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Playful sport design and sport engagement: A diary study among amateur athletes

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ABSTRACT

Sport engagement is essential for athletes' performance and long-term commitment. Drawing on self-regulation and play literature, we propose that athletes can proactively enhance their sport engagement and, indirectly, performance (i.e., goal progression) by enacting Playful Sport Design (PSD). PSD involves proactively adding play elements to training by "designing fun" (DF; incorporating creativity, humor, and fantasy) and "designing competition" (DC; fostering self-imposed challenges, keeping score, and driving self-improvement). Additionally, we explored how PSD's effectiveness varies across different sports settings: solitary versus group training and coached versus non-coached sessions. To investigate this, athletes who trained at least twice a week participated in a four-week weekly diary study using reconstruction methodology ($N = 99$ individuals, $n = 616$ sport activities). The sample consisted mostly of amateur athletes (88 %), with an average age of 28.4 years (65 % women, 35 % men). Strength sports was the most common sport (33 %), followed by fitness (19.2 %), athletics (16.2 %), and ball sports (7.1 %). On average, they trained 3.7 times per week and had 14.2 years of experience. Supporting our hypotheses, multilevel regression analyses revealed that DF and DC both enhanced goal progression through increased engagement. Notably, DF was more effective in group settings than in solitary sessions, whereas DC was more effective in either the presence of a coach (vs. no coach) or in solitary settings (vs. group settings). The findings demonstrate that athletes can initiate play to drive their own engagement and goal progression, as well as highlight the sports environments in which this behavior is most effective.

Sport engagement, a multidimensional positive psychological state characterized by vigor, enthusiasm, and immersion in training, is crucial for athletes' performance and long-term commitment (Guillén, & Martínez-Alvarado, 2014; Lonsdale, Hodge, & Raedeke, 2007). For instance, engaged athletes experience less burnout and more frequent states of flow (Guillén, & Martínez-Alvarado, 2014; Hodge et al., 2009; Lonsdale, Hodge, & Jackson, 2007). Studies highlight the role of top-down approaches, such as the social sports environment (e.g., coaches and trainers), in fostering engagement (Balk et al., 2019; Curran et al., 2015; De Francisco et al., 2020; Isoard-Gautheur et al., 2021). Additionally, research on self-regulatory behaviors in sports suggests that athletes can enhance their engagement through bottom-up processes, though these behaviors have primarily been linked to skill acquisition and performance rather than direct engagement improvement (McCardle et al., 2017). Recently, playful sport design (PSD) has been introduced as a unique bottom-up strategy that athletes can implement during training, integrating play into their training routines (Verwijmeren et al., 2024). Previous research found that athletes who incorporated PSD into their training demonstrated better sports performance, potentially due to more positive psychological states (Verwijmeren et al., 2024). Building on prior work in sport engagement, self-regulation, and PSD, the present study proposes that PSD can enhance engagement and, indirectly, sport performance. Furthermore, we suggest that PSD's effectiveness in achieving these outcomes interacts with the social sports environment.

Specifically, we combine ideas that self-regulation aids in achieving goals (Kitsantas et al., 2018; Zimmerman, 2000) and that play can reduce the negative consequences of monotony (Scharp et al., 2021), optimize challenge-skill balance, facilitate active task engagement, and

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boost energy levels (Côté et al., 2003; Deterding et al., 2011; Huizinga, 1949; Van Vleet & Feeney, 2015; Verwijmeren et al., 2024). Consequently, we developed a framework that explains whether and under which conditions playful sport design increases sport engagement and performance (i.e., operationalized as goal progression) (see Fig. 1). PSD encompasses bottom-up play strategies—initiated by athletes themselves—to foster enjoyment and competitive drive in training (Verwijmeren et al., 2024). These strategies range from creative and imaginative exercises (designing fun) to structured goal-setting methods such as micro-objectives and skill extensions (designing competition). We suggest that during training sessions where athletes apply these strategies more than usual, they experience greater engagement and feel that they have made progress toward their goals. Additionally, we integrate previous views on how the social sports environment and self-initiated strategies can impact sport engagement (Guillén, & Martínez-Alvarado, 2014; Lonsdale, Hodge, & Raedeke, 2007, Lonsdale, Hodge, & Jackson, 2007; McCardle et al., 2017) by exploring how PSD interacts with social versus solitary training, and coached vs. uncoached settings in predicting engagement and goal progression. Social cognitive theory suggests that self-regulation thrives when external constraints are minimal (Zimmerman, 2000), whereas play research indicates that self-initiated play may be amplified by social interaction (Barreiro & Howard, 2017; Reed, 2020). Thus, PSD's effect on engagement may either be strengthened or weakened by the social sports environment, which we investigate in this study. Ultimately, we aim to determine whether athletes can actively shape their own sport engagement through play and how training with peers or under the coach's supervision influence this relationship. Findings may offer valuable insights into how athletes can sustain enjoyment, commitment, and performance, whether in solitary or social sports settings (Velasco & Jorda, 2020).

1. Theoretical background

1.1. Self-regulation and playful sport design

Social Cognitive Theory views self-regulation as a cyclical process involving self-generated thoughts, feelings, and actions aimed at attaining personal goals (Zimmerman, 2000). It involves bottom-up planning, monitoring, and self-evaluation, allowing individuals to optimize performance by setting higher goals and adjusting their efforts accordingly (Schunk & DiBenedetto, 2020). Consequently, athletes are not merely passive recipients of external influences; they represent active agents that continuously adapt and influence the experiential qualities of events. It can be inferred that athletes can promote changes in their own feelings of physical and mental vitality (vigor), willingness to devote time and energy to their training (dedication), and involvement in training tasks (absorption; Guillén, & Martínez-Alvarado, 2014; Hodge et al., 2009) during training, which can contribute to accomplishing personally meaningful sport goals.

