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INTERVENTION STUDY

Playful Study Design: A Novel Approach to Enhancing Student Well-Being and Academic Performance

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Abstract
We use three studies to develop and validate the new concept of playful study design – the cognitive-behavioral orientation towards study tasks with the aim to make these tasks more fun and/or more challenging. Based on play and proactive motivation theories, we propose that playful study design can be assessed by items indicating two dimensions: designing fun and designing competition. Results of exploratory ($N = 378$ students) and confirmatory ($N = 375$ students) factor analyses support the two-factor structure of the playful study design instrument in a first study. In addition, we use the data of the whole sample of Study 1 to test the convergent and incremental validity of the construct. Results indicate that playful study design predicts students' social integration, study engagement, and well-being over and above psychological capital and core self-evaluations. In Study 2 ($N = 591$ students), we used playful study design to predict course grades. Results show that particularly designing competition was beneficial for study performance. In Study 3 ($N = 28$ students), we conducted a quasi-experimental evaluation of a training intervention to demonstrate that students who learned to playfully redesign their study tasks increased their use of fun and competition when studying. As a result, they showed greater active learning, study task proactivity, and absorption over time compared to the control group. We discuss how the construct of playful study design adds to the educational psychology literature and has implications for educational practice in university settings.

Keywords Playful study design · Proactivity · Study demands–resources theory · Study engagement

Pursuing higher education is often seen as a transformative journey where university students commit themselves to both intellectual growth and personal development. Yet, this ideal is often overshadowed by the realities of academic life. Despite having the freedom to choose courses that align with their passions, students frequently find themselves grappling with monotonous or overly challenging study tasks, resulting in periods of disengagement, frustration, and even emotional exhaustion

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(Jiménez-Ortiz et al., 2019; Li et al., 2020). These moments are not isolated, and mounting evidence shows that the academic environment, with its inherent pressures and high expectations, can significantly strain students' psychological well-being (Blanco et al., 2008; Douwes et al., 2023; Galbraith & Merrill, 2015; Kaggwa et al., 2021; Rosales-Ricardo et al., 2021).

Universities have recognized the intensity of these experiences and have responded by introducing a variety of support systems—counseling services, mentorship programs, and study workshops, to name a few (Francis & Horn, 2017; Hamilton et al., 2019). Despite these resources, many students still struggle with stress, as evidenced by study burnout, declining academic performance, and rising dropout rates, signaling an ongoing crisis in higher education (Lorenzo-Quiles et al., 2023). This raises a pressing question: Beyond institutional interventions, what role can students themselves play in shaping their academic experiences? How can they proactively regulate their well-being and sustain engagement, ensuring that they not only survive but thrive academically in the face of increasing demands?

In addressing these questions, this study delves into the transformative potential of playful study design (PSD), offering an innovative perspective on enhancing students' engagement, academic performance, and well-being. We posit that students can actively use play to make their academic pursuits both more enjoyable and intellectually stimulating, which, in turn, helps meet their fundamental psychological needs and sustains their motivation. By approaching study tasks in a playful manner, students may experience a heightened sense of agency, leading to deeper engagement and more meaningful progress (Stenalt & Lassesen, 2022). We draw from seminal work on play in adulthood (Van Vleet & Feeney, 2015) and recent research on playful work design (Bakker et al., 2020a, b; Scharp et al., 2023) to provide a comprehensive yet clearly defined investigation of PSD in the higher education context. We first develop a standardized instrument to reliably measure PSD, contributing to the operationalization of this concept. Next, we map its nomological network, examining how PSD relates to students' individual traits, contributes to academic success and well-being beyond personal resources, and predicts performance outcomes over a two-month period. Lastly, we explore the feasibility of fostering PSD through a targeted intervention, investigating how this approach can promote active learning, study task proactivity, and study engagement.

This multi-faceted investigation offers both theoretical advancement and practical insights, positioning PSD as an innovative and actionable strategy for enhancing student engagement and well-being in higher education. First, we advance the literature on self-initiated play by addressing the underexplored role of proactive, self-initiated play in higher education (van Vleet & Feeney, 2015), a critical period that bridges education and work. Research on play is well-established in early childhood learning (Bergen, 2014; Bubikova-Moan et al., 2019) and is blossoming in work-related contexts where it fosters positive outcomes (Bakker et al., 2020a, b; Scharp et al., 2023). In recent years, play has also been increasingly integrated into higher education through approaches such as gamification (Oliveira et al., 2023) and serious games (Connolly et al., 2012; Zhonggen, 2019). These approaches, however, tend to be top-down, instructor-driven strategies that rely on structured play or external motivators (Khaldi et al., 2023). In contrast, PSD represents a unique contribution by emphasizing *self-initiated* play, where students actively integrate playful elements into their study routines.

Although some studies have explored PSD (e.g., Wang et al., 2023), they have relied on unvalidated, short-adapted scales that may not fully capture the unique characteristics of PSD in educational contexts. To address this, we develop a psychometrically sound PSD scale and situate it within its nomological network—the system of interrelated constructs and observable variables that collectively define and validate PSD (cf. Cronbach & Meehl, 1955). The nomological network provides the foundation for assessing the validity of the PSD instrument. By developing a robust PSD scale and mapping its nomological network, this research provides a more accurate conceptualization and measurement of PSD. This enables the assessment of its distinct impact on student engagement, academic progress, and well-being. The findings will lead to more targeted interventions and a better understanding of how proactive self-initiated play integrated into study routines shapes student outcomes.

Second, we empirically contribute to SD-R theory (Bakker & Mostert, 2024) by highlighting PSD as a self-regulatory approach through which students proactively enhance the motivational quality of their study activities. Rather than altering the study environment itself, PSD involves engaging with tasks in a way that introduces playfulness, novelty, or challenge, thereby making them more stimulating and enjoyable. This enriches our understanding of how proactive self-regulation can foster motivation within existing study conditions, beyond students' beliefs in their ability to control or shape their environment. Importantly, this demonstrates that PSD allows students to more fully harness the motivational opportunities already present in their learning context.

Third, we contribute to the literature on academic progress and well-being (Tinto, 2012) by demonstrating the importance of proactive play strategies and related interventions as key, yet previously overlooked, mechanisms for creating more effective, enjoyable, and sustainable learning environments. PSD complements other student-centered approaches, such as active participation in classes, that facilitate academic achievement and well-being (e.g., Reeve et al., 2022). The findings showcase that PSD can contribute to well-being and is a malleable behavior. Namely, we found that students who participated in an intervention more often designed fun and designed competition in addition to being more active learners, proactive, and absorbed in their studies. This is important because it highlights that PSD is not merely a behavior some people enact and others do not but is a metacognitive skill that can be cultivated through targeted interventions.

Theoretical Background

Play as a Foundation for Learning and Development

Historically, play has been recognized as a fundamental experience for human learning and development (Chen et al., 2024). Sociocultural perspectives emphasize the essential role of play in cognitive and emotional growth, particularly in early childhood (Bergen, 2014; Bubikova-Moan et al., 2019). Play fosters learning by shaping cognitive processes, facilitating the internalization of new knowledge, and creating a transitional space between internal and external realities, allowing individuals to experiment with different perspectives, stretch conceptual abilities, and build connections between existing and new knowledge (Bodrova & Leong, 2015; Winnicott, 2005). This process fosters creativity and promotes the co-construction of understanding (Kolb & Kolb, 2010). Additionally, play enhances intrinsic motivation by providing an enjoyable and engaging moment-to-moment experience (van Vleet & Feeney, 2015). Elements of challenge, curiosity, and fantasy inherent in play contribute to heightened engagement and positive affective states (Wouters et al., 2013). By promoting interactive involvement with activities, play enhances agency, allowing individuals to proactively shape and respond to their environment (Baker et al., 2023). Moreover, the future-oriented self-regulatory skills developed through playful activities enable individuals to better manage environmental demands, safeguarding well-being while sustaining motivation (Whitebread et al., 2009).

Play persists beyond childhood and across domains, finding innovative applications in professional environments (Petelczyc et al., 2018). Research in work and organizational psychology advanced the concept of playful work design as a proactive cognitive-behavioral approach that employees use to introduce enjoyment and challenge into their tasks (Bakker et al., 2020a, b). Playful work design involves seeking out or creating surprises, incorporating humor and imagination, and introducing competitive elements to increase engagement and job satisfaction (Bakker et al., 2020a, b; Scharp et al., 2023). Through playful work design, employees redesign their work tasks to make them more enjoyable and stimulating, resulting in positive work-related outcomes such as increased motivation, performance, and well-being (Bakker et al., 2020a, b; Bakker et al., 2020a, b). Since play constitutes a cognitive and behavioral approach, we argue that the principles extend to other domains, including education. That is, self-initiated play during work and study activities both comprise the proactive use of humor, imagination, micro-objectives, and segmentation, but they may manifest themselves differently because they operate under different contextual constraints. To illustrate, designing competition for a security officer may imply predicting and striving to guess correctly where a customer will walk next, whereas students reading a set of empirical articles may strive to predict the study findings.

While play's role in the workplace has gained traction, its potential in higher education remains largely untapped (Wiggins, 2016). Thus far, research on play for educational purposes has predominantly studied approaches that are externally driven and top-down structured (Connolly et al., 2012; Khaldi et al., 2023; Oliveira et al., 2023; Whitton, 2018). While these approaches provide valuable insights into how structured play can enhance study engagement, they are accompanied by an inherent tension (Fleming, 2005; Plester et al., 2015). Namely, volition and freedom constitute important components of play (Scharp et al., 2023), whereas the initiative of most structured interventions that are utilized for educational goals reside in instructors, institutions, or other parties. This tension is not fundamentally problematic when resolved through integration (Smith & Lewis, 2011), but may explain unexpected, adverse consequences. For instance, in a longitudinal study among college students, Hanus and Fox (2015) found that students in a gamified (vs. non-gamified) course felt *less* motivated, empowered, and satisfied over time, scoring a lower final grade as well.

Thus, self-directed, student-centered approaches may complement existing perspectives. We introduce PSD, a student-driven approach that builds on the principles of playful work design. Recognizing the similarities between work and academic environments – where tasks are structured, goal-oriented, evaluated, and influence future career opportunities (Bakker & Mostert, 2024; Salanova et al., 2010) – we propose that playful strategies can significantly enhance student functioning in higher education. Preliminary research suggests that students who integrate playful elements into their academic routines report higher levels of engagement and well-being, even in challenging circumstances (Liu et al., 2023). Additionally, students who proactively design more complex study tasks or use creative tools, such as cognitive mind maps, exhibit higher engagement and achieve their academic goals more effectively (Wang et al., 2023). Based on these initial findings, we introduce the concept of PSD. PSD empowers students to reimagine their learning experiences by integrating playful elements, potentially boosting both well-being and academic performance.

