Playful Work and Sports Design: A Game Changer?

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Abstract

Purpose In this paper, we explored the mechanisms, boundary conditions, and outcomes of playful task design. In study 1, we tested our model for playful work design (PWD). In study 2, we first validated a new scale to measure playful sports design (PSD), and then cross-validated the proposed model.

Design The sample of study 1 consisted of 167 employees, who participated in a diary study for at least two days (N = 763). The data was analyzed using multilevel structural equation modeling. In study 2 we carried out a cross-sectional study (N = 327). We tested the factorial, convergent, and divergent validity of the new PSD scale. Structural equation modeling was used to replicate the results of study 1.

Findings A satisfactory validity was established for the new PSD scale. We found that PWD and PSD were positively related to flow, generally resulting in improved performance and experienced meaningfulness of the task. The relationship between PWD/PSD and flow was largely unaffected by task characteristics. Finally, we found that one can overcome the negative effects of rumination about COVID-19 on flow by using PWD and PSD.

Conclusion This study showed that playful design is naturally present in an organizational and sports context. Due to the possible benefits of PWD and PSD, it may be worthwhile to stimulate use of this proactive behavioral orientation for individuals who are not instinctively inclined to approach tasks in a playful way.

Keywords: Playful work design; Playful sports design; Flow; Performance; Meaningfulness; Scale development

Introduction

People love playing games (Ellis, 1973). Maslow (1962) asserted that play is one of the richest forms of human experience. Playing may even be part of our nature. In his book, *Homo Ludens,* Huizinga (1949) argued that everything humans do has a component of playfulness. Whatever form play might come in, these activities seem to have one thing in common: they bring us excitement and joy (Malone, 1984). One might wonder: what makes the experience of play so gratifying? And what would happen if one were to apply the principles of play to contexts that we may not inherently enjoy?

In this thesis, we will integrate play principles with work and sports activities. We anticipate identifying contexts in which people benefit from tackling tasks in a playful way. Currently, playful redesign of a task might be one of the most puzzling and least understood concepts in the fields of organizational and sports psychology (e.g., Mainemelis & Ronson, 2006). Play is frequently considered only in the context of children and is perceived as something that would undermine productivity of adults (Abramis, 1990; Van Leeuwen & Westwood, 2008). Notwithstanding, play is an effortful behavioral orientation (McGonigal, 2011), which may facilitate optimal conditions for performance. As a response to these possibly erroneous assumptions, it has often been argued that there is a false dichotomy of productivity and play (e.g., Stevens, 1980).

In an effort to explore whether play is worth considering in the organizational domain, we will study the effects, operational mechanisms, and boundary conditions of the newly coined concept of playful work design (PWD; Scharp et al., 2019). First, we will introduce the concept of flow as a possible mechanism of PWD. Flow is a trancelike state of optimal concentration (Csikszentmihalyi, 1990), which may play a critical role in explaining the effects of playful design. Second, to examine the boundary conditions of play at work, we will explore at what level of daily task complexity and task monotony PWD is most advantageous.

Third, we will assess the daily effects of PWD on work experiences (e.g., meaningfulness of tasks) and work performance. Fourth, as we collected our data during the COVID-19 outbreak, the opportunity arose to study the effects of PWD for those who ruminate about COVID-19. As a final contribution to current literature, we will explore whether playful design can also be applied to sports activities. To do so, we will validate a new measure to assess playful sports design (PSD). We will study whether PWD and PSD share theoretical and psychometric properties. In addition, we are interested to find whether playful task design shows the same effects, mechanisms, and boundary conditions across different contexts. Therefore, the validation of the scale will be followed by a replication of study 1.

Theoretical Background

The Definition and Motivational Mechanisms of Play

Play is an intricate concept. Despite the lack of agreement on one single interpretation (Petelczyc et al., 2018), there is considerable overlap in definitions created over the years. Accordingly, we have defined play as a behavioral orientation (Mainemelis & Ronson, 2006), that is voluntary (e.g., Burke 1971; Caillois, 1961; English & English, 1958; Huizinga, 1949; Lieberman, 1977; Linder et al., 2001), has an artificial quality (Burke, 1971; Linder et al., 2001), is structured through relevant rules (e.g., Huizinga, 1949; Linder et al., 2001; Statler et al., 2002) or other game elements (Caillois, 1961; Huizinga, 1949; Lieberman, 2014), and is accompanied by positive affect (e.g., Barnett, 1976; English & English, 1958; Mainemelis & Ronson, 2006). The final, and maybe most crucial, facet is that play is a goal in itself (e.g., Barnett, 1976; Burke, 1971; Huizinga, 1949; Starbuck & Webster, 1991).

Insights into the mechanisms of play contribute to the understanding of why play behavior can often be sustained for such long periods. Some people actively seek information and opportunities to improve the situation or oneself (Crant, 2000). Play may be one of the self-initiated approaches to achieve this, fueling intrinsic motivation along the way.

Csikszentmihalyi (1975a) proposed that play initiatives are not driven by future benefit (e.g., money) but rather by the process of reaching a self-set goal. In other words: the experience is *autotelic* (*auto* = self, *telos* = goal; Csikszentmihalyi, 1990).

By proactively making tasks more playful, one may satisfy basic human needs, as proposed by self-determination theory (SDT; Deci & Ryan, 1985). For example, play is freely chosen by definition, which satisfies the need for autonomy (Ryan et al., 2006). Fulfilling this need goes hand in hand with an internal drive to behave in a certain way (Ryan & Deci, 2004). Although externally driven motivation can provide individuals with a short-term boost, sustained goal-directed behavior is more likely to be derived from intrinsic motivation (e.g., Gagné & Vansteenkiste, 2013; Deci & Ryan, 1985). The self-starting and voluntary aspects of play make this behavior internally driven and provide continuous incentives to undertake action (Ryan et al., 1996).

Study 1: Playful Work Design

Play at Work

Play at work can take on different forms. For instance, modern companies occasionally place play objects in the work environment (e.g., a tennis table; Mokaya & Gitari, 2012). Play can also be integrated with ceremonies, like a coffee break (Dandridge, 1986; Dandridge, 1988). This is a typical manifestation of the work-play dichotomy: play only takes place during times of non-work. Even though this might be beneficial for recovery during work hours (Reinecke, 2009), we argue that play is most beneficial when it is integrated into work. This will transform the experience of work itself, rather than the environment surrounding it (e.g., Butler et al., 2011; Mainemelis & Ronson, 2006; Petelczyc et al., 2018; Statler et al., 2002).