One promising approach to fostering sport engagement and goal progression is Playful Sport Design (PSD)—a proactive cognitive-behavioral orientation in which athletes integrate elements of ludic and agonistic play into training sessions (Verwijmeren et al., 2024). Play, inherently voluntary and intrinsically motivated, can be ludic (spontaneous, fun, humorous) or agonistic (competitive, goal-driven) (Huizinga, 1949; Scharp et al., 2022). While sports naturally include playful components, any sport activity can be approached and performed with a playful attitude (Verwijmeren et al., 2024). For example, during a football training session - a sport that is inherently more playful - an athlete might fantasize while practicing penalties, imagining they are taking a decisive shot in a championship match. During running, a sport that is inherently less playful, one can also use imagination during training, such as envisioning themselves in the final meters before the finish line, cheered on by a crowd. Thus, consistent with self-regulation as practice-enhancing orientation (McCormick et al., 2018; Young et al., 2023), PSD embodies a cognitive-behavioral orientation through which athletes can frame and perform all types of training activities playfully (Verwijmeren et al., 2024). PSD aligns with the bottom-up nature of self-regulation (Zimmerman, 2000), as athletes initiate playful behaviors themselves, shaping their training experiences. By adopting playful strategies, athletes can enhance flexible thinking, problem-solving, motivation, and social interactions (Deterding et al., 2011; Van Vleet & Feeney, 2015). In line with the qualities of play, PSD consists of two variations of play: designing fun (DF, ludic play; e.g., varying speed using the physical environment) and designing competition (DC, agonistic play; e.g., swimming more lanes in the same timeframe) (Verwijmeren et al., 2024). While PSD has been shown to increase flow,

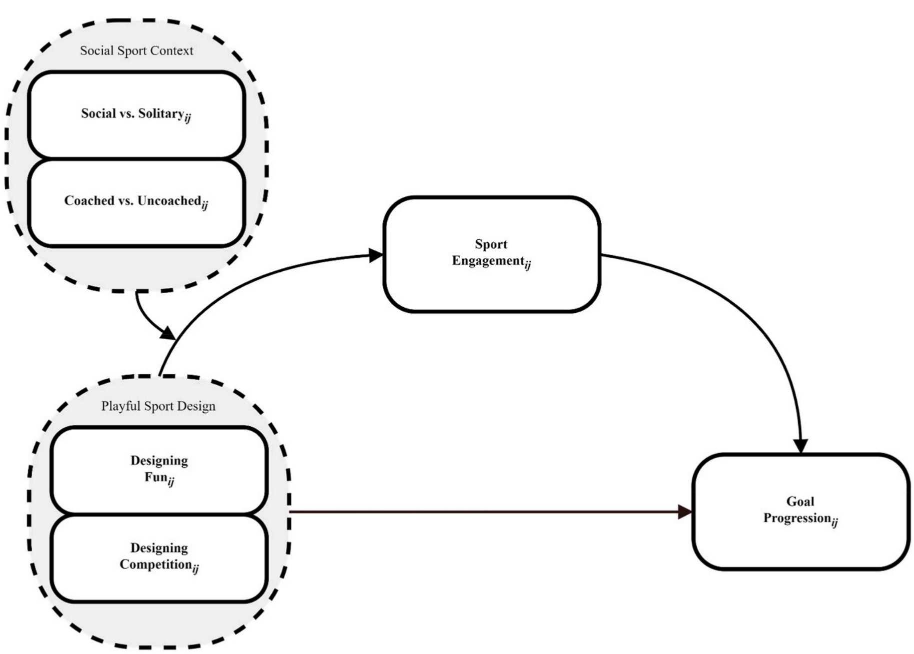

Fig. 1. Conceptual Model of Playful Sport Design, Sport Engagement, and Goal Progression
Note. $_i$ = activity. $_j$ = person.

enhance performance (Verwijmeren et al., 2024), and incorporate performance-related elements, its primary goal is not performance improvement. It is theorized to make the practice more playful and positive, which may indirectly lead to better performance, but this process has remained unclear.

1.2. Playful sport design, sport engagement, and goal progression

How can PSD lead to increased sport engagement? Social Cognitive Theory (Bandura, 2001; Zimmerman, 2000) suggests that individuals continuously evaluate their behavior in relation to their needs, abilities, and environment, potentially leading to a better fit between athletes and training. Such an improved person-environment fit has been linked to enhanced engagement (Keane et al., 2024). Additionally, research on play suggests enjoyment, self-imposed challenges, present-moment awareness, and active task involvement as factors driving engagement (Bakker & Scharp, 2024). Indeed, activities pursued for intrinsic enjoyment, rather than external rewards, have been positively linked to higher athlete engagement (Graña et al., 2021). More specifically, DF, by introducing variation and novelty, may support vigor and immersion in training (Lakicevic et al., 2020). This idea is supported by qualitative research, which found that exercisers reported greater immersion in training sessions when activities involved exploration, novelty, and variation (Swann et al., 2018). Athletes who engage in DC create self-relevant performance discrepancies, which are theorized to increase motivation (Zimmerman, 2000). Research suggests that self-improvement goals and process-oriented training can enhance sport motivation (Bieleke et al., 2019; Williamson et al., 2022), and findings from workplace settings indicate that playful approaches may foster engagement (Scharp et al., 2022).

Engagement in training sessions likely enhances performance, as athletes who are mentally and physically invested in their training exhibit higher energy, motivation, and task involvement (Guillén, & Martínez-Alvarado, 2014; Lonsdale, Hodge, & Raedeke, 2007). In this study, subjective goal progression toward meaningful personal sport goals is used as an indicator of performance during training (Brunstein et al., 1998), based on the premise that goal striving is central in sports (Beauchamp et al., 2022). Since achieving peak performance in competitions is a significant personal goal for many athletes and training encompasses the physical, technical, intellectual, and psychological preparation for this peak performance, it can be inferred that goal progression reflects an important performance outcome many athletes strive for during training sessions.

Although research remains inconclusive on whether play during adulthood enhances athletic performance (e.g., Barth et al., 2022), we propose that PSD stimulates goal progression through sport engagement. Highly engaged athletes exhibit elevated physical and mental energy, direct this energy toward meaningful sport goals, and remain deeply involved in training tasks (Guillén, & Martínez-Alvarado, 2014; Lonsdale, Hodge, & Raedeke, 2007), thereby likely improving training quality. Empirical findings align with this perspective, demonstrating that sport engagement predicts performance indicators such as flow (Hodge et al., 2009), satisfaction (Balk et al., 2019), and immersion in training (Bakker, 2014), while heightened vigor is positively associated with improved athletic performance (Nahum et al., 2019). For instance, a swimmer fully immersed in interval training and maintaining high motivation is more likely to complete intervals at pre-determined speeds with technical precision, supporting progression toward peak performance in competition.

