prevention focus conditions) for clarity and transparency purposes.

We chose environmental goals (unrelated to the subsequent tasks) where we manipulated closure. The majority of our participants (Studies 1–3) were university students, who are known to consider environmental issues as personally relevant and important, and are generally committed to protect the environment (e.g., Dunlap et al., 2000). Hence, we reasoned (non-)closure of a proenvironmental goal would be self-relevant for participants. We initially measured participants' proenvironmental commitment in all studies; as expected, their commitment was fairly high.[1] Excluding the few participants with weak commitment did not change the results, and commitment did not interact with the other variables. We used a bogus feedback procedure to put participants in a state of closure (vs. non-closure) with respect to the goal of protecting the environment. At first glance, it might seem that a high-level goal such as one's proenvironmental goal is unfit to study goal completion, as it is rather infinite in nature (and hence could never be "complete"). However, varied evidence arising notably from moral self-licensing literature suggests that even high-level goals can lead to satisfactory feelings of progress towards the goal and self-completion, and from there to reducing one's efforts towards the goal. A pilot study was conducted to ensure this was the case with the current bogus feedback procedure (see details below).[2]

3.2 | Sample size, power analysis, and small-scale meta-analysis approach

We determined sample size based on a priori power analyses conducted on G*Power (Faul et al., 2007). Although the present verbal and visuospatial tasks are different from the creativity tasks used in past research and could thus yield effects of different size, we drew from Baas et al. (2011) to approximate an expected effect size for the regulatory focus × closure interaction. We averaged the effect sizes reported for the interaction in their three studies and obtained Cohen's $d = 0.51$. On this basis and following recommendations by Perugini et al. (2018), we calculated the sample size required to detect such an effect as significant at α-level of .005 with 80% power. The analysis recommended a minimum $N = 209$ for a 2 × 2 design (Study 1), and $N = 247$ for 2 × 3 designs (Studies 2 and 3). Hence, we aimed to attain at least these numbers of participants in our studies. Study 4 was conducted in a later step and we recalibrated the power analysis based on observed results of Studies 1–3.

We additionally ran a small-scale meta-analysis on the combined results of the four studies, which allows us to interpret and conclude from the findings with greater confidence and reliability. Results of each individual study are still reported in detail, but we refrain from over-interpreting the significance of each effect in isolation, choosing instead to base the interpretation on the meta-findings. For clarity and transparency and as explained above, the meta-analysis considered all four simple effects from the focus × closure interaction.

We report all measures assessed and manipulations taken in these studies. We did not set any exclusion criterion and no participant was excluded from the datasets. All data are publicly available on the OSF webpage dedicated to the project: https://osf.io/dqxzr/?view_only=7252732160f14373bba385d3b873b315.

[1] Pro-environmental commitment was measured in all studies with 10 items (e.g., "I feel personally invested in protecting the environment") on a 7-point scale (1 = not at all, 7 = very much), except for Study 1 which included only six items. Scores by study were, Study 1: $M = 4.92$, $SD = 1.12$; Study 2: $M = 4.96$, $SD = 1.20$; Study 3: $M = 5.61$, $SD = .99$; Study 4: $M = 5.24$, $SD = 1.06$. Differences with the midpoint of the scale were all significant, respectively, Study 1: $t(286) = 13.9$, $p < .001$, Cohen's $d = 0.82$; Study 2: $t(252) = 12.8$, $p < .001$, $d = 0.80$; Study 3: $t(275) = 27.0$, $p < .001$, $d = 1.63$; and Study 4: $t(324) = 21.1$, $p < .001$, $d = 1.17$.

[2] Findings related to self-completion theory suggest indeed that a sense of completeness can occur even for high-level identity-defining goals. For example, participants whose identity-relevant intentions were noticed by others (i.e., read out loud) reported lower identity-relevant behaviour one week later than participants whose intentions had been ignored by others, presumably because in the former case social validation procured a sense of self-completeness (Gollwitzer et al., 2009). In other studies participants who recalled personal past moral behaviour (Jordan et al., 2011) and participants who reflected on progress made towards their environmental goal (Geng et al., 2016) subsequently expressed lower prosocial and proenvironmental intentions – presumably because reflecting on past good deeds had procured a sense of goal completion (see also Susewind & Hoelzl 2014). Finally, Longoni et al. (2014) observed a similar decrease in proenvironmental efforts following positive feedback on participants' past environmental behaviour, which they explicitly linked to the achieved state of goal completeness.

4 | STUDY 1: LEXICAL DECISION TASK (YES/NO)

We relied on a lexical decision task to assess how much cognitive resources participants mobilise following a manipulation of goal closure versus non-closure. Lexical decision tasks are used to assess the accessibility of certain words in semantic memory or the strength of word associations (e.g., Meyer & Schvaneveldt, 1971). They can also, however, inform about motivation and cognitive resources mobilisation. Indeed, regardless of the words' characteristics (e.g., lexical frequency), decision times decrease when participants invest more cognitive resources in the task (Mutter & Hashtroudi, 1987), and conversely increase with cognitive load (Cohen & Gollwitzer, 2008). Moreover, heart rate deceleration (an indicator of cognitive processing) predicts faster responses in the lexical decision task (Panayiotou & Vrana, 2004). Correct answers (i.e., "word" or "non-word") are supposed to be obvious for any native speaker and indeed rates of correct answers are usually extremely high in such decision tasks—the variability appearing, rather, on time taken to answer. The latter measure is thus most often used as the relevant indicator of performance, rather than the mere rate of correct answers. Hence, for the first study we relied on (shorter) lexical decision times as an indicator of (greater) general mobilisation of cognitive resources in the task.

4.1 | Method

4.1.1 | Participants

A total of 320 undergraduate students in psychology at the University of Geneva (65 male and 255 female) of an average age of 20.8 years ($SD = 4.20$) participated in the study in exchange for course credits. The entire class was enrolled in the study, resulting in a greater sample size than minimally required. They participated in sessions of 30–40 people in the university computer rooms. The study adopted a 2 (Regulatory Focus: promotion vs. prevention) × 2 (Closure: closure vs. non-closure) between-subject design, and participants were randomly assigned to one of the four experimental conditions (promotion-closure: $n = 78$, prevention-closure: $n = 82$, promotion-non closure: $n = 81$, prevention-non closure: $n = 79$). The study and the following ones were approved by the Faculty of Psychology's ethics committee at the University of Geneva. At the end of each study, participants were thoroughly debriefed and confirmed their consent to the use of their data.

4.1.2 | Procedure and materials

The study was presented as comprising two independent parts, the first related to the theme of environmental protection, and the second to lexical capabilities. All participants started with the regulatory focus manipulation task before going through the proenvironmental goal (non-)closure procedure. They then carried on with the lexical decision task in which we measured decision times.

Regulatory focus

Regulatory focus was induced through the "current ideals or ought procedure" described by Freitas and Higgins (2002) (see also Guo & Spina, 2015). In the promotion (vs. prevention) condition, participants read "We will now ask you to perform a visualisation task. Please think about something you ideally would like to do (you think you ought to do). In other words, please think about the hopes or aspirations (duties or obligations) that you currently have. Please spend at least 2–3 min to think about these hopes or aspirations (duties or obligations) as this is very important for the study." They then reported on one or two of such hopes (duties). The questionnaire was configured so that it was not possible to continue to the next page before at least 60 s had elapsed. Participants spent about 2½ min (median of 150 s) on the task.

Pro-environmental goal (non-)closure

Participants answered 20 questions inspired by the General Environmental Behaviours Scale (Kaiser & Wilson, 2004) assessing their daily-life green behaviours (e.g., "For my everyday travelling, I use public transportations or bicycle or walk", "I eat vegetable protein sources instead of meat", "I favour companies with an ecological background"). They then received a bogus feedback allegedly based on their answers to these questions. The feedback defined the participant's position relative to an alleged official standard (set at 50 points on a scale ranging from 0 to 100), that is, the "official recommendations of the national Office of Sustainable Development for protecting the environment" (see Lalot et al., 2018; Longoni et al., 2014, for similar paradigms). Depending on the experimental condition (non-closure vs. closure), participants received a negative feedback (score of 35 out of 100) versus a positive feedback (score of 65) depicted on a graph. The webpage depicting the graph was programmed so that participants had to spend at least 10 s on the feedback page before being able to continue.[3]

We piloted the goal closure manipulation to ensure that the given scores would indeed trigger a sense of (non-)closure. Detailed results of the corresponding pilot study ($N = 202$) are reported in Electronic Supplementary Material (ESM1). In summary, results confirmed that a score of 35/100 led all participants (irrespective to the regulatory focus manipulation) to consider they were "far from" achieving their goal, on average. The score of 65/100 led participants in prevention (but not promotion focus) to believe they were "close to achieving their personal environmental goal" (where participants in promotion were more likely to believe they were only "on the way of achieving their goal"). Replicating past findings (Lalot et al., 2022), following positive feedback participants in promotion focus set a higher personal proenvironmental goal whereas participants in prevention focus were happy merely to maintain their goal at the level they had reached. In sum, the pilot study demonstrated that a score of 35/100 induced goal non-closure irrespective of the focus, while a score of 65/100 induced goal closure in a prevention focus solely.