In 2011, Deterding and colleagues coined the concept of gamification. Gamification is implemented as a top-down strategy and consists of game-like elements (e.g., points, leaderboards, or achievements), which are used to engage employees in the execution of work tasks (e.g., Deterding, 2012; Sørensen & Spoelstra, 2012; Werbach & Hunter, 2012). However, there are many experts who argue that gamification does not capture play during work to its full potential (e.g., Gartner, 2012; Hamari et al., 2014; Perryer et al., 2016), as it does not lead to the anticipated positive change in employee behavior (Hanus & Fox, 2014; Rapp et al., 2019). This may come as no surprise when looking at the motivating mechanisms of play: when play is forced upon us, it is "mandatory fun" (e.g., Cherry, 2012; Mollick & Rothbard, 2014; Richter et al., 2015). This forestalls the true enjoyment of the activity at hand (Deci et al., 1999).

In light of previous research, it seems likely that people can shape their work environments in a bottom-up manner (Scharp et al., 2019; Scharp et al., *in press*). Scharp and colleagues (2019) embraced this idea through PWD. PWD is a "proactive cognitive-behavioral work orientation" (Scharp et al., 2019, p.2) through which employees can transform their experience of work (Scharp et al., *in press*). PWD, not unlike gamification, is built on the assumption that game elements can make work more pleasurable and productive. As PWD is self-initiated by nature, this strategy can successfully achieve the motivating mechanisms of play.

Play at work can be directed towards ludic (e.g., amusement) and agonistic (e.g., challenge) elements (Scharp et al., *in press*). These two variations of play at work are not mutually exclusive but might show distinct effects due to their unique approach towards play. The so-called designing fun cluster of PWD can be observed in activities that focus on creating entertainment. A typical illustration of designing fun is the use of humor or imagination during the execution of work tasks. The designing competition dimension of PWD embodies creating self-oriented challenges through the implementation of rules and goals (Scharp et al., 2019). By voluntarily making up "unnecessary" rules, one can make reality more challenging and exciting (McGonigal, 2011; Scharp et al., *in press*; Suits, 1967).

Beyond the Motivational Mechanism: PWD and Flow

PWD may create opportunities for peak experiences of concentration and enjoyment (e.g., Bakker & Woerkom, 2017; Csikszentmihalyi & Bennett, 1971; Csikszentmihalyi, 1997). During a so-called flow experience, there is no need for conscious intervention throughout the execution of a task (Csikszentmihalyi, 1988; Csikszentmihalyi & LeFevre, 1989). Even more so: there is "little to no distinction between self and environment, between stimulus and response, or between past, present and future" (Csikszentmihalyi, 1975b, p.36). One can shift in and out of flow as one goes from one activity to another. Flow can therefore vary from moment to moment (Csikszentmihalyi, 1990). The concept of flow may expand on the aforementioned motivational mechanisms of play, possibly presenting a more complete picture of the inner workings of playful design.

Roughly 41% of flow experiences are reportedly due to the characteristics of an activity (Massimini et al., 1988). Flow may happen at any time and place but may be more likely to arise during game-like actions (e.g., Bidwell et al., 1997; Csikszentmihalyi & Csikszentmihalyi, 1988; Chen, 2007; Routledge, 2016). This may be due to the characteristics of play. For example, it has been found that this optimal experience is most common when one is motivated in a self-determined manner (Kowal & Fortier, 1999). Additionally, an individual must experience thorough enjoyment for flow to occur (Csikszentmihalyi, 1990). Moreover, flow is often theorized to be the consequence of an equilibrium of structured challenges and skill (e.g., Csikszentmihalyi, 1988; Csikszentmihalyi, 1997; Engeser & Rheinberg, 2008). This can be established through goal-directed, rule-bound actions, which provide clear cues as to how well one is performing (Csikszentmihalyi, 1990). The defining features of play may therefore inherently result in a flow experience.

We argue that the dimensions of PWD both independently increase flow during the execution of a task (see Figure 1). For instance, the challenges of self-oriented competition can be experienced by an actor as being both stimulating and enjoyable. PWD creates opportunities for employees to form self-oriented challenges, through designing competition, which possibly results in flow. Furthermore, designing competition provides an individual with rapidly succeeding feedback (Scharp et al., *in press*), making one more likely to achieve a flow state (Csikszentmihalyi, 1975b). The fun cluster of PWD may stimulate flow too, as it promotes entertainment, making employees enjoy an activity to a greater extent (Bakker & Woerkom, 2017; Baumann & Scheffer, 2010; Chen, 2007). As enjoyment is a critical antecedent of flow (Csikszentmihalyi, 1990), we expect that designing fun also results in a flow experience.

Hypothesis 1: Both playful work design components, being (a) designing fun and (b) designing competition, are positively associated with flow on a daily level.

Task Characteristics in PWD

We will explore two types of task characteristics that may play a role in how PWD affects flow: task complexity and task monotony. We operationalize task complexity as an action that is relatively difficult to execute (Chae et al., 2013; Gorgievski et al., 2016), calling for a magnitude of skills and knowledge (Park et al., 2008; Wood, 1986). Task monotony, on the other hand, is characterized by repetitive actions (Melamed et al., 1995) and is typically accompanied by low external arousal (Loukidou et al., 2009; McBain, 1970). We argue that task complexity and monotony can be placed on a continuum (see Figure 2). In addition, we argue that these task characteristics can vary from day to day (e.g., Byström & Järvelin, 1995).

In accordance with job demands-resources (JDR) theory, it is possible for these types of task characteristics to form so-called job demands (e.g., Bakker & Demerouti, 2007; Harju et al., 2016). Job demands are often associated with poor organizational outcomes, as they require sustained effort or skill (Bakker & Demerouti, 2007). High task complexity, for example, could come with ambiguous feedback and high levels of anxiety (e.g., Campbell, 1988), whilst task monotony may lead to boredom (e.g., Baker, 1992; McBain, 1970). We argue that these types of tasks benefit most from PWD, as an employee can proactively generate job resources through this proactive work behavior. Under conditions of monotony, one may increase activation above its characteristic level, whilst one may decrease activation to a normal level under conditions of task complexity (Abramis, 1990).

We expect that designing fun will be most propitious in terms of flow during the execution of complex tasks. Designing fun may curtail anxiety associated with complex activities (Byström & Järvelin, 1995). Play provides psychological relief, as employees can release stress in a way that is not costly to themselves or the organization (Ellis, 1973; DesCamp & Thomas, 1993; Sørensen & Spoelstra, 2012). It might not be needed to add more challenge to complex tasks, but designing competition may be beneficial through other means. As complex tasks typically come with a level of uncertainty (e.g., Campbell, 1988; March & Simon, 1958), designing competition may enhance flow through introducing clear goals and unambiguous performance feedback (Bakker & Woerkom, 2017; Csikszentmihalyi, 1988; McGonigal, 2011).