1.3. Effectiveness of playful sport design in social sports environment

While PSD is initiated by athletes, Social Cognitive Theory highlights the influence of social agents - such as coaches, teammates, and peers - in developing self-regulation skills through modeling, social contagion, and guided planning (Usher & Schunk, 2018). Over time, socially mediated self-regulation becomes internalized, allowing athletes to regulate their behaviors independently. Additionally, McCardle and colleagues (2017) note that athletes' self-regulation and social agents may interact, but this relationship remains underexplored. On the one hand, self-regulation may become more crucial when social agents are absent (Zimmerman, 2000), as athletes must independently plan, monitor, and reflect on their training without external guidance (e.g., feedback, instruction, or progress tracking). In this context, self-regulation may acts as a resource to uphold engagement, enabling athletes to maximize their training outcomes despite the lack of external support. On the other hand, even in the presence of coaches or teammates, athletes may engage in self-regulation strategies. These strategies can be shared with others, boosting the training quality, such as (shared) goal achievement (Hadwin & Oshige, 2011). Thus, the social sports environment may (partly) impact the effectiveness of self-regulatory behaviors such as PSD.

In line with these views, we suggest that the motivational potential of PSD can be influenced by the presence or absence of social agents. First, the relation between PSD and sport engagement may be stronger in the absence of coaches or training partners, whose support has been shown to enhance sport engagement (Mellano & Pacewicz, 2023). Training solo can introduce challenges such as boredom and increased perceived exertion (Hirsch et al., 2020), making PSD an essential motivational tool. For instance, a runner facing a tough solo training session might find it helpful to imagine competing in a race or discovering new running routes (i.e., designing fun). Athletes may also try to reach a specific heart rate throughout the training or approach the training as an exciting challenge (i.e., designing competition). These enjoyable and challenging strategies might help athletes focus on the training task at hand and feel more vigorous (Scharp et al., 2022), especially when coaches or training partners are not there to support the athlete. Athletes indeed mention that self-regulation strategies are particularly useful during demanding training sessions (Hirsch et al., 2021). Moreover, play has been shown to reduce monotony, foster adventure, and mitigate the negative effects of isolation (Scharp et al., 2021).

The motivational impact of PSD may also be amplified in the presence of coaches or teammates, as play often includes a social component (social play; Burghardt, 2005). Aligning this idea, one feature of PSD is proactively creating fun for everyone who is involved in the training session (Verwijmeren et al., 2024). When athletes play or have fun with each other, it is likely that sport engagement during the training session will be promoted. This heightened engagement can be the result of increased feelings of affiliation and interactivity (Van Vleet & Feeney, 2015). Additionally, research suggests that engagement is contagious—one athlete's enthusiasm can inspire and energize teammates and coaches, reinforcing a cycle of motivation (Bakker, 2022). This engagement transfer may further boost the motivation and involvement of the athlete who initiated PSD. Empirical studies confirm that the social environment facilitates motivational outcomes of self-regulatory processes in sports (Sakalidis et al., 2022). Furthermore, coaches can allocate time for self-initiated play during training sessions, encouraging energized athletes who feel supported in their play activities (Baker et al., 2019).

1.4. The present study

Research indicates that affective states, cognitions, and behaviors during training sessions can fluctuate significantly over time (e.g., from day to day) and across different settings (Dunton, 2016; Sudeck et al., 2016). Moreover, play is inherently bound by time and space (Huizinga, 1949). To capture these dynamic variations, this study examines within-person associations between PSD, sport engagement, and goal progression, while also investigating the impact of the social sports context on this process. We propose that the construct of PSD is better represented by variations in playful behaviors, with athletes engaging in these behaviors to varying degrees across training sessions rather than solely stable between-person differences. Consequently, we adopt an episodic, activity-based approach, complementing prior between-person research that explored long-term predictors and outcomes of sport engagement (Curran et al., 2015; Hodge et al., 2009) and PSD (Verwijmeren et al., 2024). Studying intra-individual variation provides critical insight into sport engagement and goal progression as immediate effects of PSD, thereby enhancing the ecological validity of our findings. For example, on a given day, an athlete might inject playfulness into their training by setting personal challenges, such as trying to beat their own best time with a humorous twist, adding creative variations to a drill, or turning a solo workout into a mini-game - acts of playful sport design that can instantly boost engagement.

Theoretical perspectives and empirical evidence suggest that PSD enhances engagement and performance by fostering intrinsic motivation, structured challenges, and active task involvement. By enabling athletes to take control of their training experience, PSD cultivates a positive, engaging, and high-performance training environment that supports both individual growth and athletic success. Therefore, we propose.

Hypothesis 1a. Training sessions in which athletes incorporate more Designing Fun (DF) than usual will result in higher sport engagement, which, in turn, will enhance goal progression (mediation).

Hypothesis 1b. Training sessions in which athletes incorporate more Designing Competition (DC) than usual will result in higher sport engagement, which, in turn, will enhance goal progression (mediation).

Furthermore, building on existing literature, we suggest that PSD—whether through DF or DC—can either buffer the demotivating effects or amplify the motivational benefits of the social training context. This leads to the following research question:

How does the presence of social agents (e.g., training partners or coaches) influence the association between PSD, sport engagement, and, indirectly, goal progress?

2. Method

2.1. Participants and procedure

The Ethics Committee of Psychology at Leiden University (the Netherlands) approved the study (number: 2023-03-07-J.D. de Vries-V2-4567). Individuals could participate if they were adult athletes (amateur and elite) who trained at least twice a week. An a priori power analysis, conducted using Model 7 of Lafit et al.'s (2021) Shiny App and data from a previous diary study on Playful Work Design and employee engagement (Scharp et al., 2019; moderate associations, r = .43–.46), determined that 125 participants were required to achieve a power of .85 at $\alpha = .05$. Participants in the Netherlands were recruited through convenience sampling between March and May 2023. The study was conducted remotely via the Qualtrics software platform. Recruitment flyers were distributed on social media, including a link to the information letter. After reading the letter, participants could choose to take part. Upon providing informed consent, they immediately began completing the baseline questionnaire, which included questions on demographics, sports characteristics, and other stable traits.

For the next four weeks, participants received weekly questionnaires via email on Sunday evenings, asking them to reconstruct their training sessions from the previous week (Monday–Sunday). As compensation, they could enter a lottery where gift cards and Fitbits were raffled off.

