

Article

Effects of Attentional Focus on Performance and Perceived Exertion during 400-meter races in University Students

Juan-José Pérez-Díaz^{1*}, Cristóbal Sánchez-Muñoz¹ and José-Antonio Salas-Montoro¹

¹ Department of Physical and Sports Education, Faculty of Sport Sciences, University of Granada, Granada, Spain

*Correspondence: Juan José Pérez Díaz (jjpd@ugr.es).  ORCID ID nº 0000-0002-2438-6329

Received: 14/10/2025; Accepted: 01/12/2025; Published: 31/12/2025

Abstract: Attentional focus (internal/external) affects motor performance; its effect on performance (time) and perceived exertion (RPE) during 400m races was studied in non-expert university students, an area with limited research. The objective was to investigate the effects of internal vs. external focus on time and RPE in this task, considering gender differences. Using a counterbalanced repeated-measures design, 89 sports science students (37 women, 52 men) performed two 400m runs under internal focus (technical instructions) and external focus (outcome/competition instructions). Time and RPE (Borg CR10) were measured. Paired t-tests and mixed ANOVAs (2 Focus x 2 Gender) were used for analysis. Results showed no significant difference in time between focus conditions ($p=0.054$), although there was a pro-external tendency. RPE was significantly higher with external focus ($p<.001$). Men were faster ($p<.001$) with no significant gender differences in RPE ($p=.572$). Significant Focus x Gender interactions were found for time ($p=.007$) and RPE ($p=.005$). Simple effects analysis revealed that external focus significantly improved time in men ($p<.001$) but not in women ($p=.548$), while the RPE increase was significant for both genders but larger in men ($p<.001$) than in women ($p=.008$). In conclusion, in non-expert students, while the main effect of external focus on time was not significant, it did increase RPE. The effects of focus were moderated by gender. It is suggested to consider the performance-RPE balance and individual differences when applying focus strategies in this context.

Keywords: RPE; Endurance; Athletics; Running; Internal Focus, External Focus, Gender Differences; Middle-Distance Running; Constrained Action Hypothesis

1. Introduction

Attentional focus plays a crucial role in the learning and execution of motor skills in different sports contexts (Wulf, 2013). According to the literature, a distinction is made between an internal focus, centered on body movements, and an external focus, directed towards the effects or outcomes of

the movement. Numerous studies have shown that external focus facilitates more efficient and effective performance in motor tasks (Bredin et al., 2013; Collum et al., 2021; Grgic & Mikulic, 2022). These findings challenge the traditional belief that novices should consciously control their movements, suggesting instead that both beginners and



advanced athletes can benefit from instructions promoting an external focus (Porter et al., 2010; Wulf, 2013).

In the field of cyclic sports, such as cycling or running, the physical and cognitive demands are complex (McCormick et al., 2015; Pérez-Díaz et al., 2025), and attentional focus can significantly influence performance (Schücker et al., 2009) and the perception of fatigue (Brown et al., 2020; Lohse & Sherwood, 2011). However, while meta-analyses show that an external focus provides a moderate benefit for muscular endurance (Cohen's $d=0.58$) (Grgic & Mikulic, 2022), few studies have explored how manipulating attentional focus specifically affects cyclic tasks in young, non-expert populations where the technical gesture may not be automated (c.f. Avancini et al., 2025).

Furthermore, the 400-meter race represents a unique task-specificity. Unlike pure sprints or long-distance endurance events, the 400m is a mixed anaerobic/aerobic task that induces significant acidosis and demands complex pacing (Casado et al., 2021). This presents a potential theoretical conflict for attentional focus: while an external focus is known to benefit movement automaticity (Wulf, 2013), the 400m also requires a high degree of internal self-regulation to manage pacing and extreme physiological distress. Therefore, it is unclear whether an external focus provides the same benefit seen in sprints, or if a degree of internal monitoring is necessary for pacing, making this task distinct from other forms of running.

This study aims to investigate the effects of internal and external attentional focus on performance and perceived exertion during

400-meter running trials. Additionally, and recognizing that sports performance often occurs in social contexts, it exploratorily analyzes how attentional focus conditions might influence aspects of motivation generated by the implicit social interaction in the testing environment, grounding this secondary objective in Self-Determination Theory (Deci & Ryan, 2008) and recent meta-analyses on social facilitation (van Meurs et al., 2024). This design seeks to provide practical and pedagogical evidence that can be applied in both educational settings and athlete preparation.

The results of this study could have relevant implications for teaching motor skills and planning sports training, providing specific tools to optimize learning and performance in endurance activities.

2. Materials and Methods

Design—An experimental repeated-measures study with a counterbalanced design was conducted to investigate the effect of attentional focus (internal vs. external) on performance and perceived exertion during a middle-distance running task. Each participant performed two running trials under different attentional focus conditions, running time and subjective perception of effort (RPE) were measured in each condition.