[3] At the end of the experiment, when participants were asked to recall the feedback they had received, 95% of them (304) did recall their feedback, and those who did not were equally split between the positive feedback (7) and negative feedback condition (9). Excluding these participants from the analyses did not impact the results. Figures were similar for the following studies.

TABLE 1 Descriptive statistics of the measures of performance and persistence as a function of regulatory closure and regulatory focus for Studies 1–4

	Non-closure		Control		Closure	
	Prevention	Promotion	Prevention	Promotion	Prevention	Promotion
Study 1						
Decision times	397 (98)	412 (83)	–	–	424 (92)	390 (83)
Study 2						
Decision times	778 (127)	776 (125)	755 (116)	780 (106)	821 (155)	754 (116)
Study 3						
Items solved	11.54 (1.50)	11.35 (1.55)	11.48 (1.76)	11.46 (1.68)	11.57 (2.03)	11.73 (1.58)
Originality	16.40 (3.95)	17.71 (4.59)	16.68 (3.55)	16.37 (4.27)	18.17 (6.16)	16.23 (4.50)
Persistence	254 (108)	286 (148)	322 (172)	337 (307)	257 (118)	378 (219)
Study 4						
Corsi span	5.44 (0.98)	5.12 (1.10)	–	–	5.02 (1.01)	5.40 (0.96)

Note: Standard deviations are indicated in brackets. For *Studies 1 and 2*, the measure is mean decision times in the yes/no lexical decision task (in milliseconds). For *Study 3*, measures are number of items solved (from 0 to 13), mean originality of solutions found (% frequency of the response across the sample; lower frequency indicating more original solution), and persistence in terms of time spent on the task (in seconds). For *Study 4*, the measure is average Corsi (visuospatial memory) span over four tasks (score from 0 to 9).

Dependent variable: Decision times

The dependent variable was assessed by using a yes/no lexical decision task, presented as an unrelated study. The task was created on E-Prime 2.0. It required participants to determine as quickly and accurately as possible whether strings of letters appearing on the screen were words or non-words. Participants were instructed to put their two index fingers on the keyboard keys "E" and "I", and to press the former when the presented item was a word and the latter when it was a non-word. Fifteen words were created through a random word generator (e.g., "figure") and 30 non-words were created through the pseudoword generator Wuggy (Keuleers & Brysbaert, 2010) based on the initial words template (two variations per initial word, e.g., "tesure"). Participants first went through a training phase of ten items (five words and five non-words, different from the test items) and then completed the test phase, which included three blocks. In each block, the 45 items were presented in a randomised order. Participants could take a break between the blocks. All trials appeared at the centre of the screen, preceded by a 1000-ms fixation cross (+). A lower-case string of letters was then presented and remained on the screen until participants pressed a key. To ensure that shorter decision times really indicated better performance and not simply speeding through the task, only correct responses were considered in the analyses (86% of all responses). In addition, we tested whether error rates differed between experimental conditions. Results (reported in a footnote) ensured that error rates were similar across conditions.[4] Overall, mean decision time was 406 ms ($SD = 90$); for further descriptive statistics, see Table 1.[5]

4.2 | Results

We ran a repeated-measure ANOVA with block of presentation as the first within-subject factor, word category (word versus non-word) as the second within-subject factor, and Regulatory Focus (Promotion = 1, Prevention = −1), Closure (Closure = 1, Non-closure = −1), and their interaction as between-subject factors. There was a linear main effect of block of presentation indicating a learning effect, so that decision times got shorter as participants carried on from the first ($M = 450$ ms, $SD = 111$) to the second ($M = 396$ ms, $SD = 94$), and to the third block ($M = 373$ ms, $SD = 89$), $F(1, 316) = 288.1$, $p < .001$, Cohen's $d = 1.91$, 95% CI [1.64, 2.17]. There was also a main effect of word category, so that decision times were shorter for words ($M = 353$ ms, $SD = 91$) than non-words ($M = 438$ ms, $SD = 101$), $F(1, 316) = 638.1$, $p < .001$, $d = 2.84$, 95% CI [2.53, 3.15]. The main effects of Regulatory Focus and Closure were not significant, $F_s < 0.85$, $p_s > .35$, $d_s < 0.10$. More interestingly, the expected Regulatory Focus × Closure interaction effect was significant, $F(1, 316) = 5.27$, $p = .022$, $d = 0.26$, 95% CI [0.04, 0.48].

As predicted, participants in prevention closure were slower to respond than those in promotion closure (see Figure 1), $t(316) = -2.36$, $p = .019$, $d = -0.27$, 95% CI [−0.49, −0.04]. The simple effect of Regulatory Focus was nonsignificant in the Non-closure condition, $t(316) = 1.08$, $p = .28$, $d = 0.12$, 95% CI [−0.10, 0.34]. We additionally explored the simple effects of each focus, to determine whether the difference was driven by a demobilisation effect in prevention, an energisation effect in promotion, or both. The difference in prevention focus was just short of significance, and participants in prevention focus tend

[4] We tested whether Regulatory Focus and Closure impacted error rate in Study 1 with a full-factorial ANOVA. The interaction was not significant, $F(1, 316) = 0.02$, $p = .88$, Cohen's $d = 0.02$, 95% CI [−0.21, 0.24], nor were any of the main effects, $F_s < 1.78$, $p_s > .18$. In Study 2, we ran a full-factorial ANOVA with Regulatory Focus, the two contrasts corresponding to closure C1 and C2 and all relevant interactions. The C1 × Regulatory Focus interaction was not significant, $F(1, 247) = 1.82$, $p = .18$, $\eta^2_p = .01$, nor were any of the main effects, $F_s < 1.35$, $p_s > .25$.

[5] In similar lexical decision tasks, authors often decide to exclude responses times that are either extremely fast or extremely slow. Criteria for exclusion, however, vary from study to study. We chose here not to exclude any responses times from the aggregated data. It should be noted that excluding outliers responses times (> 2,500 ms) did not change the results of the analyses.

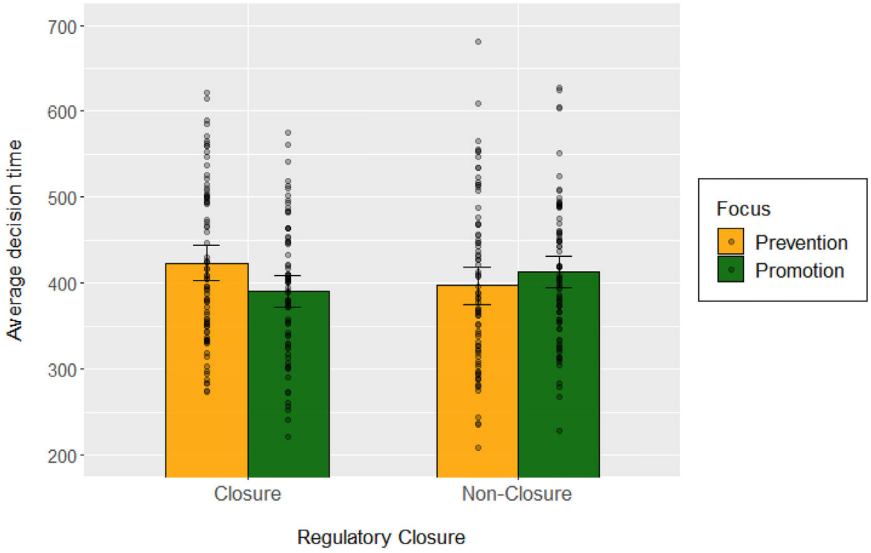

FIGURE 1 Decision times (in ms) in the yes/no lexical decision task as a function of focus and regulatory closure in Study 1. Error bars represent 95% confidence intervals.

to respond more slowly in the Closure than in the Non-closure condition, $t(316) = 1.87$, $p = .062$, $d = 0.21$, 95% CI [−0.01, 0.43]. No significant difference across closure conditions was found in promotion focus, $t(316) = -1.56$, $p = .119$, $d = -0.18$, 95% CI [−0.40, 0.05].