Conceptualizing Playful Study Design

Building on the conceptual framework of playful work design, we define PSD as a proactive cognitive-behavioral approach that students use to infuse their academic tasks with enjoyment and challenge. We adopt the label of playful study design. Unlike potential other labels, such as "playful study orientation" and "playful study behavior," *design* emphasizes the proactive and intentional process through which students modify the experience of study activities. The term "design" originates from the Latin *designare*, which translates to "give meaning to" or "make sense of things" (Krippendorff, 1989). This captures the agency of students in shaping their study activities using a variety of forms of play. This also resonates with the game design literature arguing that the designer is the individual who creates an experience (Schell, 2020). In the case of PSD, the student is positioned as the designer – the individual who creates the experience. Specifically, the student creates a more fun and competitive experience during tasks by proactively integrating play within study activities.

Like playful work design, PSD encompasses two dimensions: ludic and agonistic play (Bakker et al., 2020a, b; Scharp et al., 2023). Ludic play involves activities characterized by lightheartedness, humor, and imagination aimed at enhancing the enjoyment and entertainment of the task (Proyer, 2017). In contrast, agonistic play focuses on introducing elements of challenge, competition, and personal achievement, where students push their boundaries and strive for self-improvement (Howe, 2008). PSD, particularly designing competition, shares similarities with deliberate practice (Ericsson et al., 1993). Deliberate practice consists of structured, effortful activities aimed at improving performance, such as using active recall techniques, breaking down difficult problems, writing essays, and systematically analyzing mistakes.

However, Ericsson and colleagues (1993) distinguished deliberate practice from play. He argued that deliberate practice is effortful and focuses purely on skill improvement and is not inherently enjoyable. In contrast, PSD does not define play as an activity but as an approach to making activities. This implies that deliberate practice activities can be approached and performed playfully (or not). Thus, PSD does not replace deliberate practice but offers a playful, proactive lens through which students can engage with structured learning activities to enhance student outcomes. By adopting PSD, students can engage with their academic tasks in a more playful and self-determined way. For example, they may introduce fun elements into their study routines by using humor, creating imaginative study tools, or developing engaging narratives related to their tasks. Similarly, students can incorporate competitive elements, such as setting personal goals, engaging in friendly competition with peers, or striving to surpass their previous study performance. Based on the above, we propose the following:

> **Hypothesis 1**: PSD consists of two dimensions: Designing fun and designing competition.

Convergent and Discriminant Validity: Playful Study Design in Relation to Playfulness and Curiosity

PSD reflects how students use humor and imagination to make learning more enjoyable and challenging. We propose that PSD will show significant positive correlations with traits related to play, specifically curiosity and playfulness (Scharp et al., 2023), establishing convergent validity. Curiosity reflects a desire to explore complex, ambiguous situations (Kashdan et al., 2009), while playfulness involves reinterpreting situations to create enjoyment (Barnett, 2007; Proyer, 2012). Previous research suggests that individuals with these traits often engage in playful behaviors to enhance their experiences (Baumann et al., 2016; Guitard et al., 2005; Proyer, 2012). Given that playfulness aligns more strongly with ludic (fun) traits than with agonistic (competitive) ones (Scharp et al., 2023), we anticipate a stronger correlation between playfulness and designing fun compared to designing competition.

> **Hypothesis 2**: Trait curiosity positively correlates with (a) designing fun and (b) designing competition.
> **Hypothesis 3**: Trait playfulness exhibits a stronger positive correlation with designing fun than with designing competition.

Incremental Validity: Playful Study Design for Academic Progress and Well-Being

In investigating the nomological network of PSD, we focus on two primary outcomes of the university experience: academic progress and well-being. *Academic progress* is a multifaceted outcome, heavily reliant on students' integration within their academic environments (Severiens & Wolff, 2008; Tinto, 2012). Building on Tinto's (2012) model of integration, we consider academic integration (performance-related outcomes such as grades) and social integration (peer interactions and popularity). Academic integration pertains to grade performance and the achievement of academic goals, while social integration reflects both formal and informal peer interactions (Meeuwisse et al., 2010; Tinto, 2012), as well as popularity (Scott & Judge, 2009). Studies have shown that both academic and social integration are crucial for persistence in higher education, with social integration playing a particularly strong role in student retention and success (Meeuwisse et al., 2010; Severiens & Schmidt, 2009). Moreover, research in work and school contexts has shown that popular students are more often emulated, approached for help, and maintain more positive relationships with peers (Newcomb et al., 1993), underscoring the significance of popularity as a salient phenomenon that shapes how individuals are perceived and treated (Scott & Judge, 2009). *Well-being* in this context is captured through study engagement and subjective well-being. Study engagement refers to a state of vigor, dedication, and absorption in academic tasks (Schaufeli et al., 2002), while subjective well-being encompasses an overall sense of satisfaction and positive functioning in life (Diener et al., 2009). Both constructs are associated with improved academic outcomes and greater persistence in studies (e.g., Bakker et al., 2015; Pekrun & Linnenbrink-Garcia, 2012).

A wealth of research highlights the pivotal role of personal resources in predicting both academic progress and well-being since individuals who believe that they can successfully influence their environment are more likely to gain external resources, which helps them feel engaged (Bakker & Mostert, 2024). Core self-evaluations (CSE) and psychological capital (PsyCap) are critical to understanding student outcomes (Chang et al., 2012; Luthans et al., 2012). CSE refers to fundamental self-evaluations, such as self-esteem, general self-efficacy, emotional stability, and locus of control (Judge et al., 1998). PsyCap is a higher-order construct encompassing hope, optimism, resilience, and self-efficacy, which collectively enhance one's ability to face challenges and persist in goal-oriented activities (Luthans & Youssef-Morgan, 2017). These resources are particularly effective in driving academic performance, social integration, and well-being by allowing individuals to maintain a sense of control and purpose in the face of academic demands (Feldman et al., 2015; Luthans et al., 2012; Xanthopoulou et al., 2009).

While personal resources play a crucial role, we argue that PSD offers a unique cognitive-behavioral approach that can further enhance academic progress and well-being. Our proposal is that PSD contributes incrementally to outcomes such as peer interactions, popularity, study engagement, and subjective well-being because it enables students to reframe academic tasks as more enjoyable, engaging, and personally meaningful. Indeed, SD-R theory recognizes that students may engage in proactive self-enhancing behaviors that can sustain their engagement and create upward spirals of resources (Bakker & Mostert, 2024). Regarding peer interactions and popularity, PSD ludic (fun-oriented) and agonistic (challenge-oriented) dimensions may foster greater social integration by making students more approachable, relatable, and enjoyable to interact with (Hunter et al., 2010; Petelczyc et al., 2018). PSD strategies either increase opportunities for light-hearted moments or inspire others through motivating, challenging approaches. Formal interactions, such as group work, may benefit from the enthusiasm brought by designing fun, while informal interactions may become more creative, leading to stronger social bonds.

Hypothesis 4: (a) Designing fun and (b) designing competition explain additional variance over CSE and PsyCap in predicting formal and informal peer interactions and popularity.

Regarding study engagement and well-being, we propose that by designing fun, students create a more positive and fulfilling study experience (Bakker & Mostert, 2024), with ensuing higher levels of positive thought patterns. Similarly, infusing competition into their tasks may stimulate a sense of challenge and achievement, further prompting greater energy and accomplishment (Schaufeli et al., 2002). Consequently, we hypothesize that PSD will explain variance in both study engagement and subjective well-being beyond personal resources.

Hypothesis 5: (a) Designing fun and (b) designing competition explain additional variance over CSE and PsyCap in predicting study engagement and subjective well-being.

Predictive Validity: The Balance Between Fun and Competition

In investigating the role of PSD for performance outcomes in the form of exam grades, we propose that congruence (i.e., balance) between designing fun and designing competition is key to optimizing students' academic outcomes. Congruence effects describe the joint and synergistic influence of designing fun and designing competition on academic outcomes, whereas incongruence refers to how positive (i.e., designing fun exceeds designing competition) and negative (designing competition exceeds designing fun) discrepancies explain variability (Edwards, 1994; Edwards & Parry, 1993; Yao & Ma, 2023). An important difference between (in)congruence effects and traditional two-dimensional relationships concerns the three-dimensional paradigm that enables response surface analyses. Such analyses reveal nuanced insights into how constructs complement (or undermine) each other by capturing linear and nonlinear effects across the congruence and incongruence dimensions.

While congruence research on academic outcomes is limited, several studies in higher education exemplify how (in)congruence effects can clarify complex associations. For instance, a study among university students revealed they were particularly satisfied with their university at higher levels of congruence between a need for a supportive and social environment and the extent to which it was present (Gilbreath et al., 2011). Additionally, discrepancy effects revealed that students were more satisfied when the actual social environment exceeded their needs but less so when needs exceeded the actual social environment. Similarly, Giel and colleagues (2020) found that for bachelor students, fear of failure increased following a nonlinear pattern as the perceived performance orientation of the institution and personal mastery-avoidance goal orientation rose—however, increases in fear of failure accelerated at higher levels of the predictors. These findings highlight the value of using congruence and incongruence frameworks to understand the joint impact of constructs on academic outcomes.

Therefore, drawing from self-regulation perspectives (Kopp, 1982; Zimmerman & Kitsantas, 2014), we predict that students who can balance playful fun and competitive challenges will perform better on exams for several reasons. Three theoretical principles define this balance (cf. (Edwards, 2007; Yao & Ma, 2023). The first theoretical issue concerns asymmetries in the effects of misfit. We propose that perfect alignment (exact correspondence) between designing fun and designing competition is more optimal for grades than a slight mismatch (commensurate compatibility). Misalignment may create distractions when designing fun exceeds designing competition or promote exhaustion when designing competition surpasses designing fun (cf. Bakker & Scharp, 2024). We expect the resulting negative effects on exam grades to be symmetrical. In other words, deviations where designing fun exceeds designing competition or where designing competition exceeds designing fun are expected to equally harm exam grades (i.e., squared difference effect along misfit line).

The second theoretical issue is about variation along the fit line. Even when designing fun and designing competition are congruent, we expect the absolute levels of these dimensions to play an increasingly critical role in determining exam grades (i.e., curvilinear level effect; Yao & Ma, 2023). At lower balanced levels, students may only experience modest improvements in exam grades because this may reflect an overall withdrawal from studying and superficial processing (cf. Scharp et al., 2023). Conversely, at higher levels of congruent PSD, a synergistic effect may emerge because the dimensions create reinforcing feedback loops and foster the goal-free effect (Paas & Kirschner, 2012). Designing fun may foster divergent thinking, idea generation, and schema construction, whereas designing competition may sharpen the focus and perseverance to explore those ideas. Conversely, the structuring inherent in designing competition may boost humor and imagination by reducing ambiguity—freeing up cognitive resources. At the same time, the goal-free effect suggests that reducing goal specificity during learning reduces cognitive load and leads to better problem-solving strategies and schema construction (Paas et al., 2001). Playful study design implies that students have more of a goal-free mindset and explore concepts without being constrained by higher-order goals. This may encourage students to engage with the content of the study materials and shift focus from predefined learning outcomes— unlocking cognitive capacity for deeper learning.