> *Hypothesis 2: The positive relationship between both playful work design components, being (a) designing fun and (b) designing competition, and flow will be moderated by task complexity on a daily level. Specifically, the relationship will be strongest on days when one executes activities with higher (vs. lower) levels of task complexity.*

We expect designing competition to have the most prominent effect on flow during the execution of monotonous tasks. During PWD, one voluntarily makes reality more challenging through the implementation of "unnecessary" rules (McGonigal, 2011; Suits, 1967). Examples of adding an element of competition to repetitive tasks can be derived from early publications on play during work. For instance, Csikszentmihalyi (1975b) described how an assembly line worker approached every task as an opportunity to beat his own record. By increasing the challenge during a monotonous task, one can attain the equilibrium of challenge and skills, ultimately resulting in higher levels of flow. We argue that designing fun may also play a role in alleviating the boring components of monotonous tasks, providing more opportunities to achieve a state of flow. For example, Roy (1959) illustrated how factory workers overcame the “beast of monotony” (p.158) by engaging in horseplay. Therefore, we expect that designing fun will also result in higher levels of flow during the execution of monotonous tasks.

Hypothesis 3: The positive relationship between both playful work design components, being (a) designing fun and (b) designing competition, and flow will be moderated by task monotony on a daily level. Specifically, the relationship will be strongest on days when one executes activities with higher (vs. lower) levels of task monotony.

In addition to the main moderation effects of task complexity and monotony, we expect to find a combined effect of the two task characteristics. We argue that a task can be categorized in a circumplex model in accordance to its combined level of task complexity and monotony (see Figure 2). Although one may be inclined to think that task complexity and monotony are mutually exclusive, our definitions in fact allow for a hybrid between these two types of task characteristics. That means that a task may require high levels of knowledge and skills (complexity) but may consist of repetitive actions (monotony) at the same time. For example, proofreading a paper requires a lot of knowledge regarding a subject and statistical analyses but is not highly varied in nature. We expect that the combination of these task characteristics offer a more complete picture of the specific type of tasks that benefit from PWD.

To operationalize the combination of the two dimensions, we have created four quadrants: complex repetitive tasks, simple repetitive tasks, complex varied tasks, and simple varied tasks (see Figure 2). Complex repetitive tasks are call for knowledge and skill, making a task difficult to execute, and simultaneously consists of repeated actions. For simple repetitive tasks, one requires less knowledge/skills and carries out repetitive actions. Complex varied tasks, on the other hand, are difficult to execute and consist of heterogenous actions. Finally, simple varied tasks do not necessitate high levels of knowledge or skills and consist of alternating actions. In accordance with the aforementioned reasoning, we expect the relation between PWD and flow to be strongest for complex repetitive tasks: this type of task may benefit most from the enjoyment and immediate performance feedback, which the dimensions of PWD stimulate.

Hypothesis 4: The interaction between task complexity and monotony will moderate the relationship between both playful work design components, being (a) designing fun and (b) designing competition, and flow on a daily level. Specifically, the relationship will be strongest on days when one executes complex repetitive tasks.

Rumination about COVID-19 and PWD

Although it was not the primary goal of this study, we included rumination about COVID-19 in the model to take the unprecedented circumstances of the COVID-19 outbreak into account. Rumination is characterized by contemplating about a negative experience, such as the COVID-19 outbreak (Garnefski & Kraaij, 2006). As rumination temporarily increases negative affect and decreases positive affect (McLaughlin et al., 2007), we expect that this may play a role in our current model.

Flow is typically characterized by intense focused attention and the loss of self-awareness (e.g., Csikszentmihalyi, 1975b; Csikszentmihalyi, 1999). This may be hindered by rumination. When individuals are ruminating, they can become so preoccupied that they are unable to emerge themselves fully in activities and experience flow as a result (Carpentier et al., 2012). We expect that PWD can counteract the effects of rumination on flow, much like PWD may outweigh the effects of complex and monotonous tasks (see Figure 1). Rumination, not unlike complex tasks, may come with heightened levels of anxiety. Therefore, we argue that designing fun will be most prominent in overcoming the effects of rumination. Designing fun may be a healthy way to take one's mind off the current situation, creating more enjoyment and ultimately more flow. We do not expect designing competition to have impact on the relation between rumination and flow: one is not likely to surmount the mental demands of rumination through increased performance feedback and self-oriented challenges.

> *Hypothesis 5: The positive relationship between designing fun and flow will be moderated by rumination on a daily level. Specifically, the relationship will be strongest on days when one reports higher (vs. lower) daily rumination.*

The Mediating Role of Flow

The apparent connection between play and flow might be an important piece of the puzzle in explaining the effects of PWD. Play has long been perceived as being frivolous and counterproductive (Petelczyc et al., 2018). We argue that play, through flow, can in fact result in improved performance (e.g., Bakker & Woerkom, 2017; Fullagar & Kelloway, 2013). Full immersion in an activity and work enjoyment are important predictors of task performance (Bakker, 2008; Demerouti, 2006). Furthermore, it has been found that people do not mind initial failure as much when they are intrinsically motivated (Gagné & Deci, 2005), creating more long-term persistence (Deci & Ryan, 2008). Additionally, one might set increasingly higher goals to maintain in flow, ultimately resulting in improved performance over time (Engeser & Rheinberg, 2008). Past research has shown that flow is positively related to self-reported (Kopperud & Straume, 2009) and other-reported (Bakker, 2008; Demerouti, 2006) work performance. Therefore, we expect a similar effect in the context of PWD on a daily level (see Figure 1).

PWD may also influence work experiences through flow (Petelczyc, 2018). Specifically, we argue that flow creates a more meaningful experience of work (e.g., Csikszentmihalyi, 1999; Engeser, 2012; Hackman & Oldham, 1975; Fullagar et al., 2017; Silverman et al., 2016). People who perceived their work as being meaningful, think of their work as being purposeful and having a positive impact on oneself and others (Steger et al., 2012). We argue that having a clear goal, because of PWD, positively contributes to flow. To feel like one's work is meaningful, one must try to reach that goal. Additionally, one must focus on the attention it requires and enjoyment it brings (Csikszentmihalyi, 1990). It has been shown that self-determination and intrinsic motivation are crucial in experiencing meaningfulness of tasks (e.g., Ryan & Deci, 2000; Rosso et al., 2010). Experiencing work as a goal in itself, contributes to the belief that work serves personal development and makes the world a better place (Wrzesniewski, 2003). Consequently, we expect that being in a state of flow creates favorable circumstances for experiencing meaning in work in the context of PWD (see Figure 1).

Hypothesis 6: Flow positively mediates the positive relationships between playful work design and (a) in-role work performance, and (b) meaningfulness of tasks on a daily level.