4.3 | Discussion

This first study revealed that participants with a prevention as compared to a promotion focus mobilised fewer cognitive resources in a subsequent unrelated verbal task (as indicated by longer decision times) when they were in closure (i.e., they had received positive feedback on their pro-environmental behaviour). In contrast, when participants were in non-closure (i.e., had received negative feedback), they mobilised an equal amount of resources in the promotion and prevention focus conditions.

Whilst consistent with our hypotheses, the pattern of results was less pronounced than expected, especially for simple effects. One possible explanation refers to the format of the lexical decision task used. Yes/no lexical decision tasks have been criticized for suffering from non-optimal responding accuracy and high processing demand (Perea et al., 2002). As an alternative, authors have suggested a go/no-go format of the lexical decision task (Gordon, 1983; Gordon & Caramazza, 1982). Hence, we conducted a second study that aimed to replicate the pattern of findings obtained in Study 1 while relying on a go/no-go, in lieu of a yes/no, lexical decision task. Moreover, in Study 2 we added a control condition with no closure information in order to ensure against any default effect of regulatory focus in the verbal task, and to better disentangle the effects imputable to closure and non-closure. We expected the control condition to be similar to the non-closure condition, as no goal would be achieved in any of these conditions—as compared to the closure condition. In other words, we specifically hypothesised a simple effect of regulatory focus in the closure condition but neither in the non-closure nor in the control condition.

5 | STUDY 2: LEXICAL DECISION TASK (GO/NO-GO)

5.1 | Method

5.1.1 | Participants

A total of 253 undergraduate students in psychology at the University of Geneva (42 male and 211 female) of an average age of 21.3 years ($SD = 5.06$) participated in the online study in exchange for course credits. The study adopted a 2 (Regulatory Focus: promotion vs. prevention) × 3 (Closure: closure vs. non-closure vs. control) between-subject design, and participants were randomly assigned to one experimental condition (promotion-closure: $n = 45$, prevention-closure: $n = 39$, promotion-control: $n = 38$, prevention-control: $n = 47$, promotion-non closure: $n = 43$, prevention-non closure: $n = 41$).

5.1.2 | Procedure and materials

Again, we first induced a promotion versus prevention focus, and then provided positive, negative, or no feedback on whether participants were meeting the alleged official standard for environmental protection behaviour. To decrease potential suspicions about the research hypothesis, a filler task (a personality questionnaire, taking approximatively 5 min to complete) was introduced after the feedback procedure. Participants then finally completed the lexical decision task.

Regulatory focus

Regulatory focus was induced the same way as in Study 1 through the "current ideals or ought procedure" (Freitas & Higgins, 2002). Participants spent about 2 min (median of 124 s) on the task.

Pro-environmental goal (non-)closure

Closure was manipulated as in Study 1 but a control condition was added. Participants answered 20 questions assessing their daily-life green behaviours, on the basis of which they received either a positive, negative, or no feedback (Closure vs. Non-closure vs. Control condition, respectively).

Dependent variable: decision times

The dependent variable was measured through a go/no-go lexical decision task, presented as an unrelated study. The task was created and hosted on PsyToolkit (Stoet, 2010, 2017), and consisted in determining, as quickly and accurately as possible, whether strings of letters appearing on the screen were words or non-words. Participants were asked to press the space bar if the item was a word, and not to respond if the item was a non-word (see Gordon, 1983; Perea et al., 2002). The materials included 21 words and 21 non-words. Participants first went through a training phase of six items (three words and three non-words, different from the test items) and then completed the test phase, which included two blocks. In each block, the same 42 items were presented in a randomised order. All trials appeared at the centre of the screen, preceded by a 200 ms fixation cross (+). A lower-case string of letters was then presented and remained on the screen until participants pressed the space bar (deciding the item was a word) or until 2,000 ms had elapsed. Intertrial time was set to 500 ms. Most responses were correct (93% correct, 5% false alarm, and 2% miss). Again, only correct responses (for words) were considered in the analyses. As in the previous study, error rate was unaffected by the experimental manipulations (see note[4]). Overall mean decision time was of 776 ms (SD = 125, see Table 1 for further descriptive statistics).

5.2 | Results

Respecting our specific hypothesis that the effect of regulatory focus should only be evinced in the closure condition, we entered Closure as a set of two contrasts (hypothesis contrast C1: Closure = 2, Non-closure = −1, Control = −1; orthogonal contrast C2: Closure = 0, Non-closure = −1, Control = 1). We then ran a repeated-measure ANOVA with block of presentation as the within-subject factor, and Regulatory Focus (Promotion = 1, Prevention = −1), C1, C2, and their relevant interactions as between-subject factors. Consistent with Study 1, the analysis yielded a main effect of the block of presentation, so that decision times were shorter in the second block (M = 745 ms, SD = 123) than in the first (M = 808 ms, SD = 143), $F(1, 247) = 129.3$, $p < .001$, $d = 1.44$, 95% CI [1.16, 1.72]. More importantly, the expected C1 × Regulatory Focus interaction was significant, $F(1, 247) = 5.33$, $p = .022$, $d = 0.29$, 95% CI [0.04, 0.54]. No other effect reached significance, $F_s < 0.86$, $p_s > .35$, $d_s < 0.12$.

Consistent with our hypothesis, in the Closure condition participants were slower to respond when they were put in a prevention than a promotion focus, $t(249) = -2.43$, $p = .016$, $d = -.31$, 95% CI [−0.56, −0.06]. In contrast, regulatory focus produced no difference in the Non-closure, $t(249) = -0.08$, $p = .93$, $d = -.01$, 95% CI [−0.26, 0.24], nor the Control condition, $t(249) = 0.92$, $p = .36$, $d = .12$, 95% CI [−0.13, 0.37] (see Figure 2). Furthermore, participants in prevention focus were slower to respond in the Closure condition as compared to the Non-closure and Control condition, $t(247) = 2.26$, $p = .025$, $d = 0.29$, 95% CI [0.04, 0.54]. Decision times were not significantly different across closure conditions for participants in promotion focus, $t(247) = -1.01$, $p = .31$, $d = -0.13$, 95% CI [−0.38, 0.12].

5.3 | Discussion

The second study provides further evidence that participants who have received positive feedback on their pro-environmental behaviour mobilise fewer cognitive resources in a subsequent unrelated verbal task (as indicated by longer decision times) when being prevention-focused as compared to being promotion-focused. In contrast, in conditions of non-closure (negative feedback), participants in a prevention focus invested as much cognitive resources as participants in a promotion focus. This latter pattern was also evinced in the control condition where participants received no feedback and hence presumably did not reach closure either. Shorter decision times in promotion closure were found for a similar rate of error across conditions, which suggests that the energisation effect indeed translates into greater performance and not merely speeding through the task. As such, Study 2 using an improved version of the lexical decision task replicates and strengthens the results of our first study.

However, a limitation of Studies 1 and 2 is that they only relied on decision times as a proxy for mobilisation of cognitive resources in the subsequent task. We hence conducted a third study to address this limitation, approaching cognitive resources mobilisation through another way, that is, participants' persistence in the task. Indeed, the energisation-demobilisation hypothesis implies that participants should show greater persistence in the task following promotion (vs. prevention) closure (i.e., persisting for a *longer* time on the task). To investigate this possibility, in Study 3, we relied on a word completion task paradigm where participants could invest as much time as they wanted. This task also allowed us to consider the number of items correctly solved as a second indicator of performance. Indeed, and in contrast with the lexical decision tasks used in Studies 1 and 2, we anticipated that participants would not solve all items, but that the number of items solved would increase with participants' persistence in the task. Finally, we considered a third index, namely the relative frequency of solutions found by the participants, as an indicator of originality (itself a key dimension of creativity). This last measure allowes us to link the present findings back to Baas and colleagues' (2011) original findings (which all revolved around indicators of creativity) and to assess this dimension as a more direct replication of their results.