Our methodological approach is an adaptation of the Day Reconstruction Method (Kahneman et al., 2004), in which participants are asked to reconstruct the preceding day into episodes chronologically. In this study, participants were asked to reconstruct each sports session they engaged in at the end of each week. This method was used since athletes train on different days, and sending out daily questionnaires for four weeks significantly burdens participants, making dropout more likely. Specifically, in the weekly questionnaire, participants first indicated their training days of the previous week. Next, the selected days were presented in chronological order, and participants were asked for each training session to indicate in which sports they engaged, for how long, at what intensity, and if a coach or other athletes were present. After that, they were asked to indicate the extent to which they used PSD during, their sport engagement during and feelings of goal progression after the training. This methodological approach is most appropriate when considering participant burden and the alignment with our theorizing on the activity level of analysis.

A total of 187 adult athletes signed up to participate and filled out the baseline questionnaire. In the final sample, we included participants who filled out the baseline questionnaire and reconstructed at least three training sessions to meaningfully assess fluctuations, resulting in 99 participants who met these criteria ($n = 616$ training sessions). On average, participants reported 6.24 training sessions ($SD = 2.53$). In this final sample, the mean age was 28.4 years ($SD = 12.2$), with participants ranging from 18 to 72 years. The sample consisted of 65 % women and 35 % men. The educational level varied, ranging from finishing high school (27 %) to having a University Master's Degree (23 %). Most athletes were amateur (88 %), but some also competed at a regional (7 %), national (4 %) or international (1 %) level. Regarding types of sports, the majority of athletes participated in strength sports ($n = 33$). This was followed by fitness and fishing ($n = 19$), athletics (e.g., running; $n = 16$), and ball sports like basketball, football, or volleyball ($n = 7$). Cycling was reported by $n = 6$ of participants, while watersports (e.g., swimming, sailing, water polo) and racket sports (e.g., badminton, tennis, squash) were each practiced by $n = 4$. Gymnastics ($n = 3$), winter sports ($n = 1$), rowing ($n = 1$), and martial arts (e.g., judo, karate; $n = 1$) were also mentioned. Additionally, $n = 4$ of participants selected "other." Athletes participated in an average of 3.7 ($SD = 1.3$) sports activities per week and reported an average of 14.2 ($SD = 12.8$) years of training experience.

2.2. Measures

We calculated omega reliabilities at the between and within-person level of analysis. Omega reliability provides a more precise estimate of internal consistency by reflecting the true factor structure of a test or questionnaire, effectively handling multidimensionality and unequal item loadings (Dunn et al., 2013).

2.3. Playful sport design

The 12-item Playful Sport Design scale of Verwijmeren et al. (2024) was used to measure PSD. The items were slightly adapted for the weekly reconstruction method and introduced as follows: "Can you indicate the extent to which you did the following during your sports training session on this day? Please note that we mean behaviors that are self-started and not forced to do by others." Six items pertained to designing fun (e.g., "I looked for fantasy in the things I needed to do during this training session"), and six items pertained to designing competition (e.g., "I competed with myself during this training session, not because I had to, but because I enjoyed it"). Answers could be given on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*). The reliabilities of designing fun ($\omega_B = .96$, $\omega_W = .82$) and designing competition ($\omega_B = .91$, $\omega_W = .77$) were good. Previous research demonstrated strong construct, factorial, and predictive validity. Furthermore, internal and test-retest reliability were found to be satisfactory (Verwijmeren et al., 2024).

2.4. Sport engagement

The measurement of sport engagement was based on earlier work of Breevaart et al. (2012) and Guillén, and Martínez-Alvarado (2014). More specifically, Guillén, and Martínez-Alvarado (2014) developed a sport engagement measure based on an occupational engagement scale, but it focused on stable engagement rather than state engagement. To address this, Breevaart et al. (2012) created a state-based work engagement measure, which was then adapted to sport engagement. For instance, an item like "Today, I felt bursting with energy" was modified to "During this training session, I felt bursting with energy" in the present study. Since Schaufeli et al. (2019) have shown that three items can validly and reliably capture engagement, and to lower the burden upon our participants, three items were used to measure sport engagement. Here are the three items: 'During this training session, I felt bursting with energy" (vigor), "I was enthusiastic about this training session" (dedication), and "I was immersed in this training session" (absorption). Answers could be given on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The scale was internally consistent (ω_B = .91, ω_W = .80).

2.5. Goal progression

We measured goal progression with a single item based on Brunstein et al. (1998), which was introduced as: "The following statement is about how you felt after this training. Can you indicate to what extent you recognize this feeling?" Participants evaluated the item "After this training, I felt that I had made much progress toward achieving my sports goals" on a 7-point scale (1 = *strongly disagree;* 7 = *strongly agree*).

2.6. Social context of the training

To measure whether training partners were present during a training session, the following question was asked: 'Did you do this training session alone or together with training partners? If you did your training under supervision of a trainer, you can select alone"' (0 = *together with training partners*, 1 = *alone*). To measure whether a coach was present, the following question was asked: 'Did you do this training session under supervision of a trainer?' (0 = *No, I did not train under supervision of a trainer,* 2 = *Yes, I trained under supervision of a trainer*).

2.7. Statistical approach

The data was hierarchically organized, with 616 sport activities nested in 99 individuals. Moreover, the intraclass correlations demonstrated that differences between activities explained 40 %–73 % of the variance (see Table 1). Therefore, we conducted multilevel analyses in Mplus to test our hypotheses (Muthén & Muthén, 1998). We specified an indirect effect and conditional indirect effect model to test our hypotheses and answer our research question, respectively. To decrease bias in the estimates at the within-person level, level-1 predictors were person-mean centered, while their level-2 counterparts were included and grand-mean centered (Enders & Tofighi, 2007). Namely, the bias associated with level-2 factors, such as overall response tendencies, cannot exert main effects on centered level-1 variables (Gabriel et al., 2019). In addition, Bayes estimation with default priors was used (Enders & Tofighi, 2007). Bayes estimation is desirable when testing for indirect and interaction effects since this procedure is robust against nonnormality, decreases sample bias, and requires smaller samples than maximum likelihood estimation (Muthén & Asparouhov, 2012; Van de Schoot et al., 2013). In addition, the confidence intervals are non-symmetrical, which is similar to the results of bootstrapping procedures.