Subjects—Ninety-one Sports Science students from the University of Granada were recruited. Inclusion criteria were: (a) being a Sports Science student, (b) having no injuries or medical conditions preventing participation in the running trial, and (c) providing written informed consent to participate in the study. Two of the participants did not complete both running

trials and were excluded. The final sample consisted of 89 participants (Age: Mean [M] = 20.28, Standard Deviation [SD] = 1.97; Height: M = 173 cm, SD = 9.04; Weight: M = 69.25 kg, SD = 11.03), distributed by gender as follows: 37 women and 52 men. All participants were physically active as required by their Sports Science academic program, but were not specialized 400m runners, representing a homogeneous sample of "non-expert" runners. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by the Research Ethics Committee of the University of Granada (3822/CEIH/2023)

Instruments—To assess running performance, a 400-meter trial was conducted on a standard athletics track. Time was measured in seconds using a digital stopwatch with a precision of 0.01 seconds. Perceived exertion was measured using the Borg CR10 scale (Borg, 1982), administered immediately after each trial. Participants rated their perceived effort on a scale from 0 ("Nothing at all") to 10 ("Maximum"). Demographic information, including age, gender, height, and weight, was collected via a brief questionnaire. In addition, a dichotomous question was included to assess the potential influence of social interaction on motivation and effort: "Do you think competing alongside your peers made you able to 'push yourself' more?"

Procedure— Prior to participation, all individuals received detailed information about the purpose, procedures, potential risks and benefits of the study, as well as their right to withdraw at any moment. Written informed consent was obtained from each participant.

After signing the consent form, participants completed the demographic questionnaire. All trials were conducted on a standard 400m outdoor athletics track under consistent and favorable weather conditions (approximately 10-12°C, low wind). Participants then completed a standardized 15-minute warm-up protocol supervised by the researchers, which included jogging, dynamic stretching, and progressive running drills. They were then randomly assigned to one of two attentional focus condition sequences (internal–external or external–internal) using a counterbalanced design to control for potential order effects.

Before each running trial, participants received attentional focus instructions specific to the assigned condition. In the internal focus condition, they were asked to direct their attention to their own movements, specifically: maintaining an upright posture, controlling step cadence, landing on the midfoot, coordinating arm movement with the legs, and focusing on rhythmic breathing. In the external focus condition, participants were instructed to simulate a real competition, directing their attention toward reaching the finish line as quickly as possible, visualizing forward movement and gaining ground with each stride, and letting their movement flow automatically without focusing on technique.

Participants completed two 400-meter running trials on the athletics track on the same day, each under one of the attentional focus conditions. To minimize fatigue carryover, a standardized 30-minute passive rest period was mandated between the two trials. To simulate the social context of a competition and align with the social motivation question, trials were conducted in

small groups of 4 to 6 participants. In both trials, they were instructed to exert maximal effort. Performance time was recorded using a digital stopwatch. Immediately after each trial, participants rated their perceived exertion using the Borg CR10 scale. Upon completion of both trials, participants responded to the motivation-related question regarding the influence of social interaction.

Statistical Analysis— Descriptive and inferential statistical tests were used to analyze the data. Means and standard deviations were calculated for the time and RPE variables in each attentional focus condition. A paired Student's t-test was applied to compare running times and RPE between the internal and external focus conditions. Pearson correlations were calculated to examine the relationships between demographic variables (age, height, weight) and performance measures (time and RPE). A repeated-measures analysis of variance (ANOVA) was performed to examine the effect of attentional focus and gender on performance and RPE. Given the violation of the homogeneity of variances assumption (Levene's test, $p < .001$), the main effects for Gender were confirmed using a robust Welch's t-test, which yielded the same conclusions.

Frequencies and percentages of response were calculated for the dichotomous question about the influence of social interaction on participants' motivation and effort. Jamovi statistical software (The Jamovi Project, 2024, version 2.4) was used to perform all statistical analyses. A significance level of $p < 0.05$ was set for all analyses.

3. Results

Descriptive Statistics - Table 1 presents the descriptive statistics for running times and RPE for the internal and external attentional focus conditions.

Paired t-test - A paired Student's t-test was conducted to compare running times and RPE between the internal and external attentional focus conditions. The results did not reveal a significant difference in running times (Mean difference = 3.31 s, $t(88) = 1.953$, $p = 0.054$, Cohen's $d = 0.207$, 95% Confidence interval [CI] [-0.06, 6.69]), although there was a tendency towards faster times in the external focus condition (Figure 1). However, a significant difference in RPE was found (Mean difference = -1.42, $t(88) = -7.717$, $p < 0.001$, Cohen's $d = 0.818$, 95% CI [-1.78, -1.05]), with higher perceived exertion in the external focus condition (Figure 2).

Correlations - As an exploratory analysis, Pearson correlations were calculated to examine the relationships between demographic variables (age, height, weight) and performance measures (400m time) RPE under both attentional focus conditions (internal and external). Given the number of comparisons, these p-values are uncorrected and should be interpreted with caution.