The final theoretical issue, the contingency, considers boundary conditions for the optimal combination of designing fun and designing competition (cf. Yao & Ma, 2023). This can also be understood as the interaction between the absolute levels of these dimensions and their balance (Cohen et al., 2010). In the context of our study, the contingency specifies whether the benefits of congruence are consistent across all levels or whether they depend on both dimensions being high. When there is no contingency, the benefits of balance (i.e., congruence) hold regardless of absolute levels. However, if contingency exists, then congruence only enhances exam grades when both dimensions are high. We expect that maximum exam grades will be attained when designing fun and designing competition are congruent and high, with no lateral shift away from the fit line. In other words, we do not expect that the benefits of PSD are contingent on one dimension slightly exceeding the other. Instead, we anticipate that the highest performance is achieved when equally high. This distinction is critical because it goes beyond a simple two-way interaction. While a two-way interaction captures whether the effect of one dimension depends on the other, it does not capture whether matching levels matter (balance vs. imbalance) or whether absolute levels play a role (contingency). Traditional interaction analyses do not distinguish whether congruence produces similar benefits at all levels or whether balance is only effective when both dimensions are high. By applying surface analysis, we can directly test how performance evolves along the fit line and determine whether high-high combinations produce systematically superior outcomes. This approach provides a more precise understanding of PSD, revealing not only whether congruence matters but also under what conditions it leads to optimal learning outcomes. Therefore, we expect:

> **Hypothesis 6**: Congruence between designing fun and designing competition is positively associated with exam grades curvilinearly. That is, as both dimensions increase together from low to high levels, the improvement in exam grades is modest at lower levels but accelerates at higher levels. Moreover, any mismatch between designing fun and designing competition leads to a symmetric decrease in exam grades.

Playful Study Design as an Intervention Strategy

Existing research in applied psychology demonstrates that proactive tendencies, such as taking initiative and shaping one's environment, can be effectively supported through targeted interventions (Berg et al., 2023; Costantini et al., 2022; Knight et al., 2021; Oprea et al., 2019). These interventions, which often focus on enhancing cognitive and behavioral aspects of proactivity, have been shown to lead to positive outcomes, including increased happiness, engagement, and flow (Berg et al., 2023; Costantini et al., 2022; Körner et al., 2023). The theoretical mechanism explaining such improved outcomes lies in the enhanced fit between one's preferences and energies and the environment, such that by shaping the characteristics of the tasks at hand, individuals find the experience more manageable, their efforts more efficient, and their overall engagement and satisfaction higher (Bakker and Mostert, 2024). Similarly, a randomized placebo-controlled intervention by Proyer and colleagues (2021) revealed that various exercises increased participants' overall playfulness. These findings suggest that PSD is malleable and can be stimulated through an intervention.

Building on this evidence, we propose that a structured, multi-module PSD intervention could similarly foster proactive learning behaviors, study proactivity, and study engagement by guiding students to make their study tasks more enjoyable (i.e., fun) and challenging (i.e., competitive). Specifically, the modules progressively introduce theory and how to implement PSD with a teacher and in groups while stimulating self-directed implementation through assignments. Active learning reflects the direct involvement of students in the learning process through critical thinking and problem-solving (Collins & Obrien, 2018; Michael, 2006). As an instructional approach, active learning refers to educators creating interactive environments that shift the role of students from passive recipients to active participants in the learning process (Bonwell & Eison, 1991). However, the present study focuses on active learning as a learning approach by students *themselves*, which refers to active involvement with study materials by looking for new knowledge and techniques to improve academic performance (Bakker et al., 2012, Bakker et al., 2015). Bakker and colleagues argue that these behaviors are defined by a motivation for learning and a sense of volition directed at creating a sense of mastery.

By encouraging students to actively design study strategies that incorporate both fun and competition, the intervention can lead to a more personalized and engaging study experience. We expect that this process not only increases the relevance and appeal of study activities but also stimulates deeper cognitive engagement. Specifically, as students are prompted to explore and apply creative approaches to their learning tasks, they are required to reflect on and actively construct meaning from the material (Michael, 2006). Such active involvement in shaping their study process is expected to enhance their ability to think critically and independently, thereby promoting active learning (Collins & Obrien, 2018; Michael, 2006).

By empowering students to take active control of their study routines and encouraging them to introduce playful elements and challenges in a way that enhances their self-determined behaviors, we expect the intervention to enhance study task proactivity, defined as the extent to which individuals engage in self-starting, future-oriented behaviors to modify their study environments, roles, or even themselves (Griffin et al., 2007). Indeed, a core aspect of proactivity is taking charge of one's learning environment, shaping study tasks, and anticipating future demands to create optimal conditions for success. By being primed on how to actively and creatively redesign their study tasks in playful ways, students are prompted to independently assess what works best for their learning, effectively making them the architects of their own study experience. This self-directed approach aligns with the concept of study task proactivity (Griffin et al., 2007), as it emphasizes personal initiative and adaptability in shaping the learning environment.

Furthermore, the intervention context allows students to continuously evaluate and refine their strategies, which promotes self-regulation and autonomous assessment of their understanding. As research suggests, active learning promotes higher cognitive engagement (Collins & Obrien, 2018; Michael, 2006). Therefore, by embedding PSD principles into the study routine, students are likely to experience increased study engagement characterized by heightened absorption, dedication, and vigor. Considering this, we hypothesize that a PSD-focused intervention will lead to significant gains in both the playful redesign of study tasks and related outcomes, i.e., active learning and study engagement.

Hypothesis 7: Compared to a control group, the intervention group will show significantly higher levels of (a) designing fun, (b) designing competition, (c) active learning, (d) study task proactivity, and (e) study engagement after the PSD intervention, relative to baseline levels.

Overview of the Studies

Study 1 explores the factorial structure and validates a psychometric scale for assessing university students' PSD. It also examines the nomological network of PSD, investigating its relationship with traits linked to play and how PSD contributes to academic progress and well-being beyond the role of personal resources. Study 2 focuses on the predictive validity of PSD for academic performance, specifically analyzing how PSD relates to exam grades, using data collected approximately two months after the initial survey. Study 3 presents an intervention designed to enhance students' use of PSD and examines its impact on active learning, study task proactivity, and study engagement. All procedures adhered to APA's ethical guidelines for research, including obtaining informed consent, ensuring voluntary participation, and maintaining confidentiality throughout the study (APA, 2017). Prior to participation, students were provided with general information about the study's purpose, i.e., to explore how students can personalize their study experiences, without revealing specific hypotheses to minimize demand characteristics. They had the opportunity to ask questions and receive answers before proceeding. Additionally, participants were assured that they could withdraw at any time without consequences.

Study 1: Method

Participants and Procedure

Participants were recruited from the second year of a psychology bachelor's program at a large public university in Italy. Specifically, they were enrolled in four parallel Work and Organizational Psychology courses, which were offered separately to accommodate the large student cohort. Students completed a web-based questionnaire during a lecture as a part of the activities within the course. Participation was voluntary, and students received collective feedback on the measured constructs in a subsequent session. Out of 756 participants, 753 provided complete data (response rate = 99.6%). The mean age was 22.15 ($SD = 4.06$), with the majority being female (85%), reflecting typical demographics of psychology students in Italy (Almalaurea, 2022).

Measures

All measures were administered in Italian. Scales not already available in Italian were adapted using back-translation (Brislin, 1970), ensuring conformity between the original and translated items. We calculated Omega coefficients (ω) to assess the reliability of the measures. Omega coefficients are preferred over alpha coefficients because they do not assume tau equivalence (i.e., equal true-score variances across items: Dunn et al., 2014). Unless otherwise noted, items were rated on a five-point scale and averaged to create an overall mean score.

Playful Study Design We employed a comprehensive adaptation of the full 12-item playful work design scale (Scharp et al., 2023) to measure PSD. Unlike Wang et al. (2023), who used an abbreviated version, we deliberately included all items from the original scale. This approach ensures a more robust and consistent conceptualization of the construct across life domains, enhancing the validity and reliability of our measurement. We adapted the context of the playful work design instrument to the educational context. For instance, we adapted the item "I approach my work in a playful way" to "I approach my study in a playful way." By utilizing the full scale, we capture a broader spectrum of playful behaviors, providing a more nuanced understanding of PSD in the context of higher education. The scale captures two dimensions, i.e., designing fun (6 items, e.g., *"I approach my study tasks creatively to make them more interesting"*) and designing competition (6 items, e.g., *"I approach my study tasks as a series of exciting challenges"*). These dimensions align with ludic play and agonistic play during study activities, respectively. Response options ranged from *never* to *very often*. Higher scores indicated greater use of playful strategies ($\omega = 0.84$ for designing fun, $\omega = 0.88$ for designing competition).

Curiosity We assessed curiosity with five items from Naylor (1981), which measure individual tendencies toward inquisitiveness and exploration. A sample item is "*I am curious about things*". Responses ranged from *strongly disagree* to *strongly agree* ($\omega = 0.84$).

Playfulness We measured playfulness using the five-item Short Measure of Playfulness (Proyer, 2012), capturing the general tendency to engage in playful behavior. Example items include, "*I am a playful person*" and "*Good friends would describe me as a playful person*." Response options ranged from *strongly disagree* to *strongly agree* ($\omega = 0.73$).

Core Self-Evaluations The 12-item scale by Judge and colleagues (2003) was used to measure core self-evaluations, which captures broad self-assessments regarding one's abilities and control over life. Only the item that specifically referred to work was adapted to fit the study context. Sample items include "*I am capable of coping with most of my problems*" and "*I determine what will happen in my life*". Response options ranged from *strongly disagree* to *strongly agree* ($\omega = 0.86$).

PsyCap To assess psychological capital, we used seven items adapted from Luthans et al., (2007) capturing four dimensions. Here are example items: "*I feel confident in talking about what I am studying*" (efficacy); "*Right now, I see myself as being* *pretty successful at my studies*" (hope); "*When I have a setback at my studies, I have trouble recovering from it, moving on* (reverse-coded)" (resilience); "*I always look on the bright side of things regarding my studies*" (optimism). Participants rated their agreement on a 6-point scale, from 1 (*completely disagree*) to 6 (*completely agree*), with higher scores reflecting greater PsyCap (ω = 0.77).

Peer Interactions We used the scale developed by Meeuwisse et al. (2010) to measure peer interactions, which includes formal (7 items, e.g., "*Peer students approach me to discuss study tasks*") and informal (5 items, e.g., "*Fellow students are interested in me*") interactions. Responses ranged from 1 = *not true at all* to 5 = *completely true*, with higher scores indicating greater peer interaction (ω = 0.90 for formal interaction, ω = 0.93 for informal interaction).