3. Results

3.1. Descriptive statistics

The mean, standard deviations, reliabilities, and correlations of the study variables are presented in Table 1.

3.2. Hypotheses testing

Hypothesis 1a (Training sessions in which athletes incorporate more DF than usual will result in higher sport engagement, which, in turn, will enhance goal progression) and Hypothesis 1b (Training sessions in which athletes incorporate more DC than usual will result in higher sport engagement, which, in turn, will enhance goal progression) were tested in a single indirect effects model (see Table 2; Preacher et al., 2007). As predicted, athletes were more engaged when they designed fun (b = .36, SD = .06, p < .001, 95 %CI[.26, .48]) and designed competition (b = .24, SD = .05, p < .001, 95 %CI[.14, .35]). We calculated the indirect effects (ab) by multiplying the direct association of playful sport design with sport engagement with the association between sport engagement and goal progression. Indeed, athletes reported more goal progression because they were more engaged during the sessions they designed fun (ab = .14, SD = .03, p < .001, 95 %CI[.09, .19]) and designed competition (ab = .09, SD = .02, p < .001, 95 %CI[.05, .14]). Hence, Hypothesis 1a and Hypothesis 1b were both supported.

3.3. Role of the social context

We also proposed that the social context might strengthen or weaken the motivating potential of PSD and, therefore, impact sport engagement and goal achievement. Hence, we specified a conditional indirect effects model (see Tables 2 and 3). The social (vs. solitary) sport setting boosted the association between designing fun and sport engagement (b = .32, SD = .17, p < .05, 95 %CI[.01, .65]. The pattern of the interaction effect is plotted in Fig. 2. As can be seen, the association between designing fun and sport engagement was stronger during social sport settings (b = .64, SD = .18, p < .001, 95 %CI[.32, .98]*)* than in solitary sport settings (b = .33, SD = .06, p < .001, 95 %CI[.21, .45]). This also translated into more goal achievement (see Table 3). However, the absence or presence of a coach did not change the association between designing fun and sport engagement (b = −.20, SD = .20, p = .31, 95 %CI[-.65, .15]).

Similarly, we found that designing competition interacted with the social (vs. solitary) setting (b = −.32, SD = .16, p < .05, 95 %CI[-.64,

Table 1
Descriptives, correlations, and omega reliabilities of the study variables.

	Mean	SD_{person}	$SD_{activity}$	1-ICC	1.	2.	3.	4.	5.	6.
1. Designing Fun	3.57	1.02	.84	.40	(.96, .82)	.68**	.57**	.37*	.04	.01
2. Designing Competition	4.33	.95	.84	.44	.45**	(.91, .77)	.59**	.67**	−.07	−.12
3. Sport Engagement	4.84	.65	1.08	.73	.38**	.32**	(.91, .84)	.63**	−.03	−.11
4. Goal Progression	4.80	.83	1.15	.66	.23**	.42**	.44**	–	−.21	−.28*
5. Social (vs. Solitary)	.50	.27	.42	.70	.12**	−.02	.18**	−.02	–	.58**
6. Coached (vs. Uncoached)	.26	.29	.33	.56	−.02	.08	.13**	.02	.45**	–

Note. *p < .05; **p < .01. ICC = Intraclass Correlation. Correlations above the diagonal reflect between-person differences and are based on individual averages (level-2), whereas correlations below the diagonal represent within-person differences and are derived from activity-specific observations (level-1). Social (vs. solitary) ranged from 0 = solitary to 1 = social, whereas coach (vs. uncoached) ranged from 0 = uncoached to 1 = coached. In total, 311 (50.5 %) were solitary, whereas 306 (49.5 %) were social, and 162 (26.3 %) were coached, whereas 454 (73.7 %) were not coached. The average of the person mean of social (vs. solitary) was .42 and of coached it was .28.

Table 2
Unstandardized multilevel estimates of the indirect effects and moderated-indirect effects model.

Person Level	Indirect Effects Model		Moderated-Indirect Effects Model	
	Sport Engagement *b(SD)*[95 %CI]	Goal Progression *b(SD)*[95 %CI]	Sport Engagement *b(SD)*[95 %CI]	Goal Progression *b(SD)*[95 %CI]
Intercept	4.62(.07)**	1.45(.76)	4.83(.06)**	2.03(.89)**
Designing Fun	.23(.08)[.06,.38]**	−.25(.09)[-.40,-.08]**	.23(.08)[.07,.37]**	−.24(.10)[-.48,-.04]**
Designing Competition	.26(.09)[.07,.44]**	.46(.11)[.25,.68]**	.23(.09)[.07,.39]**	.53(.11)[.31,.75]**
Social (vs. solitary)	−.09(.26)[-.60,.36]		.16(.26)[-.28,.70]	
Coached (vs. Uncoached)	−.54(.27)[-1.08,.05]		−.19(.26)[-.71,.31]	
Sport Engagement		.70(.16)[.38,1.01]**		.57(.18)[.19,.88]**
Activity Level				
Designing Fun	.36(.06)[.26,.48]**	−.09(.06)[-.19,.03]	.33(.06)[.21,.45]**	−.08(.06)[-.23,.05]
Designing Competition	.24(.05)[.14,.35]**	.46(.06)[.34,.59]**	.32(.06)[.20,.46]**	.46(.06)[.32,.57]**
Social (vs. solitary)	.30(.10)[.08,.49]**		.28(.12)[.05,.48]**	
Coached (vs. uncoached)	.30(.15)[-.02,.57]		.27(.15)[-.09,.54]	
Sport Engagement		.37(.04)[.30,.45]**		.38(.04)[.29,.46]**
Designing Fun × Social			.32(.17)[.01,.65]*	
Designing Fun × Coached			−.20(.20)[-.65,.15]	
Designing Competition × Social			−.32(.16)[-.64,.00]*	
Designing Competition × Coached			.69(.20)[.30,1.05]**	
Variance Components				
Intercept Variance (τ_{00})	.47(.09)[.28,.65]**	.64(.09)[.46,.80]**	.21(.03)[.15,.25]**	.27(.03)[.21,.32]**
Activity Variance (σ^2)	.20(.03)[.15,.25]**	.26(.03)[.20,.32]**	.43(.09)[.24,.61]**	.59(.08)[.44,.73]**

Note. $^*p < .05$; $^{**}p < .01$.