The analysis revealed several significant correlations. Specifically, a weak but significant negative correlation was found between age and running time under internal focus ($r = -0.215$, $p = 0.043$), although not with time under external focus ($r = -0.099$, $p = 0.356$). Height showed a significant negative correlation with running time in both the internal focus condition ($r = -0.250$, $p = 0.018$) and the external focus condition, with the latter being moderate ($r = -0.373$, $p < 0.001$). Weight also correlated negatively in a weak but significant manner with time

under external focus ($r = -0.235$, $p = 0.027$), but not with time under internal focus ($r = -0.141$, $p = 0.189$). No significant correlations were found between demographic variables (age, height, weight) and RPE scores in either focus condition (all $p > 0.14$).

Furthermore, as expected, a strong and highly significant positive correlation was observed between running times obtained in the internal focus condition and those obtained in the external focus condition ($r = 0.676$, $p < 0.001$). Similarly, a moderate and highly significant positive correlation was found between RPE scores reported under internal focus and those reported under external focus ($r = 0.426$, $p < 0.001$).

Finally, weak but significant negative correlations were detected between running time under internal focus and RPE for both internal ($r = -0.275$, $p = 0.009$) and external ($r = -0.319$, $p = 0.002$) conditions.

Subgroup analysis by gender - A subgroup analysis by gender was conducted to examine potential differences in performance and RPE. Table 2 presents the descriptive statistics for running times and RPE for men and women in the internal and external attentional focus conditions.

The ANOVA conducted on running times revealed a statistically significant main effect of Gender, $F(1, 87) = 49.81$, $p < .001$, partial eta squared [$\eta^2p = 0.301$], indicating that men ran significantly faster than women in both conditions (see Table 2). The main effect of Attentional Focus did not reach statistical significance, $F(1, 87) = 2.35$, $p = 0.129$, $\eta^2p = 0.004$. However, a significant interaction between Attentional Focus and Gender was found, $F(1, 87) = 7.58$, $p = 0.007$, $\eta^2p = 0.014$. To unpack this interaction, simple effects analyses (paired t-tests) were

conducted... Men ran significantly faster in the external focus condition compared to the internal focus condition ($t(51) = 4.774$, $p < 0.001$, Cohen's $d = 0.662$). In contrast, for women, there was no significant difference in running time between conditions ($t(36) = -0.607$, $p = 0.548$, Cohen's $d = 0.099$).

As can be graphically observed in Figure 3, this interaction suggests that the pattern of change in time between internal and external focus conditions was different for men and women, with men showing a significant time reduction while women showed a slight, non-significant increase in time. It is important to note that Levene's test indicated that the assumption of homogeneity of variances was not met for the time condition under external focus ($p < .001$).

The ANOVA conducted on RPE showed a statistically significant main effect of Attentional Focus with a considerable effect size, $F(1, 87) = 55.22$, $p < .001$, $\eta^2p = 0.143$. As shown in Table 2, participants reported significantly higher RPE in the external focus condition compared to the internal focus condition. The main effect of Gender was not significant, $F(1, 87) = 0.32$, $p = 0.572$, $\eta^2p = 0.002$. Nonetheless, a significant interaction between Attentional Focus and Gender was also found, $F(1, 87) = 8.39$, $p = 0.005$, $\eta^2p = 0.022$. Simple effects analyses (paired t-tests) were conducted to interpret this interaction (see Figure 4). The results showed that the increase in RPE from internal to external focus was statistically significant for both genders, although the magnitude differed. The increase was highly significant for men ($t(51) = -8.378$, $p < 0.001$, Cohen's $d = 1.162$) and significant for women ($t(36) = -2.800$, $p = 0.008$, Cohen's $d = 0.460$). Similar to time, Levene's test indicated a violation of the

assumption of homogeneity of variances for the RPE condition under external focus ($p < .001$).

Analysis of the competition question - The analysis of the question regarding the influence of competition revealed that 84.3% (75 out of 89) of participants reported that competing alongside their peers helped them to "push themselves" more. The remaining 15.7% (14 participants) indicated that they did not feel that competing influenced their effort.

Further inferential analysis was conducted. A Chi-square test for independence was conducted to examine the

relation between gender and the response to this question. A significant association was found ($\chi^2(1) = 4.725$, $p = 0.030$), indicating that men (92.3% 'Yes') were significantly more likely than women (73.0% 'Yes') to report this perception.

Furthermore, an independent samples t-test was conducted to determine if this perception correlated with the magnitude of the RPE increase (Δ RPE, or RPE-External minus RPE-Internal). No significant difference in Δ RPE was found between participants who answered 'Yes' and those who answered 'No' ($t(87) = 0.979$, $p = 0.330$).

Table 1. Descriptive Statistics for Running Times and RPE in the Internal and External Attentional Focus Conditions.

Variable	Attentional Focus	Mean (SD)
Running time (s)	Internal	87.89 (17.16)
	External	84.57 (21.40)
RPE	Internal	7.01 (1.65)
	External	8.42 (1.58)

¹ Values are presented as mean $\pm$ SD. RPE = Rate of Perceived Exertion; s = seconds.

Table 2. Descriptive Statistics for Running Times and RPE by Gender and Attentional Focus.