In addition, Studies 1 and 2 both used the same manipulation of regulatory focus. As experimental manipulations often only pertain to certain aspects of the theoretical concept to be operationalised (e.g., Chen & Bei, 2017), conceptual replications with different manipulations are vital to ensure that the concept is indeed grasped—the respective shortcomings of each method cancelling each other out by

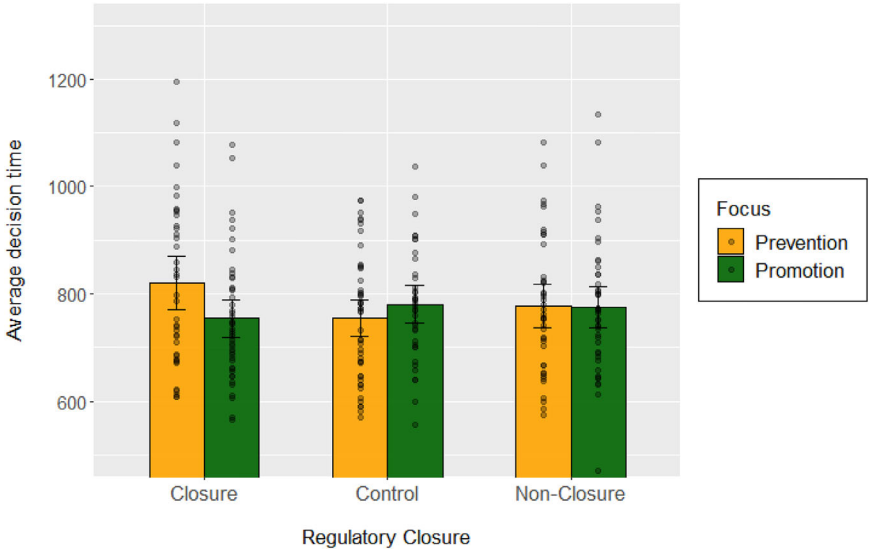

FIGURE 2 Decision times (in ms) in the go/no-go lexical decision task as a function of focus and regulatory closure in Study 2. Error bars represent 95% confidence intervals.

force of repetition (see Webb et al., 1966). In Study 3, we therefore turned to a different regulatory focus manipulation, which we describe below. Consistent with previous findings, we expected participants in prevention closure to persist for less time, solve fewer items, and find less original solutions, than participants in promotion closure, but no difference between promotion and prevention in the non-closure and control conditions.

6 | STUDY 3: WORD COMPLETION TASK

6.1 | Method

6.1.1 | Participants

Students at the University of Geneva were contacted by email to participate in an online study. The sample included 277 participants (97 male and 180 female) with an average age of 24.9 years ($SD = 8.03$). The study adopted a 2 (Regulatory Focus: promotion vs. prevention) × 3 (Closure: closure vs. non-closure vs. control) between-subjects design, and participants were randomly assigned to one of the six experimental conditions (promotion-closure: $n = 48$, prevention-closure: $n = 44$, promotion-control: $n = 46$, prevention-control: $n = 54$, promotion-non closure: $n = 48$, prevention-non closure: $n = 37$).

6.1.2 | Procedure and materials

As in Studies 1 and 2, the study was presented as a two-part survey, the first being related to environmental protection, and the second consisting of a test of lexical abilities. The procedure unfolded as in the previous studies, starting with the regulatory focus manipulation, then the pro-environmental goal (non-)closure procedure, and finally the word completion task.

Regulatory focus

The regulatory focus induction aimed to put participants into a specific mindset (a value-framing procedure; see Falomir-Pichastor et al., 2011, Study 3). To create a cover story coherent with the closure manipulation, participants were asked to think about pro-environmental values, according to which "every individual should do their best to combat environmental issues such as global warming, energy overconsumption and depletion of natural resources". Three short tasks were then presented that covered different aspects of regulatory focus: type of goal, type of strategy, and outcome valence. Depending on experimental condition, participants indicated to what extent their environmental values represented a personal ideal, a moral aspiration, and a goal to attain (promotion condition) versus an obligation, an ought, and a requirement to respect (prevention condition; 1 = Not at all, 7 = Absolutely). Second, they listed two positive consequences of proenvironmental actions as well as two examples of strategies and means allowing people to act in agreement with environmental values and promoting environmental behaviour (promotion condition) versus two negative consequences of anti-environmental actions and two examples of strategies preventing people from acting in disagreement with environmental values and preventing anti-environmental behaviour (prevention condition). Finally, they reported to what extent they would feel certain emotions when acting in a pro- (three emotions) and anti-environmental manner (three emotions). In the promotion (vs. prevention) condition, the positive emotions were related to cheerfulness (vs. quiescence) and the negative emotions were related to dejection (vs. agitation; see Shah & Higgins, 2001). Participants spent a median time of around 4 min ($Me = 243$ s) on the task.

Pro-environmental goal (non-)closure

Closure was manipulated as in Study 2. Participants answered 20 questions assessing their daily-life green behaviours, on the basis of which they received either positive, negative, or no feedback (closure vs. non-closure vs. control condition, respectively).

Dependent variables: Persistence, performance and originality in the word completion task

The word completion task was presented as a second and unrelated short study, in which the researchers were interested in "the participants' lexical capabilities". The goal was to complete a series of letters with a given number of missing letters to form a "real" word. Items were generated using a lexical tool (Lexique 3; New, 2006) to allow several different correct answers. Some items displayed the first letters of the word (e.g., MIS_ _ _ _) and some others displayed the last letters (e.g., _ _ _ LET). Words' length ranged from three to ten letters. All thirteen items appeared together on a single page (in a randomised order) and participants were asked to solve as many as they could. They were explicitly allowed to leave fields blank if they could not find a solution, and we recorded how much time they spent on the task ($M = 309$ s, $SD = 196$). We additionally calculated the relative frequency of solutions found, that is, how frequent versus unique one participant's answers were (mean percentage frequency ranged 5.30-50.20%, $M = 16.93$, $SD = 4.58$—a smaller number indicating less frequent, hence more unique answers). We finally considered the number of items correctly solved. Unexpectedly, most participants solved all or almost all items (33% solved all 13 items, 30% solved 12 items, and 19% solved 11; $M = 11.5$ items, $SD = 1.68$; see Table 1).

6.2 | Results

6.2.1 | Time spent on the task

As is often the case with single time measures, the variable was not normally distributed; we therefore applied a logarithmic transformation before running the statistical analyses (results were roughly similar when considering raw times). As in Study 2, we entered closure as a set of two contrasts (hypothesis C1: Closure = 2, Non-closure = −1, Control = −1; orthogonal C2: Closure = 0, Non-closure = −1, Control = 1). We ran a linear regression model including Regulatory Focus (Promotion = 1, Prevention = −1), C1, C2, and the relevant interactions. The analysis revealed a main effect of Regulatory Focus, $t(271) = 2.56$, $p = .011$, $d = 0.31$, 95% CI [0.07, 0.55], and a marginal main effect of the orthogonal contrast C2, $t(271) = 1.92$, $p = .056$, $d = 0.23$, 95% CI [−0.01, 0.47]. More importantly, the expected C1 × Regulatory Focus interaction was significant, $t(271) = 2.65$, $p = .008$, $d = 0.32$, 95% CI [0.08, 0.56]. No other effect reached significance, t_s (271) < 0.71, $p_s > .47$, $d_s < 0.08$.

In the Closure condition, participants spent less time on the task when put in a prevention than a promotion mindset, $t(273) = 3.64$, $p < .001$, $d = 0.44$, 95% CI [0.20, 0.68]. In contrast, there was no difference between promotion and prevention focus in the Non-closure condition, $t(273) = 0.79$, $p = .43$, $d = 0.10$, 95% CI [−0.14, 0.33], nor in the control condition with no feedback, $t(273) = -0.04$, $p = .97$, $d = -0.01$, 95% CI [−0.24, 0.23]. In contrast with previous studies, the simple effect of prevention focus across conditions of closure was not significant, $t(271) = -1.34$, $p = .18$, $d = -0.16$, 95% CI [−0.40, 0.08]. However, participants in promotion focus spent significantly more time on the task in the Closure than in Non-closure and Control condition, $t(271) = 2.43$, $p = .016$, $d = 0.29$, 95% CI [0.06, 0.53] (see Figure 3a).

6.2.2 | Number of items solved

The ceiling effect observed on the number of items solved led to a non-normal distribution of the variable (Skewness = −2.10, $SE = .15$). Given the skewed distribution, we chose to rely on a generalised linear model (gamma probability distribution with log link function). We ran a GLM including Regulatory Focus (Promotion = 1, Prevention = −1), C1, C2, and the relevant interactions, on the number of items solved. Even though the pattern was descriptively going in the expected direction (see Figure 3b), the C1 × Regulatory Focus interaction was not significant, $b = -.02$, $SE = .03$, Wald's $\chi^2(1) = 0.52$, $p = .47$, $d = 0.09$, 95% CI [−0.15, 0.32], nor were any other effects, $\chi^2 < 1.05$, $p_s > .30$, $d_s < 0.12$, presumably because of the large ceiling effect on the number of items solved and the resulting lack of variance.