Popularity The seven-item scale by Scott and Judge (2009) was used as an indicator of popularity, which measures an individual's perceived popularity among peers. A sample item is, "*I feel like a popular person.*" Participants' responses ranged from 1 = *strongly disagree* to 5 = *strongly agree*, with higher scores indicating higher levels of perceived popularity (ω = 0.88).

Study Engagement The student version of the 9-item Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003; Schaufeli et al., 2006) was administered to measure study engagement, capturing three dimensions: vigor (3 items, e.g., *"When studying, I feel strong and vigorous"*), dedication (3 items, e.g., *"I feel enthusiastic about my studies"*), and absorption (3 items, e.g., *"I feel happy when I am studying intensively"*). Participants responded using a 7-point scale (0 = *never,* 6 = *always).* We computed one overall index based on research showing that the three dimensions are closely related (Schaufeli et al., 2006; ω = 0.89).

Subjective Well-being Subjective wellbeing was assessed using eight items from Diener et al. (2009) psychological well-being scale, which captures individuals' positive evaluations of their life circumstances. A sample item is: "*I lead a purposeful and meaningful life."* Participants responded on a five-point scale, ranging from 1 = *strongly disagree* to 5 = *strongly agree* (ω = 0.90).

Statistical Analyses

The overall sample was split into two halves (N = 378 and N = 375) to explore the factor structure of the PSD scale. Exploratory Factor Analysis in the CFA framework (cf. Brown, 2015) was conducted on the first half using M*plus* (Muthén & Muthén, 2017). Model fit was assessed based on CFI, TLI, RMSEA, and SRMR. Based on established criteria, an acceptable model fit is demonstrated by TLI and CFI values ≥ 0.90, as well as RMSEA and SRMR values ≤ 0.08 (Hu & Bentler, 1999). We tested one-, two-, three-, and four-factor solutions, considering both statistical fit and theoretical alignment, i.e., alignment with existing theoretical frameworks and factor loadings, looking at whether they loaded at least 0.35 on a factor and not on more than one factor (Costello & Osborne, 2005; Floyd & Widaman, 1995), and whether any solution included factors consisting only of one or two items. The best-fitting solution was validated using CFA on the second half of the sample.

For convergent, discriminant, and incremental validity, we analyzed data from the full sample. Convergent and discriminant validity were assessed through correlations between PSD dimensions, curiosity, and playfulness. Incremental validity was tested using hierarchical regressions to determine whether PSD dimensions explained additional variance in peer interactions, popularity, study engagement, and subjective well-being beyond CSE and PsyCap. We entered CSE and PsyCap in the first step, followed by PSD dimensions in the second step, with peer interactions, popularity, study engagement, and subjective well-being as outcomes.

Results & Discussion

Table 1 shows descriptive statistics, reliabilities, and correlations between study variables, including exam grades from Study 2.

Factor Structure of Playful Study Design

Exploratory Factor Analysis

The results of Exploratory Factor Analysis (EFA) using the data of the first half of the sample are presented in Table 2. As expected, models with more factors fit better to the data (Haslbeck & van Bork, 2024).

While both the three- and four-factor models showed an acceptable fit, inspection of the factor loadings revealed instances of cross-loadings, non-significant loadings, and, in the four-factor solution, a factor with one item only. In contrast, the two-factor solution showed no such issues, with all factor loadings exceeding 0.35. Loadings for designing fun ranged from 0.40 to 0.82, and loadings for designing competition ranged from 0.47 to 0.77. There were no cross-loadings above 0.24, providing clearer factor delineation. Although the TLI and RMSEA values were slightly outside the typically recommended thresholds (Hu & Bentler, 1999), the CFI and SRMR suggested a reasonably good fit. Given the theoretical coherence and solid factor structure of the two-factor solution, we retained this model for all subsequent analyses. Table 3 displays the items and their loadings in both English and Italian. Results support Hypothesis 1 by replicating the dimensions of designing fun and designing competition from the original playful work design framework.

Confirmatory Factor Analyses

Based on the results from the EFA, we ran a two-factor CFA on the second half of the sample. The hypothesized factor structure showed a slight misfit ($\chi^2 = 477.05$;

Table 1 Descriptive statistics, reliability coefficients, and correlations among participants' demographic characteristics and study variables (n = 753)

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender	.85	.35	-												
2. Age	22.15	4.06	-.06	-											
3. CSE	3.21	.67	-.01	.07	(.86)										
4. PsyCap	4.10	1.03	-.12**	.11**	.69**	(.77)									
5. Playfulness	3.65	.72	-.11**	-.11**	.14**	.15**	(.73)								
6. Curiosity	4.14	.65	-.01	.10**	.25**	.33**	.23**	(.84)							
7. Designing fun	2.98	.83	-.05	.02	.19**	.35**	.36**	.39**	(.88)						
8. Designing competition	2.93	.80	.16**	.09*	.36**	.37**	.03	.41**	.41**	(.81)					
9. Formal peer interactions	3.41	.95	-.04	-.09*	.29**	.36**	.31**	.21**	.32**	.26**	(.90)				
10. Informal peer interactions	3.64	1.12	-.05	-.21**	.13**	.21**	.31**	.11**	.23**	.10**	.75**	(.93)			
11. Popularity	2.90	.81	-.08*	.04	.49**	.39**	.34**	.21**	.25**	.20**	.46**	.39**	(.88)		
12. Study engagement	4.78	.95	.03	.09*	.46**	.49**	.05	.44**	.36**	.63**	.33**	.15**	.29**	(.89)	
13. Subjective well-being	5.05	1.05	.06	.02	.68**	.57**	.35**	.36**	.27**	.36**	.44**	.32**	.57**	.53**	(.90)
14. Exam grades[a]	10.99	2.70	.05	-.05	.08*	.11**	-.18**	.01	-.03	.18**	.05	.01	-.03	.15**	.01

Gender: 0 = Male; 1 = Female. CSE = Core-self evaluations. Omega reliabilities coefficients are reported in parenthesis on the diagonal

[a]*N* for exam grades = 591

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

Table 2 Fit statistics of the exploratory factor analyses – subsample 1 (N = 378)

Model	Description	χ^2 (*df*)	CFI	TLI	RMSEA	SRMR
EFA	1-factor	723.65 (54)	.68	.59	.18	.12
	2-factor	197.40 (43)	.92	.88	.10	.04
	3-factor	92.91 (33)	.97	.94	.07	.03
	4-factor	44.68 (24)	.99	.97	.05	.02

df = 53; CFI = 0.90; TLI = 0.89; RMSEA = 0.10; SRMR = 0.06); hence, we added three theoretically justified covariances between residuals of items with overlapping content: DF_1 with DF_2, DF_4 with DF_5, DC_2 with DC_3. These modifications reflect shared variance due to item similarity rather than substantive overlap, improving model fit while maintaining conceptual clarity. This model displayed acceptable model fit: $\chi^2 = 174.16$; *df* = 50; CFI = 0.94; TLI = 0.92; RMSEA = 0.08; SRMR = 0.06. All standardized factor loadings were significant and ranged from 0.61 to 0.83 for designing fun, and from 0.46 to 0.84 for designing competition. The two dimensions exhibited a moderately strong positive correlation, $r = 0.55$; $p < 0.001$. Also, this two-factor model outperformed an alternative single-factor model ($\chi^2 = 717.11$; *df* = 54; CFI = 0.69; TLI = 0.62; RMSEA = 0.18; SRMR = 0.13). Both scales exhibited acceptable reliabilities, design fun: $\omega = 0.89$, designing competition: $\omega = 0.81$.

Nomological Network

Convergent and Discriminant Validity

We used the data of the whole sample ($N = 753$) to analyze the nomological network of PSD. As can be seen in Table 1, trait curiosity correlated positively with both designing fun and competition, supporting Hypothesis 2. Trait playfulness correlated positively with designing fun but was unrelated to designing competition, partially supporting Hypothesis 3. To further assess discriminant validity, we tested a six-factor model distinguishing between designing fun, designing competition, trait curiosity, trait playfulness, core self-evaluations, and psychological capital. Despite the moderate fit of this six-factor model ($\chi^2 = 2849.98$; *df* = 687; CFI = 0.83; TLI = 0.81; RMSEA = 0.07; SRMR = 0.07), it consistently outperformed all five-factor models that collapsed designing fun or designing competition with related constructs. Specifically, alternative five-factor models that merged designing fun with curiosity ($\chi^2 = 4160.36$; *df* = 692; CFI = 0.72; TLI = 0.70; RMSEA = 0.08; SRMR = 0.09), designing fun with playfulness ($\chi^2 = 3612.67$; *df* = 692; CFI = 0.77; TLI = 0.75; RMSEA = 0.08; SRMR = 0.08), designing competition with core self-evaluations (χ2 = 3944.15; *df* = 692; CFI = 0.74; TLI = 0.72; RMSEA = 0.08; SRMR = 0.09), or designing competition with psychological capital ($\chi^2 = 3635.29$; *df* = 692; CFI = 0.77; TLI = 0.75; RMSEA = 0.08; SRMR = 0.08) all showed substantially worse fit. This supports the distinctiveness of designing fun and designing competition, reinforcing the discriminant validity of the PSD scale.