Table 3
Conditional direct and indirect effects of designing fun and designing competition on sport engagement and goal progression via sport engagement.

Predictor	Moderator	Simple Slopes	Indirect Simple Slopes
		Sport Engagement *b(SD)[95 %CI]*	Goal Progression *ab(SD)[95 %CI]*
Designing Fun	Solitary	.33(.06)[.21,.45]**	.12(.03)[.08,.18]**
	Social	.64(.18)[.32,.98]**	.25(.07)[.11,.39]**
	Uncoached	.33(.06)[.21,.45]**	.12(.03)[.08,.18]**
	Coached	.12(.22)[-.35,.51]	.05(.08)[-.13,.19]
Designing Competition	Solitary	.32(.06)[.20,.46]**	.12(.03)[.08,.17]**
	Social	−.00(.16)[-.33,.32]	−.00(.06)[-.10,.13]
	Uncoached	.32(.06)[.20,.46]**	.12(.03)[.08,.17]**
	Coached	1.02(.22)[.53,1.41]**	.37(.10)[.20,.58]**

Note. $^*p < .05$; $^{**}p < .01$.

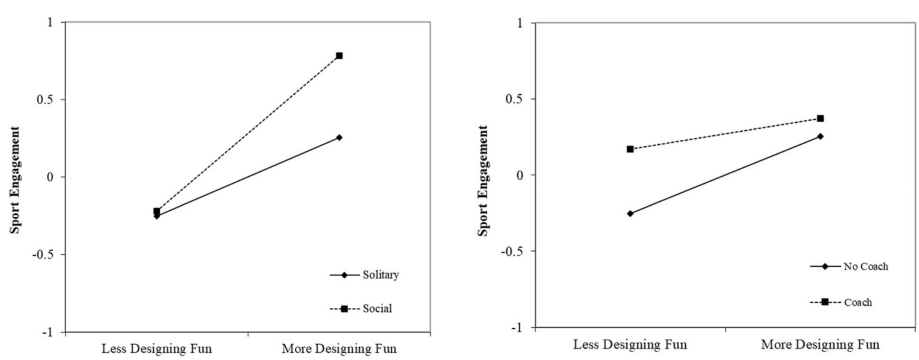

Fig. 2. Interactions between designing fun and the social sports context: Social (vs. Solitary) and coached (vs. No Coach).

.00]; see Fig. 3). In contrast to designing fun, the association between designing competition and sport engagement was stronger in solitary settings ($b = .32$, $SD = .06$, $p < .001$, 95 %CI[.20, .46]) and not significant in social settings ($b = -.01$, $SD = .16$, $p = .970$, 95 %CI[-.33, .32]). The motivating potential of designing competition was also boosted by the presence of a coach ($b = .69$, $SD = .20$, $p < .001$, 95 %CI[.30, 1.05]). Designing competition especially amplified sport engagement in the presence of a coach ($b = 1.02$, $SD = .22$, $p < .001$, 95 %CI[.53, 1.41]) and less in the absence of a coach ($b = .32$, $SD = .06$, $p < .001$, 95 %CI[.20, .46]). The amplification by solitary settings and the presence of a coach were both indirectly related to more goal progression (see Table 3).

3.4. *Exploratory analyses: interaction between designing fun and competition*

Exploratorily, we examined if designing competition and designing fun interacted in predicting sport engagement. The association between designing fun and sport engagement was moderated by designing competition ($b = -.17$, $SE = .06$, $p < .01$). Simple slopes analysis (see Fig. 4) suggests that the association between designing fun and sport engagement was stronger when designing competition was lower (–1*SD*: $b = .49$, $SE = .08$, $p < .001$) than when it was higher (+1*SD*: $b = .22$, $SE = .07$, $p < .001$). The indirect effect was moderated in a similar fashion

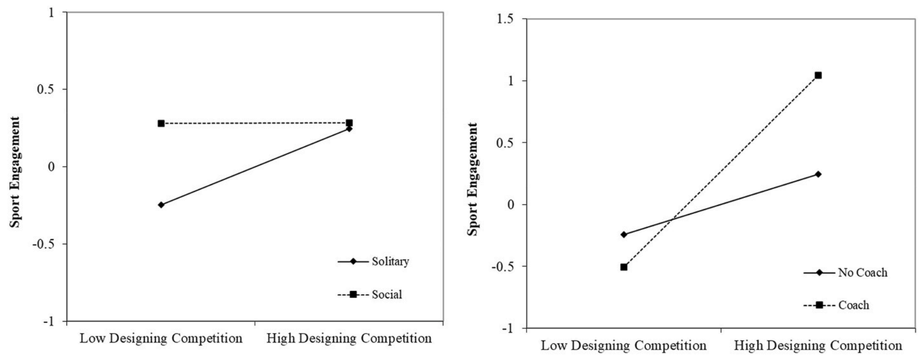

Fig. 3. Interactions between designing competition and the social sports context: Solitary (vs. Social) and coached (vs. Not coached).

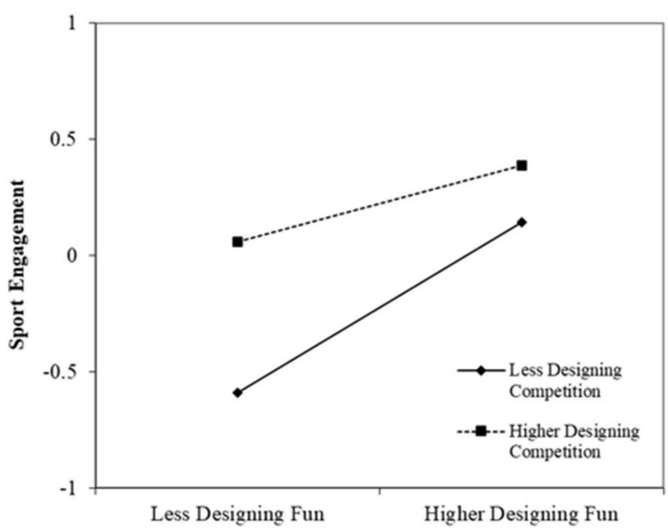

Fig. 4. Interaction Between Designing Fun and Competition in predicting Sport Engagement.

as a function of lower (–1*SD*: b = .19, *SE* = .04, $p < .001$) versus higher designing competition (+1*SD*: b = .08, *SE* = .03, $p < .001$). The results suggest that the effects of designing fun and designing competition during sport activities relate to stronger increases in sport engagement when either strategy is enacted less frequently. In other words, the positive association of designing fun with sport engagement is more salient when athletes did not design competition and vice versa.