6.2.3 | Relative frequency of solutions found

We finally turned to the relative frequency of solutions found by participants (only correct solutions were considered). The linear regression model revealed a significant C1 × Regulatory Focus interaction, $t(271) = -2.09$, $p = .038$, $d = -0.25$, 95% CI [−0.49, −0.01]. No other effect reached significance, $t_s < 1.20$, $p_s > .23$, $d_s < 0.15$. In the Closure condition, participants found fewer unique solutions when put in a prevention than a promotion mindset, $t(273) = -2.04$, $p = .043$, $d = -0.25$, 95% CI [−0.49, −0.01]. In contrast, there was no difference between promotion and prevention focus in the Non-closure condition, $t(273) = 1.32$, $p = .19$, $d = 0.16$, 95% CI [−0.08, 0.40], nor the Control condition with no feedback, $t(273) = -0.34$, $p = .73$, $d = -0.04$, 95% CI [−0.28, 0.20]. The difference in prevention focus was just short of significance, with participants tending to report fewer unique solutions in the Closure than the Non-closure condition, $t(271) = 1.94$, $p = .054$, $d = 0.24$, 95% CI [−0.003, 0.47]. The simple effect of promotion focus across conditions of (non-)closure was not significant, $t(271) = -1.00$, $p = .32$, $d = -0.12$, 95% CI [−0.36, 0.12] (see Figure 3c).

6.3 | Discussion

The third study extends findings of the two previous studies by demonstrating that the regulatory closure effect also appears in terms of persistence in the subsequent task. Participants in prevention closure spent less time on the task, suggesting a lesser mobilisation of cognitive resources. Replicating the results of Baas and colleagues (2011), we found that participants in prevention closure also reported more frequent, that is, less original and less creative, solutions to the different items. Importantly, the pattern of findings on both persistence and originality in the task supports these authors' claims

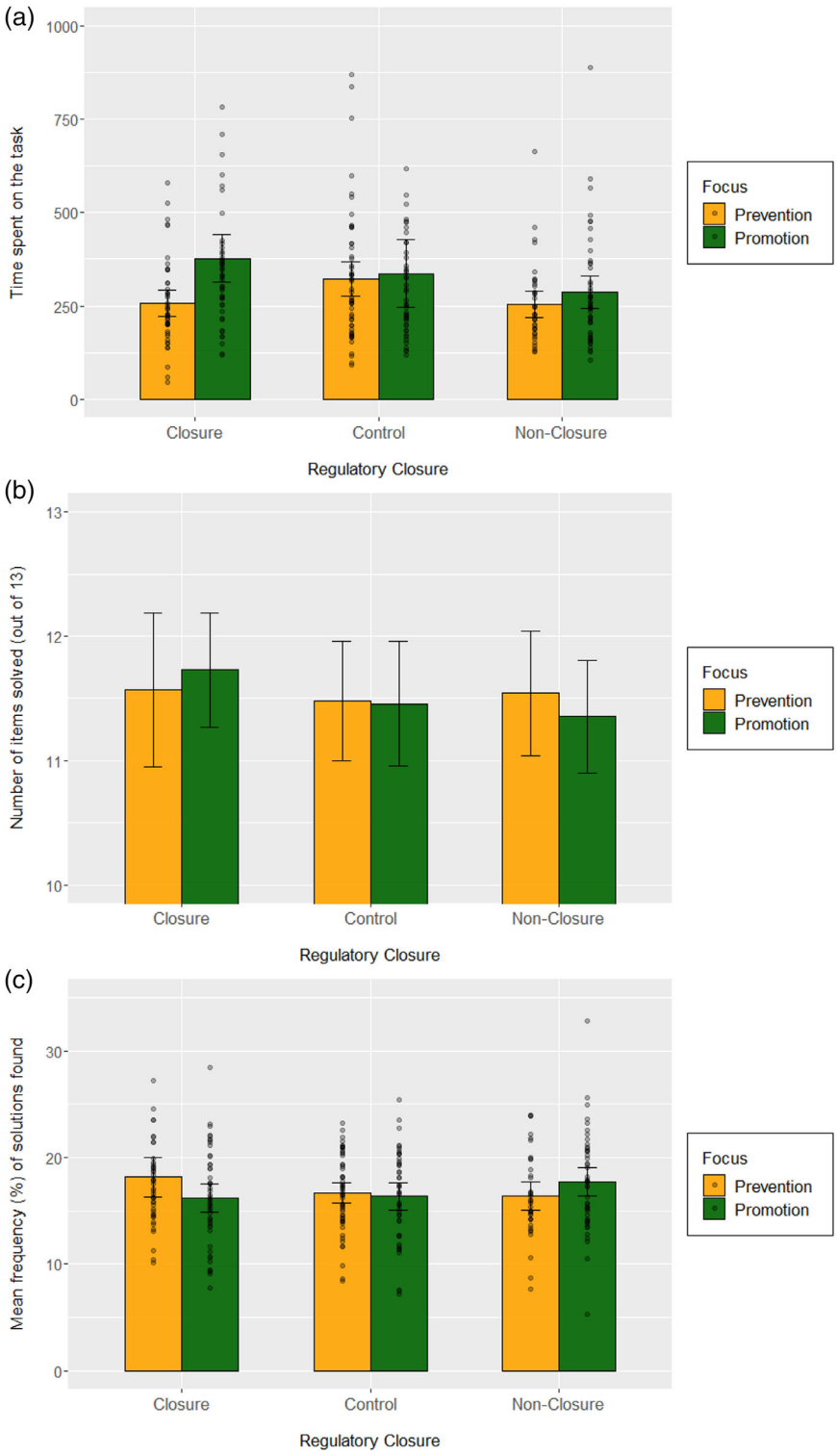

FIGURE 3 Results of Study 3: (a) Time spent on the word completion task in seconds, (b) Number of items solved (0 to 13), and (c) Relative frequency of solutions found, as a function of focus and regulatory closure. Error bars represent 95% confidence intervals.

that the boost by promotion closure is indeed a matter of cognitive resources mobilisation, beyond mere creativity processes in play.

Moreover and with respect to the present Studies 1 and 2, relying on a different manipulation of regulatory focus (a value-framing procedure instead of the current-goal task) further supports the assumption that the underlying construct at stake is indeed regulatory focus, and not merely the type of goal (ideal vs. obligation) made salient.

However, Study 3 could not identify any effect on the level of performance, assessed through the number of items correctly solved. Participants unexpectedly solved almost all items, which clearly reduced the variance of this variable and made it impossible to identify any variations across conditions. Given this shortcoming, we decided to run

one additional study that would take a different approach to assessing cognitive resource mobilisation by using a performance measure that would not rely on time (neither decision times nor time spent on the task). As the first three studies focused on lexical tasks and verbal performance, we decided to turn to a completely different sort of task. Indeed, with respect to the energisation hypothesis, the boosting effect of promotion closure should appear in all types of tasks. Study 4 was therefore introduced with the aim to test the energisation hypothesis in a classic visuospatial memory task, the Corsi test (Berch et al., 1998).

7 | STUDY 4: VISUOSPATIAL MEMORY TASK

Visuospatial working memory refers to the subcomponent of working memory responsible for dealing with visuospatial information (Pickering, 2001). It is often studied as an interindividual cognitive difference, with some people benefiting from greater memory capacities than others (Fischer, 2001). However, performance in visuospatial memory tasks is also a function of effortful allocation of cognitive resources in the task: performance has been found to decrease when cognitive load increases (Vandierendonck et al., 2004). Conversely, performance increases when a motivational incentive (e.g., money) compensates for an initial lack of motivation towards the task (Dovis et al., 2012). Together, these results suggest that performance in a visuospatial memory task is also an indicator of cognitive resources mobilisation in the task. In the present study we relied on the Corsi block-tapping test, which is the most common task used to assess visuospatial memory (Fischer, 2001; Pickering, 2001) and consists in repeating a sequence of visuospatial information of increasing length (details of the task are explained below). We considered performance in the task, or Corsi span, as an indicator of mobilisation of cognitive resources.

The preceding three studies were planned as a set, and Study 4 was added in a later stage of the research. Therefore, for this study we adapted the calculation of expected effect size by considering the effect sizes of the three preceding studies. We aggregated the observed effect sizes of our own Studies 1–3 and that of Baas et al. (2011), which resulted in an estimated $d = 0.42$ for the regulatory focus by closure interaction. As done previously, we set $\alpha = .005$ for the power analysis, which recommended $N = 306$ for 80% power. We rounded this number up to 320 (i.e., around 80 participants per cell). We preregistered the design, sample size, and planned analyses of Study 4 via Aspredicted: https://aspredicted.org/77wq3.pdf, as a conceptual replication of the previous studies.