Table 3 Items, descriptive statistics, reliabilities, and geomin rotated loadings from the EFA, 2-factor solution of the PSD scale (N = 378)

						Factor loadings	
	M	*SD*	Skew	Kurtosis	ω	1	2
Designing fun					.86		
I look for humor in the study-related things I need to do (Cerco il lato umoristico delle attività connesse allo studio.)	3.28	1.02	-.14	-.52		.67	
I approach my study in a playful way (Affronto le mie attività di studio in modo divertente.)	2.78	.91	.14	-.23		.80	
I look for ways to make my study tasks more fun for everyone involved (Cerco modi per rendere i miei compiti di studio più divertenti per tutte le persone coinvolte.)	2.83	1.06	.14	-.63		.82	
I approach my study tasks creatively to make them more interesting (Affronto i miei compiti di studio in modo creativo per renderli più interessanti.)	2.90	1.03	.02	-.52		.65	
I look for ways to make my study more fun (Cerco dei modi per rendere più divertenti i miei momenti di studio.)	2.90	1.03	.08	-.54		.76	
I use my imagination to make my study more interesting (Utilizzo la mia immaginazione per rendere più interessante il mio studio.)	3.19	1.13	-.04	-.83		.40	
Designing competition					.82		
I approach my study as a series of exciting challenges (Affronto i miei compiti di studio come se fossero una serie di sfide entusiasmanti.)	2.73	1.03	.16	-.55			.66
I push myself to do better even when it is not expected (Nel mio studio, mi spingo a fare sempre meglio anche quando non è richiesto.)	3.35	1.08	-.13	-.73			.72
I compete with myself at study – not because I have to, but because I enjoy it (Sfido me stesso/a nello studio, non perché devo, ma perché mi piace.)	3.37	1.12	-.29	-.65			.77
I try to set time records in my study tasks (Cerco di stabilire record di tempo nei miei compiti di studio.)	2.11	1.18	.86	-.25			.50
I try to keep score in all kinds of study activities (Cerco di tenere traccia di tutte le mie attività di studio.)	3.45	1.18	-.42	-.69			.47
I try to make my study a series of exciting challenges (Cerco di trasformare il mio studio in una serie di sfide entusiasmanti.)	2.65	1.07	.36	-.41			.77

ω = Omega reliability coefficient. All factor loadings are significant ($p < .05$)

The slightly lower-than-expected CFI and TLI values can be attributed to model complexity (Bentler, 1990). Since incremental fit indices compare the target model to a null model that assumes no relationships between variables, they tend to be lower when moderately correlated constructs are present (Bentler, 1990). In contrast, RMSEA (0.07) and SRMR (0.07) indicate that the model approximates the data reasonably well. Hence, taken together, these results suggest that while incremental fit indices may appear lower due to model complexity, the absolute fit indices support the adequacy of the six-factor model. Although the six-factor model does not exhibit a perfect fit, it remains the best representation of our data. The theoretical grounding of the model, alongside its superior performance compared to alternative models that collapse related constructs, supports the validity and distinctiveness of PSD as a two-dimensional construct.

Incremental Validity

Hierarchical regressions (Table 4) showed that designing fun explained additional variance (over and above CSE and PsyCap) in formal and informal peer interactions and popularity, supporting Hypothesis 4a. This suggests that students who integrate humor and fantasy in their study tasks and meetings perceive that they are more often approached by others and see themselves as more popular. On the contrary, Hypothesis 4b is rejected as designing competition did not meaningfully contribute to social integration outcomes beyond personal resources and designing fun. It is worth noting that for formal peer interactions, CSE became a significant predictor only when entering PSD as well, while for popularity, PsyCap was no longer a significant predictor when entering PSD.

Results also showed that both PSD dimensions explained significant variance in study engagement and subjective well-being beyond CSE and PsyCap, with designing competition contributing the most to study engagement, supporting Hypotheses 5a and 5b.

The findings from Study 1 provide compelling evidence for the factorial structure and validity of the PSD scale, confirming the two distinct dimensions of designing fun and designing competition, and highlighting its robustness in capturing the playful aspects of proactively approaching study tasks. Additionally, the results showed that the dimensions of PSD are related yet distinct from other traits associated with the play domain. Notably, the incremental validity analyses revealed that designing fun explains additional variance in social functioning and well-being beyond personal resources, while designing competition contributes only to well-being indicators. This suggests that designing fun is more closely tied to social dynamics, whereas designing competition may be more strongly related to inner self-regulation and motivation. Building on these insights, Study 2 aims to explore the predictive validity of PSD for academic performance, specifically examining how the playful redesign of study tasks relates to exam grades two months post-survey. This longitudinal perspective will further elucidate the potential of PSD as a proactive strategy for enhancing academic success.

Study 2: Method

Participants and Procedure

A subset of 591 students from Study 1 (85% female; $M_{\text{age}}=22.07$; $SD_{\text{age}}=4.00$; $M_{\text{designing fun}}=2.98$; $SD_{\text{designing fun}}=0.83$; $M_{\text{designing comp.}}=2.93$; $SD_{\text{designing comp.}}=0.79$) completed a multiple-choice exam approximately two months after the data collection detailed in Study 1.

Measures

Performance The number of correct answers provided on a 15-question multiple-choice exam was used as the performance indicator. The exam consisted of 15 multiple-choice questions with 4 answer options per question, covering key concepts from a well-defined and specific part of the course program. To minimize the potential for item exposure and answer sharing, eight different versions of the exam were administered. Each version was carefully designed to maintain equivalent difficulty and coverage of learning objectives, reducing the risk of variance in difficulty across versions. The exam was developed by subject-matter experts to ensure comprehensive coverage of the targeted course content, ensuring content validity. Each question had a single correct answer, with scores calculated based on the number of correct responses. The standardized format and objective scoring ensured fairness and comparability across participants.

Statistical Analyses

We conducted polynomial regression analyses (Edwards, 1994; Edwards & Parry, 1993) following Yao and Ma (2023) recommendations to assess the predictive validity of PSD dimensions. We centered designing fun (b_1) and designing competition (b_2) at the mean (i.e., value 3) and computed the squared and interaction terms: designing fun^2 (b_3), designing fun × designing competition (b_4), and designing competition^2 (b_5). Subsequently, we computed the response surface parameters. The slope along the fit line (a_1) is expected to reflect a positive, linear change in exam grade when designing fun and designing competition increases in tandem (b_1+b_2). The curvature along the fit line (a_2) is expected to be positive, which indicates that the effect of congruence is accelerating ($b_3+b_4+b_5$). Contrastingly, the slope along the misfit line (a_3) indicates the direction of the effect when there is an imbalance between designing fun and designing competition ($b_1 - b_2$), which is expected to be near zero. The curvature along the misfit line (a_4) is expected to demonstrate that grades decrease as the discrepancy between designing fun and designing competition increases. Finally, we assess the lateral shift intercept (p_{10}) and slope (p_{11}) to determine whether the optimal grade deviates from the fit line. This is assessed by evaluating whether the confidence intervals contain zero and one, respectively. We expect an absence of lateral shift. Therefore, we expect $a_1>0$, $a_2>0$, $a_3=0$, $a_4<0$, $p_{10}=0$, and $p_{11}=1$ (see Type 4: Yao & Ma, 2023). A surface response plot was used to visualize the results.

Table 4 Incremental validity analyses of playful study design relative to CSE and PsyCap (N = 753)

Criterion variable	Formal peer interactions		Informal peer interactions		Popularity		Study engagement		Subjective well-being	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	B	B	B	B	B	B	B	B	B	B
CSE	.12	.13*	-.06	-.01	.51***	.54***	.31***	.19***	.85***	.84***
PsyCap	.34***	.22***	.31***	.21***	.10*	.04	.38***	.22***	.24***	.17***
Designing fun		.24***		.26***		.18***		.08*		.11**
Designing competition		.08		-.05		-.05		.57***		.10**
R^2	.13	.18	.04	.07	.25	.27	.27	.49	.48	.50
ΔR^2		.05***		.03***		.03***		.22***		.02***

Note. CSE Core-self evaluations; Unstandardized regression coefficients are reported

***$p \leq .001$; **$p \leq .01$; *p .05

Results & Discussion

Predictive Validity

Hypothesis 6 predicted that the balance between designing fun and competition would positively correlate with academic performance, as reflected by exam grades. Bivariate correlations indicate that designing fun was not related to exam performance ($r = -0.03$, $p = 0.49$), whereas designing competition was positively associated with grades ($r = 0.18$, $p < 0.001$). Polynomial regression results (Table 5) showed that the model accounted for 21% of the variance in study performance. Both designing fun ($B = -0.35$, $p = 0.014$) and designing competition ($B = 0.74$, $p < 0.001$) exhibited significant effects on performance, albeit in opposing directions.

The response surface plot (Fig. 1) illustrates the results of the polynomial regression analysis. As expected, higher levels of both designing fun and designing competition together (i.e., when they are balanced) were associated with better performance ($a_1 = 0.38$, $SE = 0.16$, $p = 0.022$). However, the congruence effect did not accelerate at higher levels ($a_2 = 0.06$, $SE = 0.18$, $p = 0.738$), and exam grades were higher when designing competition exceeded designing fun ($a_3 = -1.09$, $SE = 0.24$, $p < 0.01$). Similarly, exam grades did not decrease faster as the discrepancy between designing fun and designing competition became more pronounced ($a_4 = -0.26$, $SE = 0.39$, $p = 0.504$). Finally, as expected, the lateral shift intercept (p_{10}) and slope (p_{11}) did not significantly differ from zero (95%CI: −9.58, 3.95) and one (95%CI: −1.08, 1.86), respectively. In other words, there is neither a lateral shift nor surface rotation. Thus, while we observed that balanced high levels of designing fun and competition generally enhanced performance, we also observed higher performance for students who more often designed competition (agonistic play) than they designed fun (ludic play). This suggests that in this context, competitive behaviors are more important for driving performance than initially anticipated. This implies that several conditions for the congruence effect we formulated (Type 4) were not met.

The results of Study 2 provide valuable insights into the predictive validity of PSD concerning academic performance. As hypothesized, balanced designing fun and designing competition in study tasks was related to higher exam grades, with the two strategies accounting for no less than 21% of the variance in study performance. However, we also found that while a balance between the two dimensions was beneficial, an excess of designing competition over designing fun also led to improved performance. This unexpected finding suggests that a greater investment in designing competition over designing fun may strengthen engagement with academic tasks, particularly individual tasks, thereby enhancing short-term academic outcomes. While competition may support immediate performance through goal-driven focus, incorporating fun may foster stronger social connections that could support learning in the long term. At the same time, the other findings suggest that a balance between designing fun and designing competition is necessary since designing fun was more predictive of social outcomes, including formal peer interactions, informal peer interactions, and popularity.

Building on these insights, Study 3 will test an intervention designed to enhance students' utilization of PSD. By focusing on strategies to promote both dimensions – designing fun and designing competition – this intervention aims to boost active learning, study task proactivity, and study engagement. We anticipate that empowering students to integrate playful elements into their study practices will not only enhance their academic performance but also foster a more enriching and engaging educational experience.

Study 3: Method

Participants and Procedure

This study employed a quasi-experimental design with a small student sample divided into two groups: an intervention group ($N = 14$) and a control group ($N = 14$). The design involved a pre-post assessment of study variables for both groups. The intervention group participated in four modules and completed weekly assignments and diaries, while the control group received no intervention. Study adherence was exceptional, with no dropouts. This can be attributed to several factors: participants received course credits for their participation, the intervention was structured to be fun, and engagement was likely enhanced by the interactive and reflective components of the sessions.