Variable	Attentional focus	Gender	Mean (SD)
Running Time (s)	Internal	Female	97.79 (18.42)
		Male	80.85 (12.13)
	External	Female	99.82 (24.44)
		Male	73.73 (8.98)
RPE	Internal	Female	7.11 (1.44)
		Male	6.87 (1.78)
	External	Female	8.03 (2.15)
		Male	8.71 (0.91)

¹ Values are presented as mean $\pm$ SD. RPE = Rate of Perceived Exertion; s = seconds.

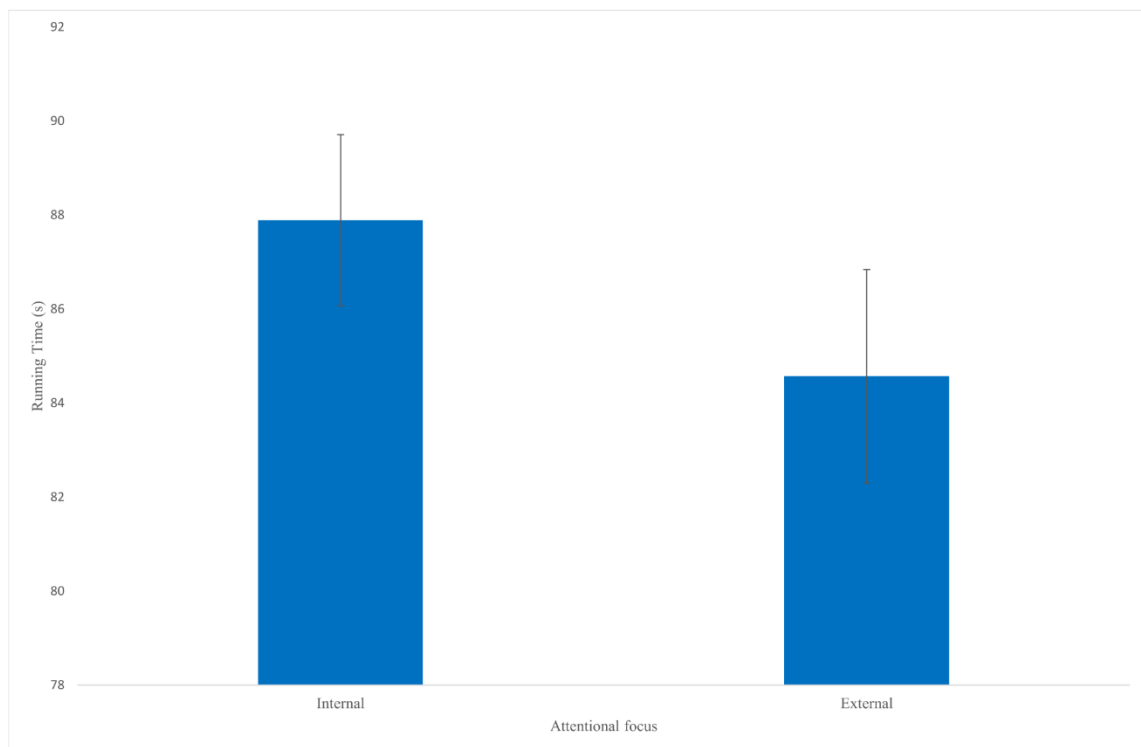


Figure 1. Mean running time ($\pm$ Standard Error) in the internal and external attentional focus conditions.