4. Discussion

Integrating social cognitive views on self-regulation with ideas about play, this study investigated to what extent athletes can proactively influence their own sport engagement during training sessions and improve their performance. We focused on playful sport design (PSD), which involves using bottom-up play strategies to make training activities more enjoyable (designing fun (DF)) and more challenging (designing competition (DC); Verwijmeren et al., 2024). As predicted, we found that when athletes used DF and DC during training sessions, their sport engagement was higher, which was positively related to a sense of progress towards their sports goals. We also explored two contrasting views on how PSD interacted with the social sports environment to predict sport engagement and goal progression. Results showed that the presence of training partners strengthened the positive association between DF and sport engagement, but this was not influenced by the presence of the coach. Conversely, the absence of training partners strengthened the positive association between designing competition and sport engagement. Similarly, the presence of the coach enhanced this association. These amplification effects indirectly contributed to greater goal progression. Taken together, the findings suggest that PSD is a worthwhile self-regulation strategy for athletes.

4.1. Theoretical contributions

Our study makes several contributions. First, we provide evidence for the idea that PSD is a unique self-regulation strategy that athletes can incorporate into their training to enhance their engagement. While we did not specifically examine the mechanisms underlying the PSD-sport engagement relationship, our findings show that both forms of PSD—designing fun and designing competition—positively relate to sport engagement. In other words, by engaging with both the theoretically proposed components of play (e.g., ludic and agonistic play; Huizinga, 1949; Scharp et al., 2022) and Social Cognitive theory, which suggests individuals actively shape their experiences (Zimmerman, 2000), athletes appear able to boost their own engagement. Likely mechanisms such as enjoyment, variety, and alignment between personal needs and training tasks may drive the relationship between PSD and sport engagement across these two distinct forms of play (Bakker et al., 2011). PSD complements the top-down perspective on sport engagement, in which external factors - such as coaches - enhance athletes' engagement by fostering environments that support their basic needs (e.g., Curran et al., 2015; De Francisco et al., 2020). It also builds on earlier research related to practice-enhancement strategies in self-regulation (McCormick et al., 2018). These strategies help athletes optimize training activities and strategically navigate their sessions to maximize outcomes (McCormick et al., 2018). While prior studies have primarily focused on skill acquisition and performance improvement through self-regulation (e.g., Furley et al., 2013; Kolovelonis et al., 2012), our findings suggest that these strategies can also foster sport engagement. All in all, by integrating ideas about self-regulation and play, this study offers a novel perspective on how athletes can enhance their own engagement.

Second, our study demonstrates that athletes experience greater progress toward their goals during training sessions when their sport engagement increases. This finding offers initial insight into how PSD can enhance sports performance, contributing to our understanding of whether adults can also leverage play in their main sport to boost athletic outcomes (e.g., Barth et al., 2022). Although we did not test PSD's relation to performance during competitions, we focused on goal progression, which is likely a relevant outcome for many athletes during training. The finding that PSD positively predicts goal progression via sport engagement supplements earlier research that demonstrated that PSD predicts better performance but did not explore underlying mechanisms in this relationship (Verwijmeren et al., 2024). It also supports the notion that athletes who feel better, perform better (Peris-Delcampo et al., 2024). Designing competition also directly predicted goal progression positively. This suggests that other mechanisms beyond sport engagement, such as learning sport-specific tactics and skills (Launder &

Piltz, 2013), play a role in the relationship between PSD and engagement. In summary, our findings indicate that sport engagement partially explains why PSD is linked to goal progression, though other mechanisms likely play a role as well.

Third, this study enriches our understanding of how PSD interacts with the social contexts in shaping sport engagement and, indirectly, goal progression. While McCardle et al. (2017) noted that athletes' self-regulation and social agents may interact, this relationship has remained relatively underexplored. Consistent with previous studies (Mellano & Pacewicz, 2023), our results show that the presence of training partners is associated with higher sport engagement, regardless of PSD. However, we found that DF and DC interact uniquely with the social sports environment. Namely, the positive association between DF and sport engagement was amplified in the presence of training partners. This supports the idea that self-started play can be amplified by social agents present during the sport activity (Barreiro & Howard, 2017; Reed, 2020) through sharing (Hadwin & Oshige, 2011) and interaction (Burghardt, 2005). We did not find evidence that the presence or absence of a coach changed how DF predicted sport engagement, suggesting that humor and imagination may be easier to share with peers than with coaches. This may also explain why DF was less strongly related to sport engagement during solitary training sessions.

In contrast to DF, DC showed a stronger relationship with sport engagement in the absence (rather than presence) of training partners. This finding aligns with the idea that self-regulation is more critical when athletes train alone, as they lack teammates or coaches to model or guide their behavior (Zimmerman, 2000). Training partners likely provide sources of challenge, competition, or cooperation (Landkammer et al., 2019), and in their absence, athletes need to challenge and compete with themselves to maintain their engagement. Furthermore, the positive association between DC and sport engagement was also amplified by the presence of a coach, likely because coaches play a key role in performance development. When their coaching approach aligns with the strategy the athlete uses (DC), it may result in more engaged athletes who perform better. Altogether, these findings suggest that DF and DC are distinct strategies that fit different social contexts, highlighting the nuanced ways in which PSD interacts with the training environment.

Exploratorily, we found that the association between DF and goal progress varied across levels of analysis (Chen et al., 2005). Although these associations were not initially hypothesized, they might be worth interpreting. At the within-person level, athletes did not report greater or lesser goal progress on days when they incorporated more designing fun than usual, suggesting that short-term fluctuations in this strategy do not directly enhance goal progress. In contrast, at the between-person level, athletes who generally engaged more in designing fun reported lower goal progression compared to their peers. Rather than serving a strictly task-oriented purpose, designing fun may primarily fulfill relational needs (cf. Self-Determination Theory; Deci & Ryan, 2000). Athletes with a stronger emphasis on designing fun may be seeking outcomes such as friendship, social connectedness, teamwork, and a sense of belonging (cf. Social Identity Theory; Tajfel & Turner, 2004). This relational orientation may come at the expense of task-focused goal pursuit. However, over time, it is possible that these relational benefits enhance athletic performance by fostering sustained sport engagement (e.g., Back et al., 2022) and strengthening team cohesion. Moreover, fulfilling relational needs does not necessarily conflict with satisfying competence needs (cf. Deci & Ryan, 2000), suggesting that relational and performance-oriented motivations may be complementary rather than mutually exclusive. Future research could further explore this.