Participants were psychology undergraduates from two different universities in Italy. The intervention group was offered an optional four-session course on the topics of change from an applied psychology perspective (one session per week, with a one-week break between sessions 2 and 3), earning course credits for attending all

Table 5 Predictive validity analyses of playful study design (N = 591)

Criterion variable	Exam grade		Exam Grade	
	B	*SE*	*B*	*SE*
Intercept	11.02	.16	11.09	.16
Designing fun (centered)	-.36**	.14	-.35**	.14
Designing competition (centered)	.74***	.15	.74***	.15
Designing fun × competition			.10	.21
Designing fun^2			-.03	.14
Designing competition^2			-.14	.16
R^2			.21	
a_1: slope along X = Y			0.38*	0.17
a_2: curvature along X = Y			−0.06	0.17
a_3: slope along X = -Y			−1.09***	0.24
a_4: curvature along X = -Y			−0.26	0.39

Unstandardized regression coefficients are reported

***$p \leq .001$; ** $p \leq .01$; * $p < .05$

sessions. Details of the intervention are summarized in Table 6. The control group completed a questionnaire twice over a month, also for course credits, as part of a lab activity. Participants in the control group were unaware of their condition. The geographical distance (577 km) between the two universities minimized the risk of contamination.

Playful Study Design Intervention

The PSD intervention was a structured, multi-module program. The structure and content of the modules were based on previous interventions to stimulate proactive behaviors, including SMART goals, discussing theory, identifying obstacles, and developing implementation intentions (Berg et al., 2023; Costantini et al., 2022; Knight et al., 2021; Oprea et al., 2019) and included various principles of game design delineated by Schell (2020), including among others narratives, collaboration, discovery, and fun (ludic) as well as challenges, levels, experience points, and rewarding wins (i.e., agonistic elements; Huizinga, 1949).

The intervention consisted of four modules. The first module introduced the goals, structure, and an icebreaker to encourage students to interact and think playfully. Subsequently, the theoretical principles of SD-R theory and PSD were introduced. Students were instructed to classify study tasks into levels of challenge and

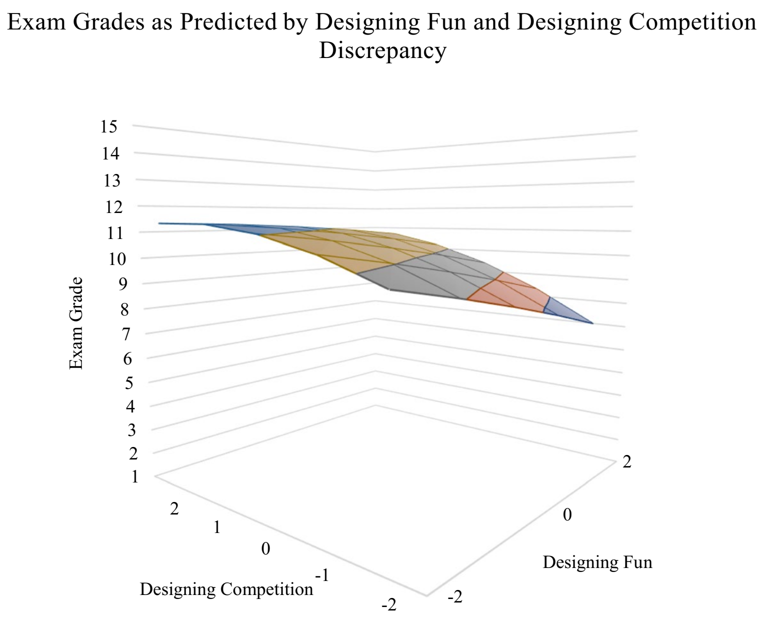

Fig. 1 Response surface plot of relationships among designing fun, designing competition, and performance as indicated by exam grades

consider how to use PSD for engagement. The assignments consisted of forming groups and using PSD strategies to present playfully.

During the second module, students presented academic papers using PSD strategies. They explored how play strategies should align with both their personality and the nature of their study activities to optimize engagement. The discussion covered how certain play strategies can boost motivation when well-matched to the individual and task, while others may buffer against demotivation. Students also examined different ways to implement play initiatives, such as bundling, merging, and alternating strategies to enhance their effectiveness. They were introduced to the experience points system and created a personalized scoring rubric. The assignments included implementing PSD strategies, scoring progress, monitoring goal-achievement discrepancies, and preparing a PSD-based presentation.

The third module focused on overcoming obstacles and critically reflecting. Students shared their experiences, identified obstacles, and developed implementation intentions. They also developed ideas about how to address the potential drawbacks of designing fun and designing competition by balancing both approaches. Finally, students explored the social aspects of PSD. Each student was instructed to develop a playful narrative and present this during the next session.

The final module offered students an opportunity to share their journey of learning about and implementing play during study activities. They discussed what they discovered and learned from each others' experiences. To facilitate knowledge retention and transfer, students were instructed to write a final reflection about the entire course.

Measures

All measures were administered in Italian. Scales unavailable in Italian were adapted using back-translation (Brislin, 1970). Items referred to behaviors from the prior week, prefaced with "*Last week*…".

Playful Study Design We measured PSD with the 12 items validated in Study 1 and 2. At baseline (T1), the omega reliability coefficient for designing fun was 0.91, and at post-intervention (T2) it was 0.94. For designing competition, $\omega_{T1} = 0.84$; $\omega_{T2} = 0.86$.

Active Learning Active learning was assessed using seven items from Bakker et al. (2012), which capture proactive engagement with study materials and self-direct behaviors. Active learning comprises a motivation for studying, a sense of volition, and a focus on creating mastery experiences. Sample items include: "*Last week, I put a lot of energy into staying updated with the latest developments in my study field", "Last week, I focused on acquiring new knowledge through my studies", and "Last week, I translated improvements and innovations into my own study habits"*. These items emphasize the students' agency in learning, which distinguishes it from active learning as an instructional method. Responses ranged from (1) *never* to (7) *very often*. Cronbach's $\omega_{T1} = 0.83$; $\omega_{T2} = 0.88$.

Table 6 Playful study design intervention overview

Module	Main Topics and Contents	Assignments
1. Introduction to Playful Study Design	• Introduction to the course: Presentation, goals, and structure • Pre-intervention survey • Icebreaker activity to enhance group interaction and playful thinking • Overview of university life using SD-R theory (demands and resources) • Identify study tasks and categorize them into levels of challenge: easy, skilled, advanced • Theoretical grounding: Introduction to PSD focusing on Designing Fun and Designing Competition • Reflection on using play (fun and competition) in academic studies, how they foster study engagement	• Form groups to study together a short research paper or commentary on work and organizational psychology topics • Use PSD strategies to present the contents of the paper creatively, using elements like memes or gifs to explain the paper in the next module
2. Applying Playful Strategies and Experience Points (XP)	• Pre-session survey • Group presentations of papers using PSD strategies (peer ratings and discussion) • Tailoring play: Fitting play to own personality and study tasks (buffering vs. boosting) • Introduction to Experience Points (XP) system. Explanation of categories (Discovery, Focus, Freedom, Quest, Joyful Mastery) • Create personalized rubrics for XP self-assessment • Individually assign XP to study tasks based on difficulty levels (easy, skilled, advanced) • Design a PSD plan with study goals framed as SMART goals, assigning XP to tasks and planning rewards	• Implement the PSD strategies and XP system over the next weeks • Review XP self-assessment, compare with actual achievements, and adjust for improvement • Prepare to present one study goal and how this was achieved using PSD and XP in a playful and challenging way during the next module
3. Review and Overcoming Obstacles	• Pre-session survey • Reflection on XP goals and rewards: Share experiences with buddies and the group • Identifying obstacles and developing implementation intentions • Address the potential downsides of Designing Fun and Designing Competition (importance of balance) • Social aspects of PSD: Enhancing social connections and building a supportive study community	• Reflect on the personal learning journey and playful strategies • Create a narrative: "*My Playful Story of This Experience*"

Table 6 (continued)

Module	Main Topics and Contents	Assignments
4. Final Presentations and Reflection	• Overview of the course • Pre-session survey • Final presentations: Each participant presents their playful story of the course • Post-intervention survey	• Submit the final reflection document to the lecturer along with presentation slides

Study Task Proactivity We used three items adapted from Griffin et al. (2007) to assess study task proactivity, with the wording adjusted to refer to study activities rather than work tasks. A sample item is: "*Last week, I came up with ideas to improve the way in which I handle my study activities.*" Responses were provided on a scale from (1) *very little* to (5) *a great deal.* Cronbach's $\omega_{T1} = 0.88$; $\omega_{T2} = 0.93$.

Study Engagement Engagement with study tasks was assessed with the same items as in Study 1, with separate dimensions retained to better understand the effects of the intervention. For vigor, $\omega_{T1} = 0.80$; $\omega_{T2} = 0.85$; for dedication, $\omega_{T1} = 0.91$; $\omega_{T2} = 0.91$, for absorption, $\omega_{T1} = 0.88$; $\omega_{T2} = 0.95$.

Statistical Analyses

Before testing our hypotheses, we checked the normal distribution of our data. Baseline comparisons between groups on focal variables and sociodemographics were conducted using *t*-tests and chi-square tests. The effects of the intervention over time and compared with the control group were investigated using mixed two-way repeated-measures ANOVA, with time (within-person factor) by group (intervention and control, between-person factor) design. A Bonferroni correction was used to control for Type I errors (Bland & Altman, 1995).

Results & Discussion

Preliminary Analyses

The Shapiro–Wilk tests showed no significant departures from normality for any of the study variables. There were no significant differences between the two groups at baseline for gender $\chi^2(1) = 1.47$, $p = 0.23$, age $t(26) = -1.26$, $p = 0.22$; designing fun $t(26) = -2.00$, $p = 0.06$; vigor $t(26) = 0.20$, $p = 0.85$, dedication $t(26) = 0.33$, $p = 0.74$, absorption $t(26) = -0.70$, $p = 0.49$, active learning $t(26) = -0.99$, $p = 0.33$, and study task proactivity $t(26) = 0.48$, $p = 0.64$. There was one exception: the intervention group had slightly higher initial levels of designing competition than the control group, $t(26) = -2.30$, $p = 0.03$. To address the initial differences between groups, our analysis focused on within-person changes over time rather than absolute levels at T2. This approach allowed us to evaluate the intervention's impact on increasing designing competition relative to the control group, despite the baseline disparities.

Hypotheses Testing

Hypothesis 7 predicted that participation in the intervention would lead to increases in (a) designing fun, (b) designing competition, (c) active learning, (d) study task proactivity, and (e) study engagement from pretest to posttest, compared to the control group. The findings are summarized in Fig. 2.