Method

Participants and Procedure

Participants for this study were gathered through social media and personal connections of the authors. Individuals participated in this study on voluntary basis but were incentivized through the allocation of prizes. The anonymity of participants was emphasized, as well as one's right to terminate their participation at any time. During the first two weeks of April 2020, a total of 193 individuals were approached through email for five consecutive days. The link to the online questionnaire was distributed at 16:00 every day and was closed at 10:00 the following day. The response rate was 90% (N = 173). Most participants filled out the questionnaire for five consecutive days (N = 103). A total of six cases had to be excluded from further analysis, as they did not participate in the diary study for at least two days.

The final sample included 763 data points and 167 participants. Within this sample, we had 71 cases of missing data. The sample included 89 males (53.3%) and 78 females (46.7%). The ages ranged from 19 to 65, with an average of 34.24 years (*sd* = 13.21). The participants in this study worked in various occupational fields, including: business services (11.4%), health and welfare (11.4%), industry (10.8%), and governmental organizations (9.0%). The participants worked 38.34 hours per week (*sd* =7.35) and 7.84 hours per day (*sd* = 1.47) on average. During the data collection, 62.6% of the days were worked from home. On days that individuals had worked from home, a total of 4.4% of the participants had to take care of children simultaneously. The majority of the participants in this sample stated that the outbreak of the COVID-19 virus had at least some impact on their work (97.6%). Most individuals indicated that the virus had a lot of impact on their work (32.3%).

Materials and Measures

We have collected data together with three other researchers, collectively measuring fourteen variables. Seven of these variables were used for the purpose of the present study. The questionnaire was administered through an online survey platform. The time frame of the items was adapted to refer specifically to the past day, as is commonly done in diary studies (Ohly et al., 2010). Moreover, the scales were translated from English to Dutch. Participants were asked to report to what extent they agreed with a statement regarding their past workday. This was assessed on a seven-point Likert scale (1 = *totally disagree*, 7 = *totally agree*).

PWD was operationalized through the twelve-item Playful Work Design Scale (Scharp et al., 2019). The Playful Work Design Scale consisted of two dimensions: designing fun (e.g., “Today, I used my imagination to make my job more interesting”) and designing competition (e.g., “Today, I tried to make my job a series of exciting challenges”).

Flow Experience was measured using the thirteen-item Work Related Flow Inventory (WOLF; Bakker, 2008), consisting of three dimensions: absorption, work enjoyment, and intrinsic work motivation. Example items are “Today, I got carried away by my job” (absorption), “Today, I felt happy during my work” (work enjoyment), and “Today, I worked because I enjoyed it” (intrinsic work motivation).

Subjective Task Complexity was assessed using the four-item scale as developed by Maynard and Hakel (1997). The scale was composed of one single dimension. An example is: “Today, my tasks were mentally demanding”.

Subjective Task Monotony was operationalized through the four-item Subjective Work Monotony Scale (Melamed et al., 1995), which all loaded to one single dimension. An example of this scale is: “Today, my work had a lot of routine”.

Performance was measured through an adapted version of the 25-item work performance scale by Goodman and Svyantek (1999). Specifically, we have selected four items from the nine-item in-role performance subscale. These items were selected based on their factor loading and face validity. An example item is “I have achieved the objectives of my job today”.

Meaningfulness was measured through the Work and Meaning Inventory (WAMI; Steger et al., 2012), originally containing ten items. The WAMI consists of three dimensions: positive meaning, meaning through work, and greater good motivations. We have selected six items with the highest factor loading and face validity to decrease response burden. Examples are: “Today, I understood how my work contributed to my life’s meaning” (positive meaning), “Today, my work helped me makes sense of the world around me” (meaning through work), and “I know my work made a positive difference in the world today” (greater good motivations).

Rumination was assessed using the rumination dimension of the shortened Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2006). We have adapted the items to specifically address the COVID-19 virus. The rumination scale of the CERQ consisted of four items. An example of this measure is: "Today, I have been preoccupied with what I think and feel about the COVID-19 virus".

Strategy of Analysis

We have used multilevel structural equation modeling (SEM) to account for the violation of independence of residuals. The repeated measures were nested within individuals, creating a two-level model with the repeated measures at the day-level (within-person) and individuals at the person-level (between-person). All variables in this study were measured on a day-level and were therefore entered in Level 1. Level 2 consisted of covariances of the endogenous variables; a suggested technique to accommodate for not using any between-subject measures in a multilevel model (Rosseel, 2020). It has been argued that a multilevel analysis is robust in a sample of at least 30 participants (Maas & Hox, 2004). As we used a participant pool of $N = 167$, we had satisfactory power to use this type of analysis.

We have analyzed our data with the Lavaan package (Rosseel et al., 2020). We have centered the independent variables to the person-mean, as is generally advised when assessing Level 1 variables (Enders & Tofighi, 2007). This has set the mean of the independent variables to zero, showing the daily fluctuations of a person around their own average score. This eliminates between-person variance, only leaving the within-person effects. Second, we used the centered variables to create the interaction terms. These interaction terms were modeled in the regression equation, together with the centered independent variables, in a hierarchical structure. We used the person ID as a cluster for the data in this multilevel structure. All hypotheses were tested in a single model to limit familywise error (Shaffer, 1995).

Results

Preliminary Analysis

Means, standard deviations, correlations, and internal consistencies (Cronbach's alpha) are shown in Table 1. We found that all scales had good/excellent internal consistency over the days. To justify multilevel analysis, we calculated the deviance difference and intra-class coefficients (ICCs). We found that a two-level intercept model showed a better fit to the data than a one-level intercept model for flow (*ICC* = .62; Δ–2×log = 283.75, p < .001), as well as for performance (*ICC* = .42; Δ–2×log = 365.94, p < .001) and meaningfulness (*ICC* = .67; Δ–2×log = 133.42, p < .001). The ICC of flow and meaningfulness showed moderate reliability. Performance, on the other hand, showed a poor reliability (Koo & Li, 2016). However, it is still possible for poor ICC values to invalidate hypothesis tests when multilevel analysis is not used. For example, there may be higher bias probability due to the inclusion of between-person variance (Dyer et al., 2005). Therefore, multilevel analysis may be beneficial for the data analysis, even when the ICC is poor (Hayes, 2006). Additionally, we looked at the ICCs of the independent variables and found that monotony (*ICC* = .50) and complexity (*ICC* = .49) showed poor reliability. Rumination (*ICC* = .62), designing fun (*ICC* = .63), and designing competition (*ICC* = .59) showed moderate reliability (Koo & Li, 2016).