7.1 | Method

7.1.1 | Participants

British participants were recruited and remunerated through the online data collection platform Prolific. A total of 325 participants (103 male, 212 female, 10 undisclosed) of a mean age of 25.4 years ($SD = 5.50$) completed the study. The study adopted a 2 (Regulatory Focus: promotion vs. prevention) × 2 (Closure: closure vs. non-closure) between-subject design, and participants were randomly assigned to one of the four experimental conditions (promotion-closure: $n = 79$, prevention-closure: $n = 77$, promotion-non closure: $n = 84$, prevention-non closure: $n = 85$). Average scores on the proenvironmental commitment measure showed that this sample (from the general population) cared for the environment just as much as the student samples used in Studies 1–3 (see note [1]).

7.1.2 | Procedure and materials

The study was created and hosted on Psytoolkit. As in the previous studies, we first induced a promotion versus prevention focus, and then provided either positive or negative feedback on whether participants were meeting the alleged official standards for protecting the environment. As in Study 2, a filler personality questionnaire was inserted after the feedback procedure. Participants finally completed the visuospatial memory (Corsi) task.

Regulatory focus

Regulatory focus was induced in the same way as in Study 3 through a value-framing procedure and participants were asked to write about proenvironmental values in a way that induced either a promotion or a prevention mindset.

Pro-environmental goal (non-)closure

Closure was manipulated as in the previous studies and participants received either positive or negative feedback (closure vs. non-closure), allegedly based on their self-report of 20 daily-life green behaviours.

Dependent variable: Visuospatial working memory span (Corsi)

Participants were then introduced to the Corsi block-tapping test, which we adapted from the computer version proposed on Psytoolkit. A random configuration of nine purple squares appeared on the screen and squares would "light up" (turn yellow) in sequence, one at a time. At the end of the sequence, participants recreated the sequence by clicking the appropriate squares, using the computer mouse. The task started with a 2-square sequence and increased in difficulty (+1 square each time) for as long as participants correctly recreated the sequence. If they made an error, they received one more trial at the same level of difficulty. The task reached an end when participants failed twice in a row or when they had successfully reproduced a 9-square sequence, which was the highest level of difficulty. Their score, or Corsi span length, was the highest number of squares that they successfully recalled in sequence.

To increase score reliability, participants completed the task four times: twice with the classic "forward" instructions, and twice with "backward" instructions. The Corsi backward variant is similar to the forward task except that the sequence must be repeated from the *last*

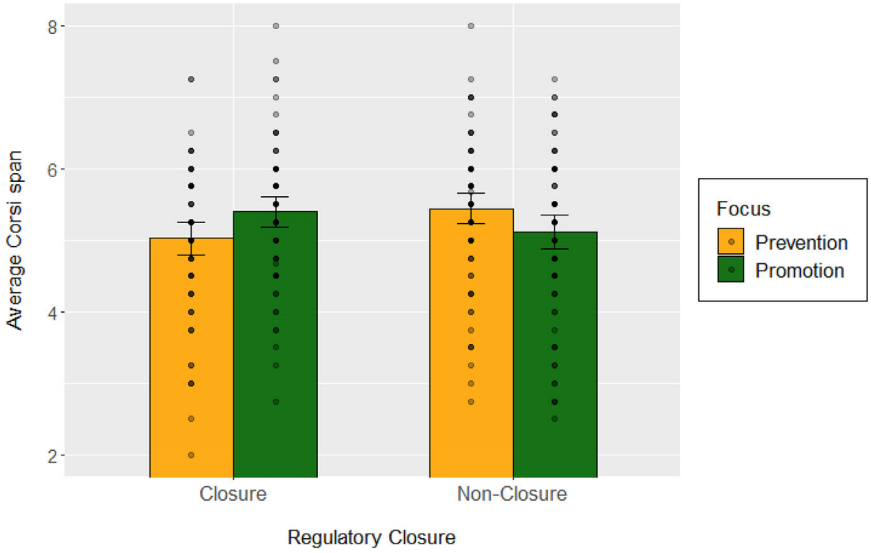

FIGURE 4 Average visuospatial Corsi (visuospatial memory) span across four tasks (number of items correctly recalled in a sequence), as a function of focus and regulatory closure in Study 4. Error bars represent 95% confidence intervals.

to the *first* square lighting up. Past research shows that it is not more difficult than the Corsi forward task (Kessels et al., 2008). We hence aggregated participants' span on the four tasks to obtain an average Corsi span ($min = 2$, $max = 8$, $M = 5.25$, $SD = 1.02$; see Table 1).

7.2 | Results

We ran a linear regression model including Regulatory Focus (Promotion = 1, Prevention = −1), Closure (Closure = 1, Non-closure = −1) and their interaction on the average Corsi span. None of the main effects reached significance, $t_s < 0.60$, $p_s > .54$, $d_s < 0.07$, but the expected Regulatory Focus × Closure interaction was significant, $t(321) = 3.11$, $p = .002$, $d = 0.35$, 95% CI [0.13, 0.57]. In the Closure condition, participants performed less well in the visuospatial test when put in a prevention than a promotion mindset, $t(321) = 2.31$, $p = .022$, $d = 0.26$, 95% CI [0.04, 0.48]. In contrast with previous studies, the opposite effect appeared in the Non-closure condition with participants performing better when put in a prevention mindset, $t(321) = -2.08$, $p = .039$, $d = -0.23$, 95% CI [−0.45, −0.01]. In addition, participants in prevention focus performed less well in the Closure than Non-closure condition, $t(321) = -2.62$, $p = .009$, $d = -0.29$, 95% CI [−0.51, −0.07]. The opposite tended to be true for participants in promotion focus, although the effect failed to reach significance, $t(321) = 1.77$, $p = .077$, $d = 0.20$, 95% CI [−0.02, 0.42] (see Figure 4).

7.3 | Discussion

Study 4 replicated the findings of Studies 1–3 with a completely different measure, a visuospatial memory task. In contrast to previous studies, it also showed a specific inversion of the effect in the non-closure condition. This effect is not consistent across studies as it appeared as nonsignificant in Studies 1–3, nor is it congruent with Baas and colleagues' (2011) findings. It concurs, however, with a regulatory fit approach, according to which negative information about goal pursuit (i.e., non-closure) is more relevant in a prevention than promotion focus. Instead of interpreting this effect in isolation, we chose to rely on a small-scale meta-analytic approach.

8 | SMALL-SCALE META-ANALYSIS

8.1 | Analytical strategy

The pattern of findings of the four studies is rather consistent. However, we failed to find an effect of regulatory focus on the measure of performance in Study 3 (probably due to a ceiling effect on this variable), and we observed a simple effect of regulatory focus in the non-closure condition in Study 4 only. The simple effects of promotion and prevention focus also showed variations from study to study. To better estimate the reliability of our findings and help interpreting them, we hence conducted a small-scale meta-analysis including the findings of all four studies (Braver et al., 2014; Goh et al., 2016). We certify the four studies included in this article and this meta-analysis are the only ones we conducted (i.e., an empty file-drawer; Vosgerau et al., 2019). We chose Cohen's *d* as the effect-size indicator. Using R and the *metafor* package (Viechtbauer, 2010), we ran random-effect models (Paule & Mandel method; confidence intervals estimated with the Knapp & Hartung and Sidik & Jonkman calculation; see Veroniki et al., 2016) to test the four simple effects of Closure, Non-closure, Prevention, and Promotion conditions.

To avoid an overrepresentation of the findings from Study 3, which included three outcomes, we first aggregated them into a single standardised score of performance and persistence. We also reverse-coded measures of decision times (Studies 1 and 2) and frequency of solutions found (Study 3) so that higher score systematically represented greater mobilisation of cognitive resources in the various tasks. In order to test for both Closure and Non-closure meta-effects properly, we did not