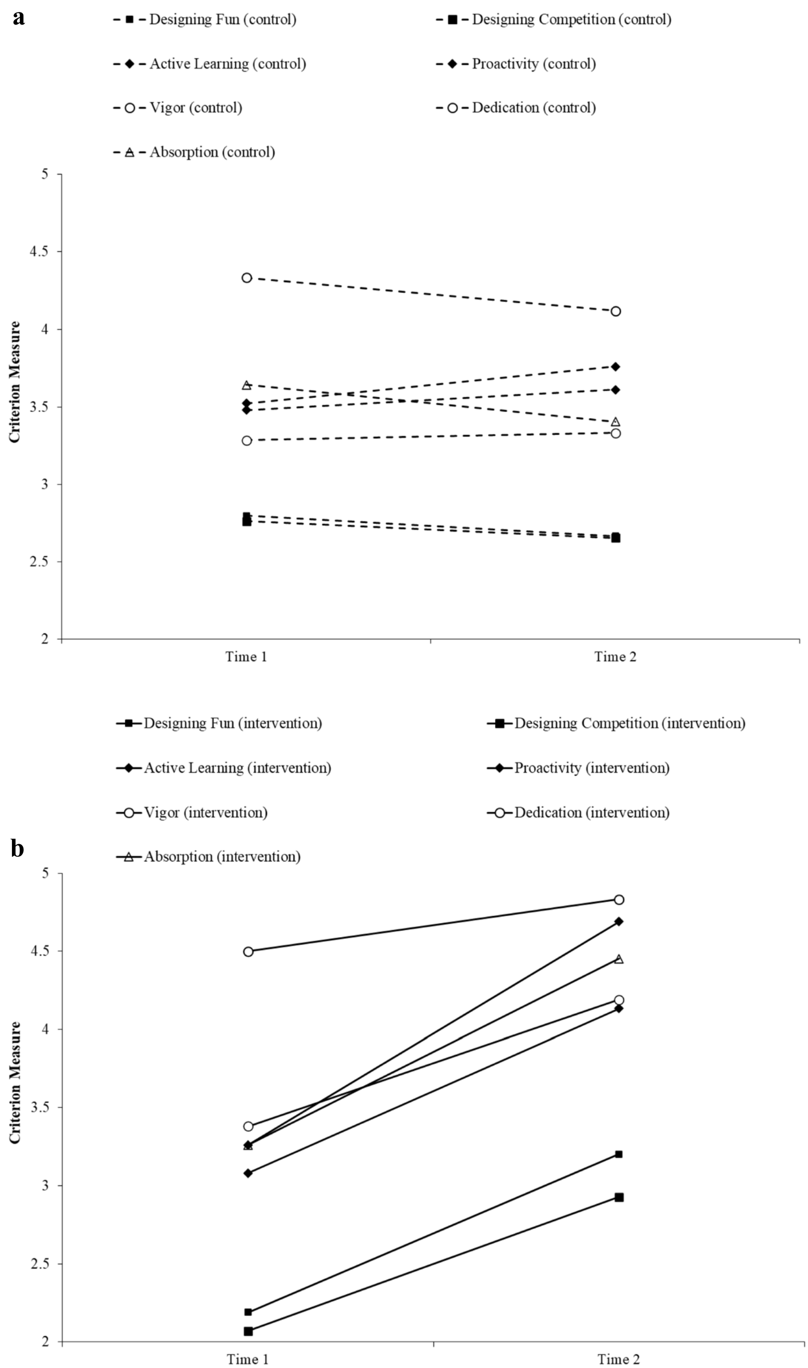

Fig. 2 **a** changes in playful study design, active learning, proactivity, and study engagement across time for the control group. **b** changes in playful study design, active learning, proactivity, and study engagement across time for the intervention group

Regarding designing fun, results showed that there was a significant main effect of time, $F(1, 26) = 10.18$, $p = 0.004$, $\eta_p^2 = 0.28$. Students designed more fun at Time 2 ($M = 2.94$, $SE = 0.15$, 95%CI: 2.18, 2.81) than at Time 1 ($M = 2.49$, $SE = 0.15$, 95%CI: 2.62, 3.25). However, the main effect of the intervention did not create differences ($F(1, 26) = 0.017$, $p = 0.898$, $\eta_p^2 = 0.001$) between the intervention ($M = 2.73$, $SE = 0.19$, 95%CI: 2.33, 3.13) and control group ($M = 2.70$, $SE = 0.19$, 95%CI: 2.33, 3.10). Importantly, the time × intervention effect was significant, $F(1, 26) = 17.14$, $p < 0.001$, $\eta_p^2 = 0.40$. Specifically, the intervention group increased in designing fun ($\Delta M_{|T2\text{-}T1|} = 1.01$) from Time 1 ($M = 2.19$, $SE = 22$, 95%CI: 1.75, 2.63) to Time 2 ($M = 3.20$, $SE = 0.22$, 95%CI: 2.75, 3.66), whereas the control group slightly decreased ($\Delta M_{|T2\text{-}T1|} = 0.14$) from Time 1 ($M = 2.80$, $SE = 0.22$, 95%CI: 2.36, 3.24) to Time 2 ($M = 2.67$, $SE = 0.22$, 95%CI: 2.21, 3.12). These results support Hypothesis 7a.

A similar pattern arose for the design competition. The results showed that the main effect of time was significant ($F(1, 26) = 6.07$, $p = 0.021$, $\eta_p^2 = 0.19$). Students more often designed competition at Time 2 ($M = 2.79$, $SE = 0.15$, 95%CI: 2.86, 3.10) than at Time 1 ($M = 2.42$, $SE = 0.15$, 95%CI: 2.10, 2.73). However, the intervention did not create differences ($F(1, 26) = 0.65$, $p = 0.426$, $\eta_p^2 = 0.03$) between the intervention ($M = 2.50$, $SE = 0.18$, 95%CI: 2.13, 2.87) and control group ($M = 2.71$, $SE = 0.18$, 95%CI: 2.33, 3.08). Yet, the time × intervention interaction effect was significant again ($F(1, 26) = 10.18$, $p = 0.004$, $\eta_p^2 = 0.28$). Students participating in the intervention showed an increase ($\Delta M_{|T2\text{-}T1|} = 0.86$) in designing competition from Time 1 ($M = 2.07$, $SE = 0.21$, 95%CI: 1.64, 2.51) to Time 2 ($M = 2.93$, $SE = 0.21$, 95%CI: 2.50, 3.36). Contrastingly, the control group slightly decreased ($\Delta M_{|T2\text{-}T1|} = 0.11$) when we compare Time 1 ($M = 2.76$, $SE = 0.21$, 95%CI: 2.33, 3.20) with Time 2 ($M = 2.66$, $SE = 0.21$, 95%CI: 2.22, 3.09). These results support Hypothesis 7b.

For active learning, based on the increase from Time 1 ($M = 3.28$, $SE = 0.20$, 95%CI: 2.87, 3.69) to Time 2 ($M = 3.87$, $SE = 0.21$, 95%CI: 3.44, 4.31), the main effect of time, $F(1, 26) = 9.75$, $p = 0.004$, $\eta_p^2 = 0.19$, was significant. While the intervention ($F(1, 26) = 0.028$, $p = 0.869$, $\eta_p^2 = 0.01$) did not relate to differences between the intervention ($M = 3.55$, $SE = 0.26$, 95%CI: 3.01, 4.08) and control group ($M = 3.61$, $SE = 0.26$, 95%CI: 3.07, 4.14), the time × intervention interaction effect was significant ($F(1, 26) = 5.87$, $p = 0.023$, $\eta_p^2 = 0.18$). Students participating in the intervention reported higher levels of active learning ($\Delta M_{|T2\text{-}T1|} = 1.05$) when we compare the end of the study ($M = 4.13$, $SE = 0.30$, 95%CI: 3.52, 4.75) with the start ($M = 3.08$, $SE = 0.29$, 95%CI: 2.50, 4.75). The control group only showed a small improvement in active learning ($\Delta M_{|T2\text{-}T1|} = 0.13$) from Time 1 ($M = 3.48$, $SE = 0.61$, 95%CI: 2.90, 4.07) to Time 2 ($M = 3.61$, $SE = 0.30$, 95%CI: 3.00, 4.23). These findings support Hypothesis 7c.

For study task proactivity, we also found the main effect of time ($F(1, 26) = 9.29$, $p = 0.005$, $\eta_p^2 = 0.26$). The results indicate that students increased in task proactivity from Time 1 ($M = 3.39$, $SE = 0.28$, 95%CI: 2.83, 3.96) to Time 2 ($M = 4.23$, $SE = 0.25$, 95%CI: 3.71, 4.74). However, the between-subjects analysis ($F(1, 26) = 0.548$, $p = 0.466$, $\eta_p^2 = 0.02$) revealed there were no differences between the control ($M = 3.64$, $SE = 0.32$, 95%CI: 2.99, 4.30) and intervention group ($M = 3.98$, $SE = 0.32$, 95%CI: 3.32, 4.63). Again, the time × intervention interaction effect was significant, $F(1, 26) = 4.74$, $p = 0.039$, $\eta_p^2 = 0.15$. Students participating in the intervention showed a stronger increase in study task proactivity ($\Delta M_{|T2\text{-}T1|} = 1.43$) from Time 1 ($M = 3.26$, $SE = 0.39$, 95%CI: 2.46, 4.06) to Time 2 ($M = 4.69$, $SE = 0.36$, 95%CI: 3.96, 5.42) compared to the control group ($\Delta M_{|T2\text{-}T1|} = 0.24$), which slightly increased from Time 1 ($M = 3.52$, $SE = 0.39$, 95%CI: 2.73, 4.32) to Time 2 ($M = 3.76$, $SE = 0.36$, 95%CI: 3.03, 4.49). These results support Hypothesis 7d.

Regarding study engagement, there were no significant effects on vigor (Time: $F(1, 26) = 3.015$, $p = 0.094$, $\eta_p^2 = 0.104$; Intervention: $F(1, 26) = 2.58$, $p = 0.220$, $\eta_p^2 = 0.06$; Time × Intervention: $F(1, 26) = 2.38$, $p = 0.135$, $\eta_p^2 = 0.08$) and dedication (Time: $F(1, 26) = 0.06$, $p = 0.816$, $\eta_p^2 = 0.01$; Intervention: $F(1, 26) = 1.21$, $p = 0.281$, $\eta_p^2 = 0.05$; Time × Intervention: $F(1, 26) = 1.17$, $p = 0.289$, $\eta_p^2 = 0.01$). For absorption, we also did not detect a main effect of time ($F(1, 26) = 2.81$, $p = 0.106$, $\eta_p^2 = 0.10$; Time 1: $M = 4.45$, $SE = 0.27$, 95%CI: 2.89, 4.49; Time 2: $M = 3.93$, $SE = 0.27$, 95%CI: 3.37, 4.49) or the intervention ($F(1, 26) = 0.517$, $p = 0.479$, $\eta_p^2 = 0.02$; Control: $M = 3.52$, $SE = 0.33$, 95%CI: 2.85, 4.20; Intervention: $M = 3.85$, $SE = 0.33$, 95%CI: 3.18, 4.53). However, the time × intervention interaction effect was significant, $F(1, 26) = 6.33$, $p = 0.018$, $\eta_p^2 = 0.20$. The intervention group showed a stronger increase in absorption ($\Delta M_{T2\text{-}T1} = 1.19$) from the start ($M = 3.26$, $SE = 0.38$, 95%CI: 2.47, 4.05) to the end of the study ($M = 4.45$, $SE = 0.39$, 95%CI: 3.66, 5.24) compared with the control group, which experienced a slight decrease ($\Delta M_{T2\text{-}T1} = 0.24$) from the start ($M = 3.64$, $SE = 0.38$, 95%CI: 2.85, 4.43) to the end of the study ($M = 3.41$, $SE = 0.39$, 95%CI: 2.61, 4.20). This provides partial support for Hypothesis 7e.