First, we explored the fit of the full multilevel model through the chi-square (χ^2), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI), and Tucker-Lewis Index (TLI), as is common practice when carrying out a SEM analysis (e.g., Gefen et al., 2011). A small χ^2 generally indicates a better fit. Furthermore, CFI and TLI should be ≥ .90 to prove good fit. RMSEA and SRMR should be ≤ .08. We found that the current model is associated with a significant χ^2, signaling that the model does not fit perfectly (Barrett, 2007; χ^2 (48) = 1105.636; p < .001). However, the χ^2 is sensitive to sample size and is more likely to be significant when large amounts of data points were used in the analysis (Jöreskog & Sörbom, 1993). We found perfect fit on the other fit indices (RMSEA = .000, SRMR = .000, CFI = 1.000, TLI = 1.000). It is important to note that these fit indices may have been inflated due to the fact that many relations between variables were modeled.

To test the hypotheses, we have entered the data in a hierarchical structure for all endogenous variables. Initially, we entered the main effects (model 1). Then, we added the two-way interaction effects to the regression equation (model 2). Finally, we entered the three-way interaction (model 3). We found that including the interactions led to an increase in explained variance for flow, performance, and meaningfulness (see Tables 2, 3, and 4).

Main Analysis

In line with hypothesis 1, model 1 revealed that designing competition (b = .332, SE = .034, p < .001) and designing fun (b = .188, SE = .033, p < .001) both made a positive contribution to flow. We found that these effects remained significant after the two-way and three-way interactions were added to the model (see Table 2). These findings indicate that hypotheses 1a and 1b are supported. In hypothesis 2 we proposed that the relationship between both PWD dimensions and flow would be moderated by daily task complexity. Model 2 shows that the interaction between designing fun and complexity (b = -.020, SE = .046 , p = .663) and designing competition and complexity (b = .000, SE = .047, p = .998) do not explained unique variance in flow. These interactions between the dimensions of PWD and task complexity remained non-significant after the three-way interaction was added to the model (see Table 2). Therefore, we concluded that there is no ground to reject the null hypothesis.

Furthermore, we argued that daily task monotony would moderate the relationship between PWD and flow. We found that the interaction between designing competition and monotony (b = .010, SE = .047, p = .824) was non-significant. Additionally, the interaction between designing fun and task monotony (b = -.017, SE = .039, p = .659) did not help to explain additional variance in flow. These interactions remained non-significant once the three-way interactions were added to the model (see Table 2). In sum, we found that hypotheses 3a and 3b were not supported either.

We also predicted that the task characteristics would show a combined effect on flow. Model 3 revealed that there was a significant three-way interaction between designing competition, complexity, and monotony (*b* = -.087, *SE* = .034, p = .010) but not between designing fun, complexity, and monotony (*b* = .009, *SE* = .027, p = .730). To explore the direction of the significant three-way interaction, we plotted the effect using a premade Excel template (Dawson, 2020). Figure 3 revealed that the highest increase in flow, due to designing competition, occurred for simple repetitive and complex varied tasks. The highest levels of flow were detected for complex varied tasks when designing competition. The effect was against the line of expectations, as we predicted the strongest effect to be present for complex repetitive tasks. Therefore, we can conclude that hypotheses 4a and 4b were not supported.

Hypothesis 5 stated that the relationship between PWD and flow would be moderated by rumination. We found that designing fun indeed showed a significant interaction effect with rumination on flow (*b* = .085, *SE* = .041, p = .036). In line with expectations, designing competition did not show a significant effect with rumination on flow (*b* = -.054 *SE* = .042, p = .998). Figure 4 shows that designing fun is associated with an increase in flow, for those who reported to ruminate about the COVID-19 virus. The interaction plot revealed that designing fun does not only help one to overcome the effects of rumination but even increased the levels of flow beyond the level of those who did not report to ruminate about the COVID-19 virus. We can therefore conclude that hypothesis 5 is supported.

In hypothesis 6, we proposed that flow would mediate the relationship between PWD and performance. Additionally, we hypothesized that flow would mediate the relationship between PWD and meaningfulness. To establish mediation, we had to show that there is a significant relationship from the independent variable to the mediator (see hypothesis 1), from the mediator to the outcome variable, and from the independent variable to the outcome variable (Baron & Kenny, 1996). The regression weight of the independent variable should at least decrease when the mediator is added. The mediation is perfect if the independent variable no longer has an effect on the outcome variable when the mediator is added.

Flow contributed significantly to performance (*b* = .546, *SE* = .055, p < .001). When flow was not added to the model, designing competition (*b* = .262, *SE* = .049, p < .001) and designing fun (*b* = .112, *SE* = .047, p = .017) showed a significant relation to performance. When flow was added to the regression equation, designing competition explained less unique variance in performance (*b* = .100, *SE* = .048, p = .038) but remained significant. Designing fun, however, no longer significantly contributed to performance (*b* = .043, *SE* = .043, p = .317). When exploring the size of the indirect effects, we found that designing competition (*b* = .162, *SE* = .026, p < .001) and designing fun (*b* = .068, *SE* = .020, p = .001) indeed showed a significant indirect effect through flow in their relationship with performance. Therefore, hypothesis 6a was supported.

We found that flow is positively related to meaningfulness (*b* = .319, *SE* = .049, p < .001). Further, we found that designing competition was significantly related to meaningfulness, when flow was not added to the model (*b* = .180, *SE* = .042, p < .001). In contrast, designing fun was not significantly related to meaningfulness when flow was not added to the model (*b* = .035, *SE* = .040, p = .382). Therefore, we can conclude that hypothesis 6b was not supported for designing fun. After further assessment of the indirect effect for designing competition, we found that the unique contribution to meaningfulness decreased when flow was added to the model (*b* = .086, *SE* = .043, p = .046). The analysis of indirect effects showed that designing competition showed a significant indirect effect through flow in its relationship with meaningfulness (*b* = .095, *SE* = .019, p < .001). Therefore, hypothesis 6b was partially supported: only designing competition was mediated by flow in its relationship to meaningfulness.

Discussion Study 1

One of the main goals of study 1 was to find whether PWD affects performance and meaningfulness through flow. First, we found support for the idea that PWD is positively related to flow. Designing fun and designing competition both showed an individual relation to flow, suggesting that this optimal state of concentration can be reached through different types of playful design. Second, we found that flow acts as a mediating mechanism to improve performance. Third, we found that the relationship between PWD and meaningfulness was mediated by flow for designing competition but not for designing fun. This shows that, although the dimensions of PWD are related to each other, designing competition and designing fun indeed show distinct effects. Our findings show that designing fun does not contribute to experienced meaningfulness of work tasks, indicating that adding more humor or imagination to work does not increase one's sense of purpose during work.