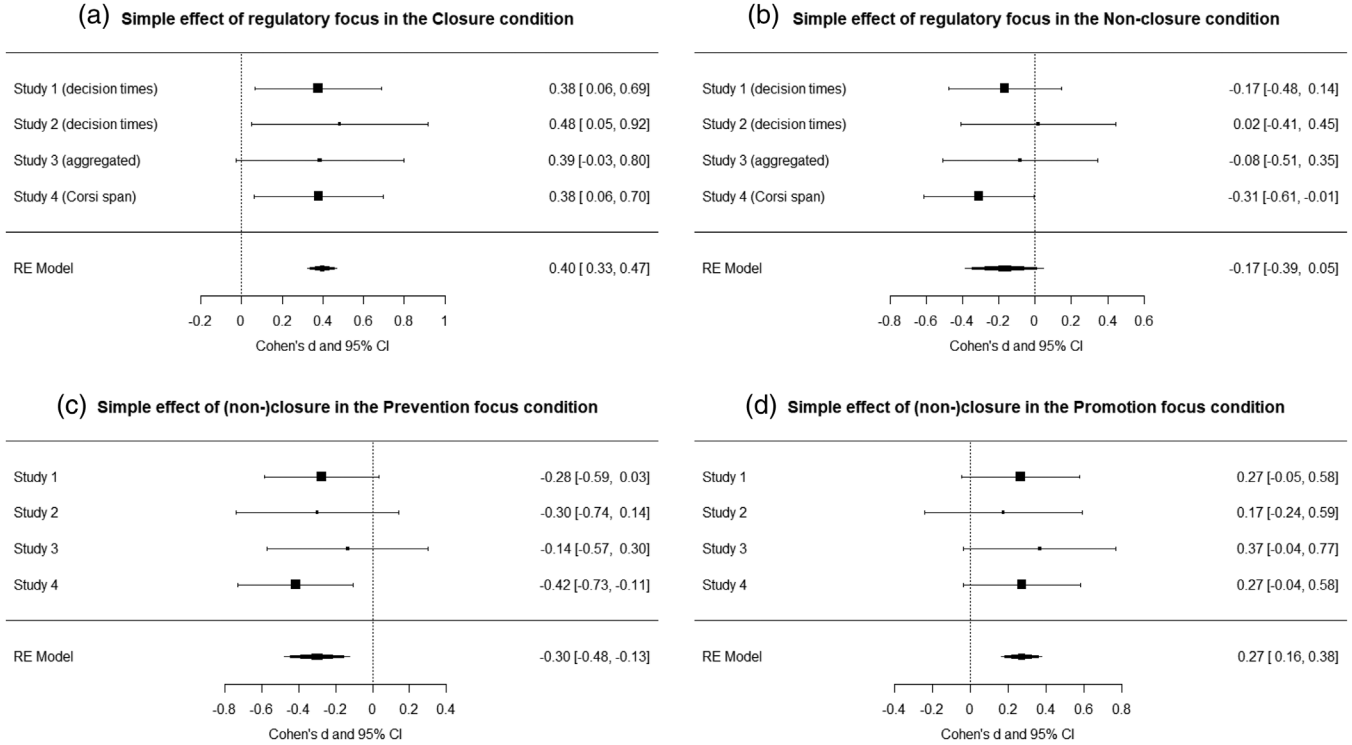

FIGURE 5 Results of the small-scale meta-analysis: Simple effects of closure (a), non-closure (b), prevention focus (c), and promotion focus (d).

consider the control conditions of Studies 2 and 3 but focused instead on the conditions of clear closure (positive feedback) and non-closure (negative feedback).

8.2 | Results

In the Closure condition, the analysis revealed a significant and homogeneous simple effect of Regulatory Focus, $d = 0.397$, $SE = .023$, 95% CI [0.326, 0.469], $t = 17.66$, $p < .001$; $Q(3) = 0.18$, $p = .98$, indicating overall greater mobilisation of cognitive resources following promotion closure than prevention closure (see Figure 5a). In the Non-closure condition, the analysis revealed a homogeneous *nonsignificant* effect of Regulatory Focus, $d = -0.170$, $SE = .068$, 95% CI [−0.387, 0.047], $t = -2.49$, $p = .088$; $Q(3) = 1.72$, $p = .63$ (see Figure 5b). Congruently with the hypothesis, a formal comparison showed the simple effect of closure was greater (in absolute terms) than the simple effect of non-closure, $b = .23$, $SE = .072$, 95% CI [0.09, 0.37], z-test = 3.17, $p = .002$.

Turning to the simple effects of each focus, the analysis revealed a significant and homogeneous simple effect of prevention, indicating a lesser mobilisation of resources in closure than non-closure, $d = -0.303$, $SE = .056$, 95% CI [−0.481, −0.126], $t = -5.44$, $p = .012$; $Q(3) = 1.11$, $p = .77$ (see Figure 5c). Conversely, there was a significant and homogeneous simple effect of promotion, indicating a greater mobilisation of resources in closure than non-closure, $d = 0.270$, $SE = .033$, 95% CI [0.164, 0.377], $t = 8.09$, $p = .004$; $Q(3) = 0.42$, $p = .94$ (see Figure 5d). The simple effects of prevention and promotion were of similar magnitude, $b = -.03$, $SE = .065$, 95% CI [−0.16, 0.10], z-test = −0.51, $p = .61$.

9 | GENERAL DISCUSSION

In the present research, we drew from previous findings on regulatory closure to propose that promotion closure (i.e., achieving a promotion-framed ideal goal) has a specific activating effect on the individual, increasing the general mobilisation of cognitive resources. This is indicated in an enhanced performance in subsequent tasks not related to the attained goal. In contrast, prevention closure (i.e., achieving a prevention-framed ought goal) has a deactivating effect on the individual, leading to lower mobilisation of cognitive resources and thus lower performance in subsequent tasks. The results of four studies, presented separately and interpreted in a meta-analytical fashion, support these hypotheses. Specifically, results show that promotion closure (induced with respect to the goal of protecting the environment) fostered engagement, persistence, and performance in a series of unrelated tasks, as compared to prevention closure. No effect of regulatory focus appeared in the control condition (Studies 2–3) with no closure information, strengthening the claim that any difference was due to the state of regulatory closure and not to differences in processing style or other mechanisms associated with the self-regulation foci by default. In addition, the difference in resources mobilisation following closure seems to be imputable to a deactivation effect in prevention as much as to an energisation effect in promotion, as indicated by meta simple effects of similar magnitude.

The effect of regulatory closure on subsequent tasks related to a different goal domain had so far only been investigated with respect to creativity tasks (Baas et al., 2008, 2011). By replicating Baas and colleagues' effect with a set of different subsequent tasks (i.e., verbal and visuospatial tasks) and with different measures (shortened decision times, originality, persistence, and visuospatial memory), we extend these previous findings and ensure that the effect is not limited to a specific set of creativity tasks but most likely depends on a more generalised motivational mechanism. As such, the present findings advance the current state of research and strengthen the assumption that the closure effect pertains to an energisation effect, that is, a greater mobilisation of cognitive resources, regardless of the specific cognitive resources needed to solve the particular task. In line with previous models of motivation and performance, this suggests that regulatory closure impacts motivational direction and intensity, which in turn increase information processing resources (Humphreys & Revelle, 1984).

Further, we had expected the three conditions of promotion closure, promotion non-closure and prevention non-closure to trigger an activating emotional response (cheerfulness, frustration, and stress, respectively) but the question remained as to whether these three would be equally arousing. The present results suggest that promotion closure has a particular quality leading to even higher performance than promotion non-closure (i.e., a real "boost by closure"). This is reminiscent of previous findings showing how people can benefit from a motivational boost when they are both activated and focused on the core elements of the task, leading in fine to better performance (Baron, 1986; Sanders & Baron, 1975).

Turning to non-closure, following a goal completion hypothesis we suggested that non-closure (introduced here as negative feedback on people's environmental behaviour) should be equally activating in a promotion and prevention focus, because of the discrepancy-related tension underlying the unfulfilled goal (Förster & Higgins, 2005; Gollwitzer et al., 2013; Gollwitzer et al., 1982; Wicklund & Gollwitzer, 1982). This hypothesis is consistent with past findings by Baas and colleagues (Baas et al., 2008, 2011) who proposed that both states of promotion non-closure and prevention non-closure are equally activating and result in similarly high engagement in the following task.

At first glance these results could also seem consistent with the perspective of regulatory fit (Higgins, 2000, 2006) applied to task performance. However, as we argue in the next section, a careful comparison of theoretical assumptions and observed results rather suggests it is *not* the case.

9.1 | Regulatory non-closure: Goal-completion and regulatory fit perspectives

In a regulatory fit perspective, it has been argued that because of their greater reliance on vigilance (vs. eagerness) strategies prevention-oriented individuals are more sensitive to negative information about the self and self-goals (Higgins, 2006). In addition, promotion non-closure (or "non-gain") could arouse feelings of sadness and dejection (i.e., deactivating emotions; Higgins, 1987; Higgins, 1997; Higgins et al., 1997; Shah & Higgins, 2001) rather than frustration. Non-gains (promotion non-closure) hence have lower hedonic intensity than losses (prevention non-closure; Idson et al., 2000, 2004; Liberman et al., 2005). As Higgins (2006, p. 459) noted:

> when imagining failing to make a desirable choice (i.e., imagining making an undesirable choice), prevention-focused people should be more strongly engaged and experience a stronger motivational force of repulsion than promotion-focused people. This is because failure maintains the vigilance that sustains the orientation of prevention-focused people, but it reduces the eagerness that sustains the orientation of promotion-focused people.