4.2. Limitations and future considerations

This study is not without limitations. Firstly, the use of the Day Reconstruction Method restricts causal inferences, and reverse causality cannot be ruled out. For example, the feeling of making goal progress might also influence how engaged athletes feel (Bipp et al., 2020). To allow for stronger causal inferences, we suggest that future research uses temporally separated measures of sport engagement and performance. In addition, more causally robust research designs, such as field experiments incorporating ecological momentary assessment (e.g., Beal, 2015) can be employed to measure athletes' PSD, engagement, and performance across training sessions. These approaches would provide richer insights into the dynamics of PSD and engagement.

Another limitation is the reliance on self-report measures, which may introduce common method bias (Podsakoff et al., 2003). However, there are several reasons why this bias is limited in our manuscript. First, we person-mean centered our predictors. Since common-method effects such as desirability bias represent individual differences (i.e., a level-2 variable), the findings cannot be explained by any direct effects of common method bias (Gabriel et al., 2019). In addition, interaction effects cannot be attributed to common method variance (Siemsen et al., 2009). Conversely, interaction effects become more difficult to detect when common method variance increases. Nonetheless, future research may incorporate alternative performance measures, such as ratings from peers or coaches, or using sport-specific physiological measures (e.g., wattages, heart rates) to provide a more objective assessment of outcomes.

Third, the measure of goal progression may not have been specific enough, as it assessed the perceived progress toward achieving sports goals. However, the type of goal was not explicitly defined, meaning athletes could interpret it in various ways—such as training goals, seasonal goals, or long-term objectives. As a result, our performance measurement may lack precision. Future research is encouraged to reference more specific types of goals.

Fourth, sample characteristics, such as the relatively high proportion of women and amateur athletes in this study, may have influenced the generalizability of our findings. However, the primary focus of our research was to examine how within-person fluctuations in PSD relate to sport engagement and goal progress within different social contexts, rather than individual differences. Nevertheless, we encourage future research to incorporate more diverse samples (e.g., professional athletes) to enhance generalizability. Additionally, further studies could explore how stable individual differences, such as psychological traits (e.g., extraversion) and sport-specific factors (e.g., training experience), influence PSD effectiveness in shaping sport outcomes.

Lastly, our study might be slightly underpowered, as we included a lower sample size than anticipated due to drop-out. We note that our power analysis was based on a model involving cross-level interactions - examining the effect of a between-level variable, such as a psychological trait, on within-person associations - which typically requires larger sample sizes than models focusing solely on within-person associations (the focus of this study). Nevertheless, future research may include larger sample sizes including and include ways to prevent study drop-out.

Besides future research suggestions to overcome this study's limitations, we have some additional suggestions for future research. While this study offers insight into the social training contexts in which PSD effectively increases sport engagement, it did not examine how PSD interacts with psychological characteristics of the social sport environment. An example is peer or coach motivational climate (e.g., task-oriented or ego-driven climate), which have been shown to predict engagement (Curran et al., 2015; Isoard-Gautheur et al., 2021). Investigating these characteristics can help athletes and coaches better understand when PSD is most effective. Other directions for research may include how PSD relates to other self-regulation strategies, whether and how PSD affects teammates in team sports, for which athletes PSD works better to increase engagement, analyzing triggers for the usage of designing competition or designing fun (e.g., boredom, underachievement, (implicit) motives), and using experimental designs.

4.3. Practical implications

This study suggests that athletes can enhance their engagement and goal progression by integrating PSD into their training routines. This can involve designing fun activities, which include behaviors and cognitions focused on amusement, creativity, and fantasy. It can also involve designing competition, such as self-imposed challenges, setting time records, and competing with oneself. Since PSD is a proactive behavior and its positive effects are most pronounced when voluntary, athletes should ideally initiate these strategies themselves. However, coaches and trainers can still encourage athletes to take an active role in their training by incorporating PSD elements. Tailoring specific PSD strategies to the social setting can maximize training benefits. Overall, our study highlights that group training sessions can boost sport engagement. When athletes incorporate fun into these group settings, it can further enhance engagement and goal progression. Additionally, when a coach is present, athletes may benefit most from incorporating competitive elements, similar to solitary settings.

Finally, interventions represent a valuable research opportunity and a practical tool for stimulating PSD. Future studies could explore how to develop and teach athletes PSD strategies. These interventions could be organized into modules and embedded in training programs, consisting of multiple structured sessions (cf. Costantini et al., 2025). For example, a multi-session program could first introduce the principles of PSD, then help athletes identify strategies that align with their personality and training activities, followed by practical experimentation. Athletes could reflect on obstacles, adapt strategies to different contexts, and explore the social dimension of PSD. To consolidate learning, participants could reflect on their journey and present their final insights. Such interventions would enable researchers to assess the effectiveness of PSD in enhancing outcomes while providing practical guidance for implementation.

5. Conclusion

This study highlights how athletes can proactively enhance their daily sport engagement and goal progression by integrating PSD into their training. The findings reveal that DF is particularly effective in social environments, potentially fostering group dynamics and boosting motivation through creativity and humor. In contrast, DC proves more beneficial in solitary and coached settings, potentially sustaining engagement by encouraging self-driven improvement and challenge-seeking behaviors. This research advances the ongoing discussion on play and performance, demonstrating that PSD is not merely recreational but serves as a self-regulation strategy to optimize athlete motivation and engagement. It also illuminates the complex interplay between social contexts and engagement, showing that PSD's effectiveness varies depending on training conditions - whether an athlete trains alone or with a group, as well as the presence of coaching guidance. These insights lay the groundwork for future research exploring how individual differences and psychological aspects of the sport environment shape the impact of PSD.

CRediT authorship contribution statement

Juriena D. de Vries: Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Yuri S. Scharp:** Writing – review & editing, Visualization, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Arnold B. Bakker:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

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Data availability

Data will be made available on request.

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