Another goal of study 1 was to explore the boundary conditions of the relationship between PWD and flow. We found that designing fun increases flow during work tasks for those who tended to ruminate about COVID-19. The other hypothesized two-way interaction effects were not supported: we found no evidence for a combined effect of PWD and task complexity, nor did we find support for a combined effect of PWD and task monotony. Does that mean that task characteristics do not influence PWD at all? We argue that it may be possible that the task characteristics do influence our model, but their impact is not located at the previously anticipated pathways. For example, the task characteristics were directly related to PWD: complex tasks made PWD behavior more likely to occur. For monotonous tasks, designing fun was less likely to be used, whilst this task characteristic did not predict designing competition. Additionally, we found that there was a significant moderation of designing competition and complexity when considering performance. For this relationship, designing competition was especially beneficial in terms of performance for highly complex tasks.

Another reason for not detecting the two-way interactions could be due to a non-sufficient level of within-person variance in our sample (Koo & Li, 2016). On the other hand, the effect may only be present when one looks at the combined effect of complexity and monotony. We found a significant three-way interaction between designing competition, complexity, and monotony on flow. Against our expectations, we found that complex varied tasks and simple repetitive tasks benefitted most from designing competition in terms of flow. It seemed that designing competition impactfully improved flow when only one of the two task characteristics was present. We can only speculate as to why this effect occurs. Possibly, the combination of these two demanding types of tasks cannot be overcome simply by integrating playful design into work.

Study 1 did not come without limitations. First, there may have been an unintentional selection bias. Diary studies require participants to fill out a questionnaire for numerous days, which is a demanding activity. As a result, we may have unwittingly included participants with certain characteristics (Alaszewski, 2006). Another possible limitation is the shift of response over the days. This may have been caused by a changed perception towards the meaning of the rating, and therefore possibly does not reflect a change in intensity of behavior (Mehl & Conner, 2014). Third, we have only used self-report measures and did not include day-level control variables. This may have introduced common method bias in our data. However, we may have reduced the impact of common method bias by applying person-mean centering to all Level 1 variables (Podsakoff et al., 2003). Fourth, we have included participants in our study who did not fill out the questionnaire for five consecutive days. By allowing for this, we may have accidentally included participants who had opportunity to recover in between workdays. Fifth, we have used a heterogenous sample, which may have deflated the results. Finally, although we have established a theoretical foundation to infer causality, we were unable to establish statistical causality.

More research is needed to conclude that our model can be cross-validated in other domains. Therefore, we will explore whether the proposed model can also be applied to the context of sports in study 2. Using play elements during tasks may be beneficial during undertakings which require long-term persistence and commitment in general. The task characteristics we have specified may also be applied to other types of activities. For example, one may experience task complexity whilst playing chess or task monotony whilst rowing a boat. Moreover, reaching a state of flow is largely due to finding a balance between internal and external states, which can reasonably be the case across various types of activities (Swan, 2016). Therefore, we propose that one can transform one's experience in a variety of situations through playful design, and experience flow as a result. Ultimately, it may be possible for flow to elicit higher levels of performance and meaningfulness across varying circumstances.

Study 2: Playful Sports Design

Play in Sports

In sports, it has been theorized that one can transform a training experience into a more interesting, challenging, and fun activity (e.g., Chen & Pu, 2014; González-González et al., 2018). Congruent with this line of reasoning, we argue that one can redesign sports trainings to be more playful, even though play elements may already be naturally present in some sports (Suits, 1988). Through transforming a training into a more playful experience, one may create a "game within a game". Similar to the organizational context, the training experience can be transformed through both top-down and bottom-up approaches.

Over the past decade, gamification has already made its way to sports, signifying that some athletes indeed seek tools to transform their training experiences. Sports gamification often manifests itself through the use of applications, which provide players with reward points, ranks on leaderboards, or virtual badges (Johnson et al., 2016). However, these types of applications are not available for all variations of sports. Additionally, most gamified interventions intended for sports fail to provide sustained involvement of users (González-González et al., 2018). Therefore, much like in the context of work, top-down gamification does not seem to result in the anticipated positive behavioral change in the context of sports.

We argue that the concept of bottom-up playful task redesign can also be implemented in contexts beyond the workplace, like sports. Playful sports design (PSD) may be part of the explanation why some athletes successfully achieve a state of flow during trainings (H1) and consequently increase their performance (H6a) and sense of meaningfulness (H6b). Flow is highly desirable for athletes, as the margin between success and failure is extremely narrow in sports (Swann, 2016). It is especially interesting that most athletes perceive flow as being controllable (Swann et al., 2012), creating a possibility to restore flow after a disruption (Chavez, 2008). We argue that one can proactively stimulate flow during trainings through PSD behavior.

It has been shown that flow, in the context of sports, is associated with elevated levels of objective and subjective performance (e.g., Jackson & Roberts, 1992; Jackson et al., 2001; Stavrou et al., 2007). Reasonably, being in a state of flow may be important for performance during individual trainings, as flow can cancel out distractions, providing pure focus to successfully complete the task (Swann, 2016; Csikszentmihalyi, 1997). We expect the relation between flow and perceived meaningfulness to be present in the context of sports too. One is especially likely to report an activity contributing to their personal growth or their understanding of the world, subsequent to being in a state of flow (Csikszentmihalyi, 1999). Although meaning is often studied in the context of work (e.g., Wrzesniewski et al., 2013), we argue that it is also possible to stimulate the perceived meaning of sports through PSD and flow.

Furthermore, we expect that the task characteristics, being complexity (H2) and monotony (H3), play a moderating role in how PSD affects flow. These effects may be more prominent when exploring between-person effects rather than within-person effects, as investigated in study 1. We expect that PSD will be most beneficial in terms of flow during the execution of highly complex (e.g., sports with a lot of rules) and monotonous sports (e.g., sports with a lot of repetitive actions). Designing competition may be especially useful during sports with monotonous characteristics, as one can increase the challenge to meet one's skills. Designing fun, on the other hand, may be most advantageous during complex sports, as one can achieve a focused state of mind through diminishing the adverse effects of this demanding activity. As we have found task complexity and monotony to show a combined effect in study 1, we expect to find a similar effect in the context of sports (H4). Finally, we expect that designing fun will stimulate flow during trainings for those who report to ruminate a lot about COVID-19 (H5).

Playful Exercise Design Scale Development

One of the goals of study 2 is to test the psychometric properties of the PSD instrument. We expect that this newly developed measure will show the best fit to a two-factor model, like PWD does (Scharp et al., *in press*), representing designing fun and designing competition. For example, one may design fun during sports by providing oneself with a narrative (e.g., pretending to participate in the Tour de France), or design competition by making up additional rules (e.g., the ball cannot touch the ground).