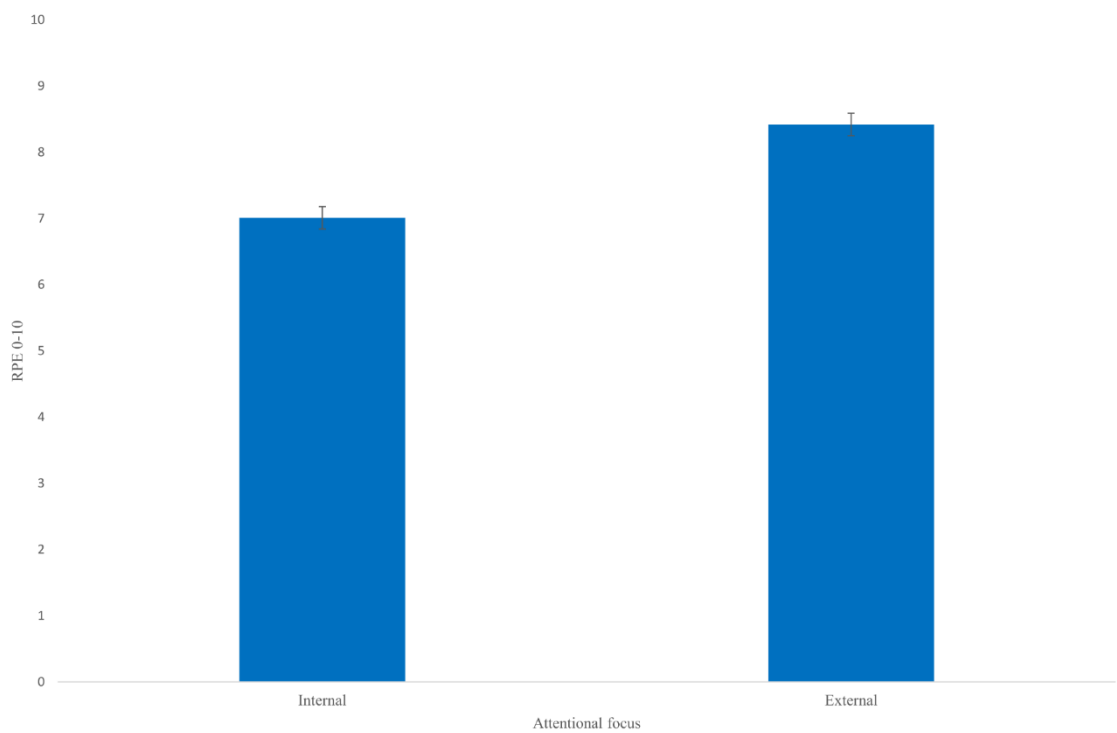


Figure 2. Mean subjective perceived exertion (RPE) ($\pm$ Standard Error) in the internal and external attentional focus conditions.

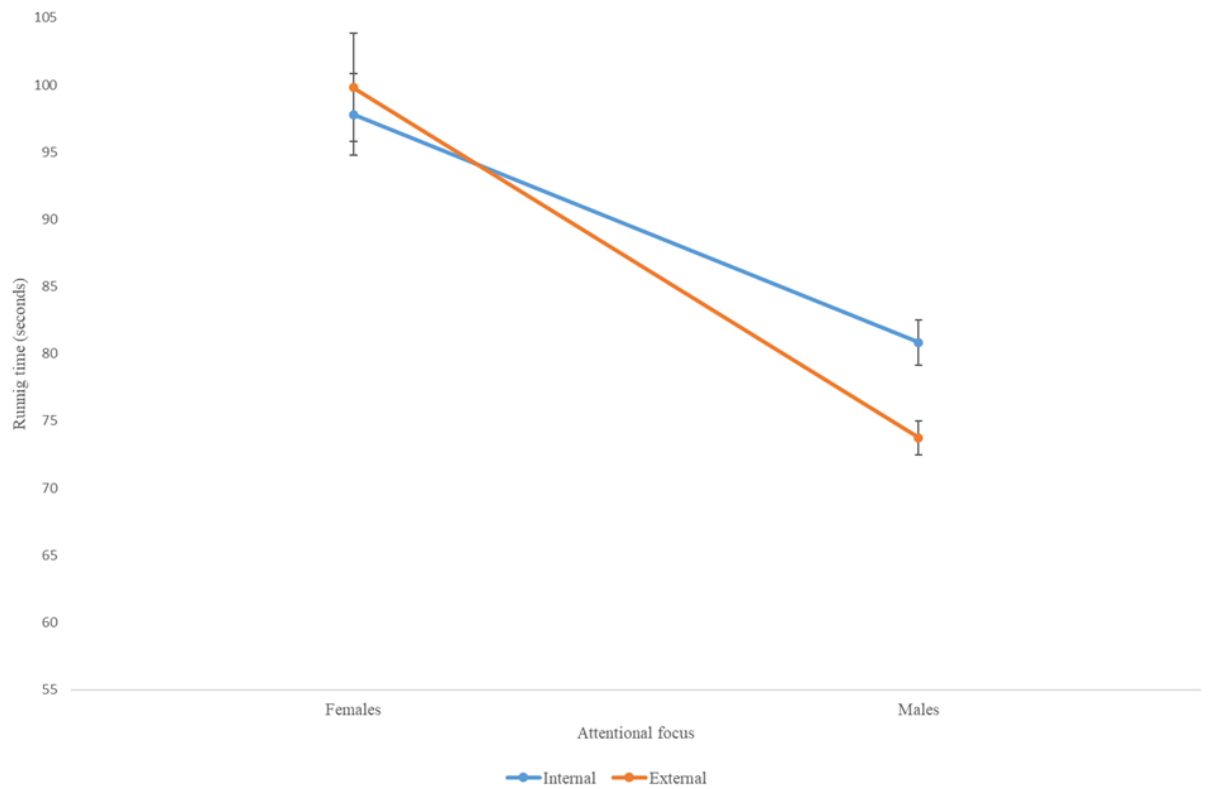


Figure 3. Interaction between attentional focus and gender for mean running time (Mean $\pm$ Standard Error).