Overall, the results support the effectiveness of the intervention over time in fostering PSD, active learning, and study task proactivity. However, the findings for study engagement were mixed. While vigor and dedication did not change, the intervention increased absorption. In other words, while the intervention facilitates deep focus and immersion in study activities, the modules may not increase the energy and enthusiasm related to studying. The broader context may explain this finding. For instance, vigor and dedication may be influenced by additional factors beyond the intervention, such as students' overall academic workload, the inherent appeal of study materials, and individual differences in motivation and interest.

General Discussion

Play is a universal and fundamental aspect of the human experience, fostering creativity, imagination, and joy across cultures (Kolb & Kolb, 2010). While much research has focused on its role in early childhood development and adaptation (Weisberg et al., 2013), the potential for playful tendencies to support thriving in higher education has been largely overlooked (Wiggins, 2016). Existing approaches in higher education, such as gamification (Oliveira et al., 2023) and serious games (Connolly et al., 2012), tend to emphasize external motivators and instructor-driven methods, providing limited insight into self-initiated, intrinsically motivated play among students. This gap leaves the potential of play underutilized in academic contexts, with little attention given to how students' natural inclinations for play can promote well-being and academic success. The present study addresses this gap by introducing PSD as a proactive, self-regulatory strategy empowering students to leverage their playful tendencies to enrich their study experiences, thereby enhancing well-being and ultimately improving academic outcomes. By focusing on student-driven play, our study sheds light on an underexplored aspect of higher education that can be pivotal in fostering student engagement and success.

Across three studies, we demonstrated that integrating play into study activities can be reliably conceptualized through two dimensions: designing fun and designing competition. Both dimensions significantly contribute to academic well-being, as reflected in study engagement and subjective well-being, beyond students' personal resources. Additionally, designing fun explains extra variance in social integration beyond personal resources. Moreover, we found that balancing these two aspects of play has direct implications for performance, as reflected in academic grades. Finally, our intervention study revealed that targeted programs can enhance PSD, leading to increased active learning, task proactivity, and absorption in study tasks.

Theoretical Implications

Our study makes several key theoretical contributions to the literature. First, we advance the understanding of play in adulthood within higher education. Building on foundational research on the proactive integration of play into work activities (Bakker & Scharp, 2024), we conceptualized PSD as a dual orientation toward studying comprised of designing fun and designing competition. This nuanced and empirically validated conceptualization of play in higher education offers a detailed framework that enables further theorizing on how different aspects of play – when initiated by students themselves – shape academic progress and well-being.

Second, we provide a significant empirical contribution substantiating the propositions of SD-R theory (Bakker & Mostert, 2024), particularly regarding proactive self-regulatory strategies to enhance study resources. SD-R theory posits that individuals who actively shape their environments gain additional resources, creating upward spirals of engagement and well-being. We proposed and found that PSD acts as one such proactive strategy, uniquely contributing to academic progress and well-being beyond students' personal resources. While both dimensions of PSD contributed to well-being, we found that only designing fun explained additional variance in social functioning. This can be explained by the differing nature of the two aspects of PSD: designing competition primarily involves students creating challenges for themselves rather than with or for others, while designing fun reflects the more socially oriented dimension of PSD. Moreover, our findings align with those of Scharp et al. (2021), who demonstrated that designing fun was particularly effective in managing social stressors while designing competition was more effective in dealing with agentic stressors. Taken together, these results emphasize the importance of recognizing and promoting PSD as a unique approach that can transform higher education experiences. Its transformative potential may counterbalance lower levels of personal resources, with the effectiveness of different PSD approaches being contingent on the facet of academic integration considered.

Third, our study makes a significant contribution to the literature on academic progress and well-being (Douwes et al., 2023; Tinto, 2012) by framing play within the higher education setting as well as response surface analyses in higher education (see Núñez-Regueiro, 2024). Our findings complement research that showcases that proactive strategies such as active participation in class can contribute to academic achievement and wellbeing (e.g., Reeve et al., 2022). We emphasize the crucial role of proactive strategies in enhancing both social and academic integration. Our investigation focused on the balance between different play-oriented proactive strategies and their impact on performance grades. Interestingly, our findings partially contradicted our initial expectations. We discovered that while a balance between designing fun and designing competition contributes positively to performance on a multiple-choice exam, a tilt towards designing competition appeared to be more strongly beneficial for academic performance. Future research may further investigate when and for which student outcomes designing fun and designing competition boost each other (or not).

This finding may most likely be attributed to the goal-oriented focus that competition fosters or the nature of such exams, which may reward intensive, competitive preparation. Indeed, existing research indicates that formulating goals is a significant strategy for increasing academic performance (Bipp et al., 2015; Morisano et al., 2010). Potentially, this finding could be explained by the fact that designing fun facilitates more divergent thinking and a mastery-oriented approach, whereas designing competition may relate more strongly to convergent thinking and a performance-oriented approach. Research indicates that the latter is more important for higher grades for multiple-choice exams, whereas the former may undermine performance (e.g., De Vink et al., 2022; Senko & Miles, 2008). However, the benefit of designing competition did not negate the value of balance – we found that both dynamics contributed to student outcomes, but designing competition outweighed designing fun in the specific context of a multiple-choice test. Designing fun may instead facilitate performance more on open-ended exams and assignments that draw more on creativity (cf. Daker et al., 2022).

The findings derived from the polynomial analyses highlight the value of considering the interplay between different aspects of PSD in shaping positive outcomes, particularly in higher education. This approach echoes the work of Gilbreath and colleagues (2011) who found that university satisfaction is higher when the actual academic environment slightly outweighs the desired one. Similarly, unpublished evidence (blinded) suggests that the interaction between different PSD dimensions significantly impacts well-being. Specifically, a study among naval cadets showed that designing fun is more positively related to positive affect and more negatively related to exhaustion on days when cadets also engage in designing competition. This aligns with prior research on job crafting, which indicates that combining different strategies often yields the most optimal outcomes (Petrou & Xanthopoulou, 2021; Seppälä et al., 2020). Taken together, while designing competition appears more directly linked to academic performance, designing fun may be more important for fostering positive social relationships, which could indirectly influence performance and well-being. Future research should further investigate these dynamics, particularly examining how the dimensions of PSD contribute to shaping different aspects involved in academic integration.

Finally, we demonstrated that PSD can be effectively enhanced through targeted interventions, leading to improvements in active learning, proactive study behaviors, and absorption in study tasks. These findings are particularly relevant for educational practice in university settings, as they suggest that fostering PSD orientations can promote more engaging and self-determined learning. While the intervention did not significantly alter vigor and dedication levels, it yielded notable improvements in active learning, study task proactivity, and absorption. These dimensions are crucial for meaningful learning and are highly valued in the job market (Børte et al., 2023; Ribeiro-Silva et al., 2022; Tymon & Batistic, 2016; Wild et al., 1995, 1995). Our findings underscore PSD's potential to foster deep learning processes, which may confer long-term benefits to students' academic and professional development. This insight has significant implications for educational psychology. It suggests that designing and implementing interventions that encourage students to infuse fun and competition into their study routines could be a pivotal strategy for boosting student engagement and well-being. Educators can foster a thriving learning environment by integrating playful elements into academic settings, actively modeling PSD, and signaling that incorporating fun and humor into learning is encouraged. This approach has the potential not only to enhance student educational experiences but also to support their future career prospects.

Limitations and Future Directions

Despite the strengths of this research, including its multi-study design, longitudinal data, and external criterion validation, its limitations should be acknowledged. First, while Study 1 provided valuable insights into the relationships between PSD and social integration, the cross-sectional design limits our ability to infer causality. It remains unclear whether PSD drives social integration or whether well-integrated students are more inclined to adopt playful study strategies (e.g., because their social environment is psychologically safe). Future research should employ longitudinal designs to assess the temporal dynamics between PSD and social integration more rigorously.

Second, Study 2 focused on performance outcomes using a multiple-choice test format, which may have inherently favored the designing competition aspect of PSD over designing fun. This may have influenced our findings, as competitive strategies may align more closely with test-based performance metrics. Future studies should explore how PSD strategies affect other forms of assessment, such as essay-based evaluations, oral presentations, or collaborative projects, to determine whether designing fun plays a more prominent role in these contexts.

Third, while the quasi-experimental design of Study 3 provides valuable insights into the effects of a PSD intervention, the small sample size limits the generalizability of the findings. Additionally, although the geographic separation between the intervention and control groups helped mitigate contamination, the small sample size reduced the diversity of participants and increased the likelihood that group-specific dynamics, lecturer characteristics (cf. Bakker & Mostert, 2024), peer relationships, and other unmeasured contextual factors influence the effectiveness of the intervention. Given these limitations, Study 3 could be framed as a pilot study that provides initial evidence for the efficacy of the intervention. Future research should replicate this intervention with larger and more diverse samples, and investigate different formats, such as online or app-based interventions, to enhance accessibility and scalability.

Finally, the present research focused on conceptualizing PSD, developing its measurement, and providing evidence of validity. While the associations of PSD with perceived formal peer interactions, informal peer interactions, popularity, study engagement, and subjective wellbeing beyond core self-evaluations and psychological capital evidence incremental validity, more research is needed to firmly establish PSD as distinct from and incrementally predicts beyond related constructs, such as study crafting. Theoretically, PSD differs from study crafting in foci and mechanisms (cf. Bakker & Scharp, 2024). PSD is centered on up-regulating positively valenced states during activities by incorporating humor, creativity, challenges, and striving, whereas the goal of study crafting is alignment between the student and the environment by adjusting study resources and demands (Bakker & Mostert, 2024). These distinctions raise important questions for future research regarding the unique associations with student outcomes and whether their combined use (blending) leads to additional benefits. For instance, does designing fun boost the association of study crafting in the form of increasing social resources with popularity?

Conclusion

This research marks the first study to validate a comprehensive PSD instrument, advancing theoretical and practical understanding of how proactive playful strategies, conceptualized through designing fun and designing competition, can support academic progress and well-being in higher education. Across three studies, we demonstrated that PSD not only fosters active learning and study engagement but also contributes to academic performance and social integration in ways that are not fully explained by students' personal resources. The findings underscore the importance of proactively incorporating play into academic tasks as a self-regulatory strategy that can enhance students' well-being and study outcomes.

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Data Availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics Approval All the procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual adult participants included in the study.

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

Conflict of Interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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