Accordingly, studies have observed greater performance and persistence following negative performance feedback in a prevention rather than promotion focus (Förster et al., 2001; Shu & Lam, 2011, 2016; Van Dijk & Kluger, 2004, 2011)—although it should be noted that all these studies considered closure and performance within the same task or same task domain. Yet, although the fit hypothesis as put forward by Higgins is theorised as a full-cross interaction between promotion/prevention and another element expected to fit with the foci, it is unfortunate to note that not all papers analyse regulatory fit results accordingly. In some instances, only the simple effects of promotion-prevention are presented (e.g., Cesario et al., 2004; Freitas & Higgins, 2002; Idson & Higgins, 2000), while in others only the simple effects of the fitting element are presented (e.g., Cesario & Higgins, 2008; Idson et al., 2000; Shu & Lam, 2016). Some papers merge conditions of fit (e.g., promotion-positive and prevention-negative) to compare their average to conditions of non-fit (e.g., Gallagher & Updegraff, 2011; Vaughn et al., 2009), and finally some present the full decomposition in four simple effects of the interaction (e.g., Cesario et al., 2013; Förster et al., 2001; Shu & Lam, 2011). Hence, evidence in favour of the fit hypothesis might be weaker than originally thought.

In addition, other research on *incidental* (vs. integral) fit has produced different results (Cesario et al., 2013; Cesario & Higgins, 2008; Cesario et al., 2008). Where integral fit represents an alignment of different elements and their direct effect within the same context (e.g., fit between the person's orientation and the framing of the message or the task, strategy imposed to reach the goal, etc.), incidental fit describes how an initial correspondence between such elements creates a "feeling right" sensation that can be misattributed and carried over to the next task (consistent with a feeling-as-information perspective, e.g., Schwarz, 2012). In this perspective, one could understand prevention non-closure as a case of incidental fit (to the extent that negative information about performance fits a prevention mindset), as compared to promotion non-closure. Yet, incidental fit effects are complex. Although some argue that because they feel right, people might interpret the new situation or task as enjoyable and engage in it more (Cesario et al., 2008), others observe that the feel-right sensation also implies that the situation does not require extensive cognitive

investment, and as such actually reduces intensive engagement in the task (see e.g., Koenig et al., 2009; Vaughn, Malik, et al., 2006; Vaughn, O'Rourke, et al., 2006). Finally, some have found promotion versus prevention non-closure to lead to similarly high efforts and performance in a subsequent task, although different strategies were preferred in each focus (e.g., at an organisational level: Ahn et al., 2021; at an individual level: Scholer et al., 2014).

Summarising the evidence above, it seems less than obvious that, as the traditional regulatory fit perspective would have it, prevention non-closure should automatically lead to greater engagement than promotion non-closure. Although the simple effect of non-closure emerged as significant in one of the studies (Study 4)—which could prime facie be seen as evidence in favour of the regulatory fit perspective—the small-scale meta-analysis mostly supports predictions from goal completion theory and Baas and colleagues' previous findings (2011): the simple effect of focus under closure was significant while the simple effect under non-closure was not, and both were different from each other. Further research is needed to better distinguish these effects and identify the specific conditions that make it more likely for promotion non-closure to lead to greater or lower engagement (see also Carver, 2004; Hamstra & Schreurs, 2018).

9.2 | Limitations and future directions

Four studies yielded a consistent pattern of results while relying on different measures, manipulations, and types of participants, which strengthens the reliability of our findings. Nevertheless, they still present some limitations that future research needs to address. First, in all studies we relied on proenvironmental goals and values to manipulate the state of (non-)closure. Imposing on participants the goal domain provides the advantage of being able to ensure that the subsequent task stays unrelated to the goal domain used to establish closure/non-closure, and it allows us to maintain the goal domain constant between participants (which is not necessarily the case, for example, when participants freely choose to recall one past episode of personal success/failure in any goal domain). However, it also requires that the domain be relevant for all participants. In our case, it seems that the theme of protecting the environment was engaging enough for our population of university students and young adults, who all reported moderate to high proenvironmental commitments across studies. Nonetheless, future studies might want to vary the domain in which closure is manipulated or assessed as well as target issues that some people feel highly committed to resolve whereas others are not.

Second, we focused on performance and persistence in cognitive tasks. Here too, it would be appropriate to test the effect of regulatory closure on the performance of other types of tasks. Baas et al. (2011) noted that analytical problem-solving tasks would be a particularly relevant type of tasks as it had previously been shown that a prevention focus is more beneficial in those than a promotion focus (Förster & Dannenberg, 2010). Still, it is not yet known whether and how this advantage depends on the state of closure. Less intellectual and more physical tasks should also be explored. In addition, the specific mechanism through which resource mobilisation increases performance remains to be identified. As Baas noted, "activation involves a combination of physiological, cognitive, and affective reactions" (Baas et al., 2011, p. 795). The exact components at play in the current set of studies, especially in promotion closure, remain to be explored.

Moreover, it must be noted that performance in the present tasks was not explicitly incentivised. One could argue that participants' motivation could be different, for example, if performing well had some benefit either for themselves (reward) or towards the general goal (e.g., would result in a donation for a proenvironmental charity). However, people do not always need external incentives to engage in a task: more internal factors linked to self-evaluation motives such as self-improvement and achievement (Sedikides & Strube, 1997) and intrinsic motivation (Deci & Ryan, 2000) can be motivating enough—and those were most likely present, to an extent, in the current research. In addition, indirect evidence from moral self-licensing literature (see note [2]) suggests that the pattern of efforts relaxation following closure can arise regardless of the level of incentivisation or real-world relevance of the task (Geng et al., 2016; Jordan et al., 2011). In sum, we would expect that a stronger incentivisation of the task (e.g., with external rewards) most likely does *not* influence the pattern of results observed. Nonetheless, future studies should investigate the issue of incentivisation further to see (a) what forms of internal motivation might be present and responsible for the results, or (b) whether external incentives produce different results.

Finally, the effects of closure could also be investigated in less performance-oriented domains such as morality. Research has shown how recalling past moral behaviour (i.e., moral closure) can paradoxically lead to weaker intentions to act morally in the future (for reviews, see e.g., Blanken et al., 2015; Mullen & Monin, 2016). It seems possible, therefore, that the relaxing "self-licensing" effect is especially likely to appear under prevention moral closure, whereas promotion moral closure would foster the further adoption of consistent moral behaviour (Lalot et al., 2022). This intriguing possibility would need to be investigated in relation to other factors influencing the self-licensing effect (see e.g., Conway & Peetz, 2012; Lalot et al., 2018; Susewind & Hoelzl, 2014).

9.3 | Conclusion and outlook

The present results replicate and extend previous findings in the literature that attaining a goal has different implications when the person is regulated by a promotion or a prevention focus. They show that promotion closure is activating and leads to investing sustained cognitive resources in a subsequent unrelated task, whereas prevention closure is deactivating and leads to lesser engagement, performance, and persistence. Albeit modest in size, these findings have real-world implications. Although disengagement from an attained goal is an effective strategy whenever the newly acquired resources are then reinvested in another competing goal (Oettingen, 2012; Schwörer et al., 2020), prevention closure seems to decrease investment of resources altogether,

at least temporarily. Considering regulatory focus as an adjustable component of the environment first (as was the case in the present research), our results suggest that task characteristics (i.e., those that put people in a more promotion or prevention focus) in everyday life could either facilitate or limit the emergence of the regulatory closure effect. One can notably imagine plenty of examples in the workplace (see e.g., Higgins & Pinelli, 2020): closure in tasks that induce promotion focus (such as successfully developing a new programme, template or more generally an innovative idea, or positively concluding a negotiation process with clients) is more likely to result in motivational energisation. In contrast, closure in tasks that induce prevention focus (such as finishing a careful text proofreading, accounting checking, or replying to all important emails before a set deadline) is more likely to result in motivational deactivation. Organisational psychologists might utilise the present findings to advise workplace practices and identify the optimal times when employees should take a break (i.e., after finalising prevention tasks). Going further, ambiguous tasks or those that can easily be focus-framed might benefit from being framed in promotion when individuals are close to completing them, so they can benefit from the motivational boost.

Second, considering regulatory focus as an individual difference, the results also imply that different individuals would benefit from different closure strategies. Prevention-oriented people, be they students or teachers, employees, or leaders, would benefit from taking a break after successfully completing a first task to properly engage in the following one. In contrast, promotion-oriented people would benefit from directly moving on to the next task so they can take advantage of their energisation while it lasts.

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CONFLICT OF INTEREST

None of the authors have any conflict of interest to disclose.

ETHICS STATEMENT

All studies received approval from the Faculty of Psychology's ethics committee at the University of Geneva.

DATA AVAILABILITY STATEMENT

All data are publicly available on the OSF webpage dedicated to the project (https://osf.io/dqxzr/?view_only=7252732160f14373bba385d3b873b315).

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