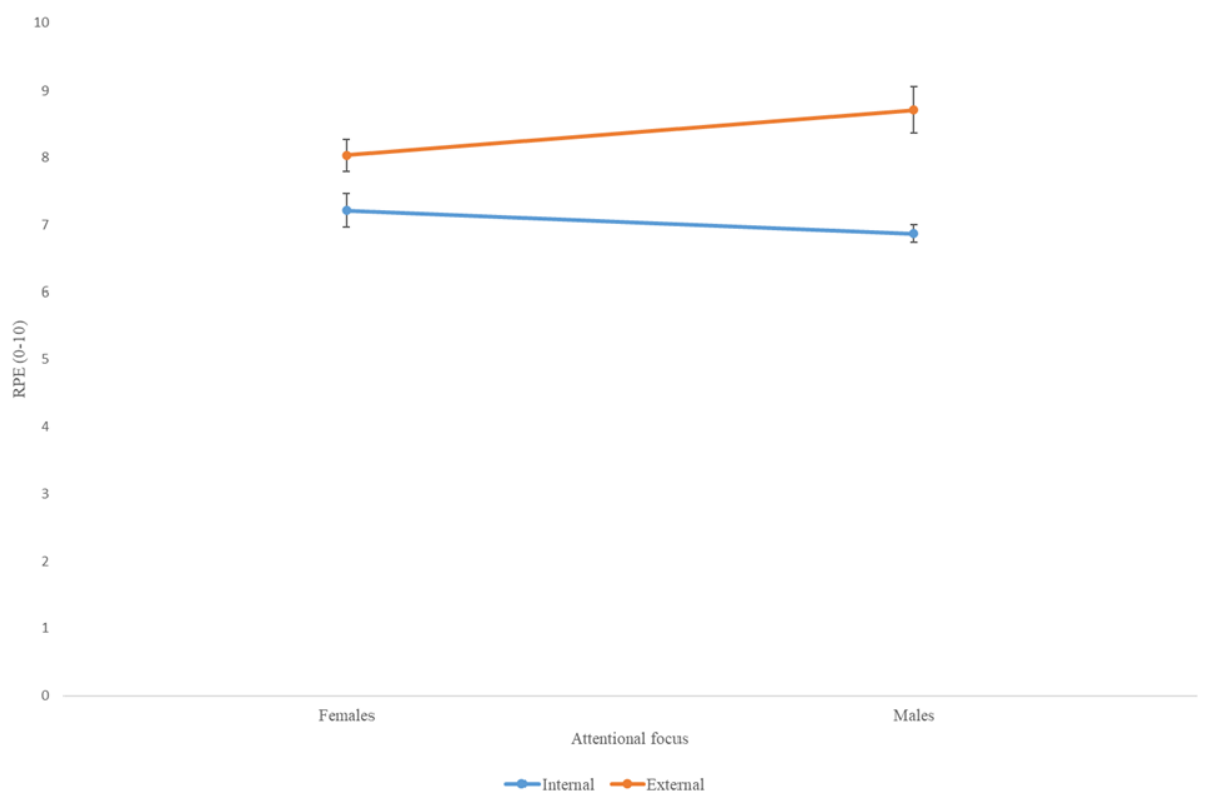


Figure 4. Interaction between attentional focus and gender for mean subjective perceived exertion (RPE) (Mean $\pm$ Standard Error).

4. Discussion

The present study aimed to investigate the effects of manipulating attentional focus (internal vs. external) on performance, measured by running time, and RPE during a 400-meter trial in Sports Science students. Comparative analyses revealed a more complex picture than often presented in the literature, particularly regarding perceived exertion and the influence of individual factors on focus effects. While the anticipated significant performance benefit of external focus was not achieved ($t(88) = 1.953$, $p=0.054$), a novel and practically significant finding emerged: participants reported significantly higher RPE during external focus trials ($t(88) = -7.717$, $p<0.001$). Furthermore, analyses revealed significant interactions between attentional focus and gender for both performance and RPE. These results—the unexpected RPE increase, the marginal performance effect, and the moderating role of gender—provide new insights and warrant detailed discussion on potential underlying mechanisms and, critically for applied practice, implications for applying attentional focus strategies in this context.

Attentional Focus and Performance - Contrary to widespread findings in other motor tasks and some cyclic activities (Wulf, 2013), our results did not show a statistically significant main effect of attentional focus on performance ($p=0.054$, Cohen's $d = 0.207$). This small, non-significant effect size is, however, highly consistent with recent large-scale meta-analyses (e.g. Nicklas et al., 2024), which found a similar small overall benefit for external focus (SMD = 0.24) but reported 'substantial heterogeneity' and explicitly warned that the results 'cannot be generalized for all tasks and skill levels. Our study supports this warning. The non-significant main effect in our data masks a clear and significant Focus x Gender interaction ($p=0.007$), which is discussed in section 4.3. This highlights the complexity and task specificity of attentional focus

effects, which may be consistent with other recent reviews suggesting that individual perceptions and task context moderate outcomes (Yamada et al., 2021). The constrained action hypothesis (Wulf et al., 2001), which postulates that an external focus promotes more automatic and efficient motor control, remains the dominant theoretical framework. However, our findings suggest that its application may be moderated by factors such as gender, task-complexity, and skill-level, rather than being a universal benefit.

Specifically the nature of the task—400m running—might interact with attentional focus differently than shorter sprints or longer endurance efforts. It is plausible that a certain degree of internal monitoring (sensations of effort, rhythm, fatigue) is necessary or even beneficial for self-regulation and pacing in this type of trial (Casado et al., 2021), which could partially attenuate or counteract the advantages of a purely external focus on performance (Schücker et al., 2009).