> *Hypothesis 7: PSD consists of two-factors, being designing fun and designing competition.*

To test the convergent validity of the scale, we used four constructs which have already been shown to be related to PWD (Scharp et al., *in press*). We expect that those who display higher levels of PSD behavior will be more playful, proactive, competitive, and more prone to fantasizing. Playfulness is a predisposition to provide oneself, or others, with enjoyment and entertainment (Barnett, 2007). We argue that it would be reasonable to expect that those who are more playful by default, are more likely to exhibit PSD behavior. The personal initiative trait is exemplified by self-starting undertakings and going beyond what is formally required (Frese et al., 1996). Those who report high levels of PSD will likely show more personal initiative, as PSD is a bottom-up driven behavior (Scharp et al., *in press*). Competitiveness is defined as "the enjoyment of interpersonal competition and the desire to win and be better than others (Spence & Helmreich, 1983, p. 41). Although designing competition is focused on self-oriented challenges, we expect designing competition to be strongly correlated to the competitiveness trait. On the other hand, we expect fantasy proneness to be more strongly related to designing fun than to designing competition.

Hypothesis 8: PSD is positively related to (a) playfulness, (b) competitiveness, (c) personal initiative and (d) fantasy proneness.

To test the divergent validity of the PSD measure, we will explore the relation between PSD and negative affect, as well as the relation between PSD and rigidity. We predict that those who report high frequencies of negative affect and rigidity to typically show less PSD behavior. Individuals who score higher of negative affect experience gloomy emotions (e.g., shame or fear) more often than those who report lower levels of negative affect (Thompson, 2007). We expect that negative affect is less prominent in individuals who display PSD behavior, which is more commonly positively associated with optimistically oriented traits (e.g., Scharp et al., *in press*). Finally, we assert that those who score high on rigidity, which is a tendency to avoid new things (Lynam et al., 2012), are less likely to use PSD during sport activities. PWD has been found to result from a more curious tendency and openness to experience (Scharp et al., *in press*).

Therefore, it seems plausible that PSD is a less common strategy for those who are prone to consistently execute actions in the same way.

Hypothesis 9: PSD is negatively related with (a) negative affect, and (b) rigidity.

Method

Participants and Procedure

To recruit participants for this study, we have contacted sixty-two regional and national sports associations. Twenty-six associations (41.9%) agreed to spread the survey amongst their members. Additionally, we gathered participants through social media. Individuals participated in this study on voluntary basis. The confidentiality of the data collection was emphasized, as well as one's right to terminate their participation at any time. In May 2020, a total of 688 individuals participated in this study by filling out an online questionnaire. However, 342 participants were excluded from further analysis, as they did not complete all items of the questionnaire. Moreover, eight participants were left out of the dataset because they did not exercise for at least one day per week. We excluded ten participants who were below the age of 18. Finally, we removed one case from the sample as no consent was given to use the data for the purpose of this study. Therefore, the final sample included 327 participants.

The majority of participants in the sample were males (56.3%). The ages ranged from 18 to 78, with an average of 42.67 years (*sd* = 16.07). Most participants' highest obtained degree was a vocational degree (36.1%), followed by a university degree (29.4%), and a high school degree (14.4%). In the final sample of participants, 82.0% practiced their sports together with others or played a team sport. Moreover, 47.1 % of the individuals in this sample trained under supervision of a trainer and 24.8% played in professional leagues. The average years of experience practicing the sports was 17.50 (*sd* = 15.15), ranging from 1 to 65 years. Additionally, the participants trained for an average of 3.08 days per week (*sd* = 1.60). Most participants in this sample trained at a sports association (64.2%). In this sample, 69.4% of the participants engaged in an endurance sport, whilst 30.6% of the participants practiced strength sports. The participants in this sample practiced various different sports, for example: watersports (21.7%), athletic sports (11.9%), agility sports (10.1%), ball sports (9.2%), leisure sports (7.6%), cycling sports (7.0%), mind sports (4.9%), and martial arts (3.7%).

Materials and Measures

The questionnaire was administered through an online survey platform. The scales were translated from English to Dutch for the purpose of this study. Participants were asked to report the extent to which they agreed with a statement on a seven-point Likert Scale (1 = *totally disagree*, 7 = *totally agree*). We asked participants to fill out the questionnaire whilst keeping their behavior and experiences before the COVID-19 outbreak in mind.

Convergent Variables

Competitiveness was measured using the competitive subscale of the Work and Family Orientation Questionnaire (Helmreich & Spence, 1978). The scale is composed of three reversed coded items (e.g., “I am not highly motivated to succeed”) and three regular items (e.g., “I accept challenging tasks”).

Fantasy Proneness was assessed through the six-items from the Capacity for Fantasy and Imagination Scale (Costa & McCrae, 1992). An example item from this scale includes: “I feel like my imagination can run wild”.

Personal Initiative was operationalized through a seven-item measure developed by Frese and colleagues (1997). An example item is: “I actively attack problems”.

Playfulness was measured using the Short Measure for Adult Playfulness (SMAP; Proyer, 2012a; Proyer, 2012b). The scale consisted of five items, for example: “It does not take much for me to change from a serious to a playful frame of mind”.

Divergent Variables

Rigidity was assessed through the Five-Factor Measure of Avoidant Personality (FFAvA; Lynam et al., 2012). Specifically, we used the seven-item rigidity dimension of this scale. Three items were reversed coded (e.g., “I’ll try anything once”) and four items were stated in the regular direction (e.g., “I am very predictable”).

Negative Affect was operationalized through the brief Positive and Negative Affect Schedule (PANAS; Thompson, 2007). For the purpose of this study, we merely used the negative affect dimension of the scale. The five negative affect questions included, for example: “How often do you feel upset?”. Participants were asked to indicate how often they experienced negative affect on a seven-point Likert scale (1 = *never*, 7 = *always*).

Model Variables

For task complexity and subjective task monotony we have used the same scales as we did in study 1. However, these scales were adapted to fit the sports context. For example, we used the items: “My sport is mentally demanding” (complexity; Maynard & Hakel, 1997) and “My sport has a lot of routine” (monotony; Melamed et al., 1995). To assess rumination, we used the scale by Garnefski and Kraaij (2006). The content of these items was not changed.

PSD was measured with an adapted version of the twelve-item Playful Work Design Scale (Scharp et al., 2019). Six items were focused on designing fun (e.g., “I approach my trainings in a playful way”) and the other six items related to designing competition (e.g., “I compete with myself during the trainings, not because I have to, but because I enjoy it”). Participants were asked to indicate how often they engaged in PSD on a seven-point Likert scale (1 = *never*, 7 = *always*).

Flow Experience was operationalized through the nine-item flow scale by Martin and Jackson (2008). An example of this measure is: “I do things spontaneously and automatically whilst I am exercising, without having to think”.