Attentional Focus and Perceived Exertion - One of the most significant and novel findings of this study was the marked increase in RPE reported in the external focus condition compared to the internal focus condition ($p<.001$). This result is particularly noteworthy as it appears to contrast with the expectation of increased motor efficiency (and potentially lower perceived effort) often associated with external focus, cf. (Aghdaei et al., 2021), and highlights that attentional focus itself is a key modulator of fatigue perception (Lohse & Sherwood, 2011). It holds crucial implications for applied practice. Several concurrent explanations can be proposed. Firstly, it is plausible that external focus instructions, by emphasizing the simulation of competition and the goal of maximizing speed, increased psychological pressure and performance anxiety (Kemarat et al., 2022). This increased cognitive/emotional arousal could have contributed directly to a higher perception of

effort (Haddad et al., 2013). Secondly, this heightened psychological state might have translated into a real attempt by participants to "push themselves harder" or adopt a more aggressive pacing strategy. Although the improvement in running time was not statistically significant on average, the observed tendency towards slightly faster times with external focus could reflect greater actual physical work performed, which, physiologically, would be associated with a higher level of effort and fatigue (Tucker & Noakes, 2009). The higher RPE would, in this case, be a reflection of a greater self-imposed objective demand or simply a different interpretation of physiological signals under heightened arousal.

These findings are vital for applied sport psychology and coaching as they highlight that promoting an external focus may not always lead to an easier or more efficient feeling of effort, even if it contributes to performance. Managing RPE is fundamental in endurance activities for pacing, recovery, and crucial for exercise adherence and positive long-term participation (Ekkekakis et al., 2011; Skorski & Abbiss, 2017; Williams et al., 2016). Professionals must consider this potential increase in perceived cost when recommending external focus, particularly in non-elite populations where well-being and adherence are key goals. Furthermore, it is worth remembering that this effect on RPE also showed a significant interaction with gender, suggesting individual differences in this response that warrant further investigation for tailored practical recommendations.

Gender and Performance - Consistent with well-established literature on sex differences in running performance (Ansdell et al., 2020; Santisteban et al., 2022), our analysis revealed that men were significantly faster than women in this 400m trial, a difference consistent across both attentional focus conditions. However, it was interesting that, despite this marked difference in chronometric performance, no overall

significant difference in RPE was found between men and women, suggesting that, overall, the subjective experience of effort in this task may be comparable between genders, aligning with some recent findings (Hasegawa et al., 2025).

Crucially, the most theoretically and practically relevant finding regarding gender was its significant interaction with attentional focus for both running time ($p=0.007$) and RPE ($p=0.005$). Our analysis of the interaction for time revealed a clear and opposing pattern: external focus produced a significant performance improvement in men (Cohen's $d = 0.662$), but this effect was not observed in women ($d = 0.099$). This finding is novel and warrants careful hypothesizing. One possibility is that the men in our sample (who were significantly faster overall) possessed a more automated running technique, allowing them to benefit from an external focus as predicted by the constrained action hypothesis (Wulf, 2013). Conversely, for the women in our sample, the external focus instructions were simply not effective in improving performance ($p=0.548$). This suggests that the benefits of external focus may not be universal (Aiken & Becker, 2023), but are instead moderated by factors such as the athlete's baseline skill level or the specific pacing strategies adopted, which were not measured in this study. The RPE interaction ($p=0.005$) further complicates this, showing that while both genders experienced higher RPE under external focus, the magnitude of this increase was significantly larger in men ($d=1.162$) than in women ($d=0.460$), suggesting men may have adopted a more aggressive pacing strategy in response to the instructions.

These results represent a novel contribution highlighting the importance of considering individual differences like gender when applying attentional focus strategies in running. Future research should explore these interactions in more detail to determine if different attentional strategies are indeed more effective or perceived

differently depending on the athlete's gender, informing more personalized coaching.

Effect of Competition - In line with the exploratory question of this study, the majority of participants (84.3%) reported that competing alongside their peers motivated them to exert more effort. This finding underscores the importance of the social context in motivating effort in sports performance, which is consistent with theoretical frameworks such as Self-Determination Theory (Deci & Ryan, 2008). The presence of other participants perceived as competitors can generate a sense of challenge, increase psychophysiological arousal (Viru et al., 2010), and consequently lead to greater perceived or actual effort.

This point is especially relevant when considering the implementation of strategies that promote motivation in beginner athletes, to foster exercise adherence (Rodrigues et al., 2020), encourage greater effort (DiMenichi & Tricomi, 2015), or promote student interest (Ivanova & Korostelev, 2019), as perceived by the majority in this study. In this sense, the data suggest that incorporating healthy competitive dynamics in educational or recreational settings can be a valuable tool for coaches and physical educators. Nevertheless, it is important to balance these strategies with approaches that also promote intrinsic motivation and mitigate potential negative effects such as competitive stress or performance anxiety (Fishbach & Woolley, 2022).

5. Limitations

This study presents some limitations that should be considered when interpreting the results. Firstly, although the sample size ($N=89$) can be considered adequate to detect moderate main effects, it might have limited power to detect more subtle interactions or to generalize the findings with high confidence. More importantly, the sample consisted exclusively of Sports Science university students, which restricts the generalization of

the results to other populations with different ages, fitness levels, or sports experience.

Secondly, the running task used (400 meters on a track) is very specific and may not be representative of other distances or real-world running contexts, each with distinct characteristics and physiological demands (Thompson, 2017).

Thirdly, although the RPE scale is a validated measure, it remains a subjective assessment and can be influenced by unmeasured individual factors. Further limitations include the lack of physiological correlates as heart rate or lactate to objectively complement RPE. Furthermore, a direct manipulation check was not performed to ensure that participants strictly maintained the assigned attentional focus throughout the trial, and the potential for demand characteristics arising from the explicit instructions cannot be ruled out.

Finally, other variables that could have influenced performance were not exhaustively controlled, such as the detailed training level of the participants (beyond being students of Physical Activity and Sports Sciences), task-specific intrinsic motivation, or pre-trial mood state.

6. Practical Applications.

For young, amateur athletes and in educational contexts, it is relevant to consider the nuances of using external attentional focus. While the general literature broadly supports its benefits for performance and motor learning (Aiken & Becker, 2023; An & Wulf, 2024; Chua et al., 2021) our findings in a 400m trial with university students present a more complex picture: we observed that the effect of external focus on running time was moderated by gender ($p=0.007$), but, simultaneously, this condition induced a significantly higher RPE.

This highlights a potential performance-perceived effort trade-off that is critical for practitioners working with non-elite populations and high-intensity tasks. Our findings suggest that sports and physical

education professionals, when applying outcome-focused external instructions, should consider this potential trade-off. While there might be a small potential benefit in performance, it is crucial to monitor the notable increase in the participant's perceived cost (RPE). A high RPE, such as the 1.42 unit increase observed in the external focus condition, although potentially reflecting greater effort (which might be desirable for training stimulus in some circumstances), could also negatively affect long-term exercise adherence or the subjective experience of the activity (Ekkekakis et al., 2011; Williams et al., 2016), key outcomes in applied settings.

On the other hand, participants' perception that competing alongside peers helped them exert more effort underscores the importance of the social environment in promoting motivation and effort in sport (Anderson-Hanley et al., 2011), in line with Self-Determination Theory (Deci & Ryan, 2008). Fostering a group training environment could be beneficial for overall motivation and effort (van Meurs et al., 2024) and could potentially complement the use of specific attentional focus strategies.

Consequently, our findings underscore the importance of nuanced and individualized approaches for applied sport psychology professionals, coaches, and physical educators. It is recommended that professionals explore pedagogical and training strategies that balance the pursuit of performance with the management of perceived effort.

Furthermore, considering the significant focus $\times$ gender interactions observed, adapting instructions to the athlete's level, the specific task demands, and potentially individual characteristics like gender could be more effective than applying a single focus type universally. For example, professionals could explore hybrid strategies, such as using an internal focus during preparation followed by an external focus during execution (Aiken & Becker, 2023). The

ultimate goal should be to promote physical activity adherence and a positive sports experience in young and amateur populations, considering both objective improvements and subjective perceptions.

6. Future research directions

To broaden the understanding of the impact of attentional focus on sports performance and experience, it would be valuable to extend this research to more diverse populations, including higher-level competitive runners, whose technical gesture is presumed highly automated (Pacherie & Mylopoulos, 2021). This would allow verification of whether the effects of focus (or their absence in our case for time) differ from novices and to more clearly isolate the attentional impact from the motor learning process (Chua et al., 2021). More generally, future research could systematically explore the relationship between the level of experience or automation of the technical gesture and the relative effectiveness of different attentional focus strategies.

Given the unexpected increase in RPE with external focus and the significant interactions with gender observed in our study, a critical future direction is to delve deeper into the underlying psychophysiological and psychological mechanisms. Including psychophysiological measurements (such as brain activity related to cognitive load or electromyography to evaluate muscular efficiency) (Cheng et al., 2024) alongside subjective reports is needed to fully understand why external focus increased RPE in this context and how this process might differ between genders.

Furthermore, it would be interesting to experimentally manipulate different types of external focus instructions (e.g., focused purely on the outcome vs. focused on the effect of the movement) and internal focus instructions (e.g., kinesthetic sensation vs. specific body part mechanics), and examine how these specific instruction types influence both performance and RPE, and whether

their effects are moderated by gender or skill level in endurance tasks like the 400m.

Finally, considering the influence of context, it would be important to examine the effect of these attentional strategies in real or simulated competition situations with higher psychological pressure, where factors like anxiety (Nideffer, 1990) can interact with the effectiveness of attentional focus. Findings from these lines could more precisely inform the design of interventions and training programs to optimize attentional focus in runners, balancing performance goals with athlete well-being and long-term engagement.

Funding: This study was supported by predoctoral fellowship from the Spanish Ministry of Universities (FPU20/00611 to Juan-José Pérez-Díaz).

Conflicts of Interest: The authors declare no conflict of interest.

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