Performance was measured through the Relative Mastery Measurement Scale (George et al., 2004). This scale includes four reversed coded items (e.g., “My family members would not be happy with my performance when I am exercising”) and four regular items (e.g., “Overall, I am satisfied with myself regarding my performance when engaging in my sport”).

Meaningfulness was measured with the WAMI (Steger et al., 2012). However, to fit the context of sports, we have removed one of the items. This item was part of the greater good motivation dimension. Therefore, we measured meaningfulness with an adapted five-item version of the WAMI. An example item is: “I see exercise as something that contributes to my personal growth”.

Strategy of Analysis

To assess the validity of the newly developed PSD scale, we used exploratory factor analysis in IBM SPSS Statistics 25. To obtain simple structure, we used maximum likelihood estimation. Furthermore, we used oblique rotation (promax), as we found in study 1 that the two dimensions of PWD are correlated (see Table 1; $r = .503$, $p < .001$). Moreover, we carried out a confirmatory factor analysis in IBM SPSS Amos 26 (Arbuckle, 2011). To explore the convergent and divergent relations with respect to PSD, we used a bivariate correlation analysis in SPSS. Finally, we investigated the hypothesized model through a SEM, using the Lavaan package in R (Rosseel et al., 2020). We have grand mean centered the independent variables to create interaction terms. These were added into one regression model in a hierarchical structure, together with the uncentered independent variables.

Results Phase 1: Scale Validation

Exploratory Factor Analysis

Whilst looking into the number of factors of the new PSD measure, we only considered factors with an eigenvalue above 1 and suppressed items with a factor loading below .35 (Osborne, 2014). In addition, factors were only considered when at least three items loaded to them. This is considered to be justifiable and advisable when performing an exploratory factor analysis (e.g., Kaiser, 1970; Osborne, 2014). The first factor solution provided us with three factors for the twelve PSD items. The designing fun items all loaded to one single factor, explaining 45.5% of the variance (Eigenvalue = 5.46). We found that two of the items of designing competition loaded on a third factor (item 11 and 12), whilst the other four items loaded to a second factor. As we excluded factors with less than three items loading to it, this factor was excluded from further analysis. We found that, after removing the third factor, item 11 and item 12 loaded to the second factor too. The second factor explained 14.9% of the variance (Eigenvalue = 1.79). Our analysis indicated that the PSD scale has a two-factor structure and no cross-loadings (Table 6). The reliability of the designing fun (α = .889) and designing competition (α = .802) scales were good.

Confirmatory Factor Analysis

To find further evidence for hypothesis 7, we investigated the fit measures in AMOS. Although many fit measures were available, we used the χ^2, goodness-of-fit index (GFI), RMSEA, CFI, IFI, and NNFI, as recommended by Gallagher and colleagues (2008). A small χ^2 generally indicates a better fit. Furthermore, we applied the general rule of thumb for GFI, CFI, IFI, and NNFI, for which $\geq$ .90 indicate good fit. RMSEA should be $\leq$ .08. In Table 7, the outcome of the confirmatory factor analysis can be found. In the initial analysis, both model 1 and model 2 showed fit issues.

To examine the reason for the poor fit of the model, we carried out a post hoc analysis by adding covariate pathways between error terms of variables. This is suggested to be acceptable if items show congruence in their formulation (Jöreskog & Sörbom, 1993). Only when we covaried three pairs of error terms, we found a satisfying fit for the model. We covaried the errors of two pairs of items for designing fun, being item 5 and 9 (*MI* = 43.34) and item 6 and 10 (*MI* = 47.81). The first pair of items both concerned integrating fantasy into a training, whilst the second pair of items were both focused on making a training more fun. Additionally, we covaried the errors of a pair of items for designing competition, being item 11 and 12 (*MI* = 94.98), which were both oriented towards keeping track of one's performance. This resulted in a model with satisfying fit (χ^2 (28) = 191.881; p < .001, GFI = .909, RMSEA = .093, CFI = .932, IFI = .932, NNFI = .911).

Following the initial confirmatory factor analysis (Table 7), we found that a two-factor structure fitted the data best ($\Delta\chi2$ (1) = 301.56, p < .001). We found that all items loaded to the expected factor and showed corresponding factor loadings to the exploratory factor analysis. Therefore, we concluded that hypothesis 7 was supported. The factor loadings for designing fun ranged between .67 and .85. For designing competition, the factor loadings varied from .31 to .82.

Convergent and Divergent Validity

We expected PSD to be positively related to playfulness, fantasy proneness, personal initiative, and competitiveness. We found that designing fun was significantly related to competitiveness (r = .210, p < 001), fantasy proneness (r = .307, p < .001), personal initiative (r = .220, p < .001), and playfulness (r = .397, p < .001). Additionally, we found that designing competition was significantly related to competitiveness (r = .389, p < 001), fantasy proneness (r = .221, p < .001), personal initiative (r = .298, p < .001), and playfulness (r = .298, p < .001). Therefore, we can conclude that hypothesis 8 was supported.

To test the divergent validity, we hypothesized that PSD would show negative relations with rigidity and negative affect. These hypotheses were partially supported, as we found that designing fun was significantly related to rigidity (r = -.243, p < .001) but not to negative affect (r = - .008, p = .879). For designing competition, we found non-significant relations for both rigidity (r = -.065, p = .243) and negative affect (r = .055, p = .323). Therefore, hypothesis 8a was not supported and hypothesis 8b was partially supported. Although we did not find that there is a negative relation present in our data, these findings still indicate that there is evidence for divergent validity between PSD, rigidity, and negative affect.

In addition to testing the hypotheses, we performed an exploratory analysis of the differences between correlations for designing fun and designing competition. This was done through converting the correlation coefficient to a z-score and then using Steiger's (1980) equation to perform an asymptotic z-test (Lee & Preacher, 2013). In line with expectations, we found that competitiveness showed a significantly stronger relation to designing competition than to designing fun ($z = -2.464$, $p = .014$). However, we found that fantasy proneness did not show a significantly stronger relation with designing fun than with designing competition ($z = 1.56$, $p = .247$). As expected, playfulness ($z = 1.40$, $p = .163$) and personal initiative ($z = -1.05$, $p = .294$) showed similar correlations to both dimensions of PSD. Finally, we found that negative affect did not show a tendency towards either of the two dimensions ($z = .60$, $p = .549$). However, rigidity was significantly stronger negatively related to designing fun ($z = -2.32$, $p = .020$).

Results Phase 2: Testing the Model

Preliminary Analysis

Means, standard deviations, correlations, and internal consistencies (Cronbach's alpha) are shown in Table 5. The alpha-levels indicated that the internal consistencies of the scales ranged from moderate to excellent. Additionally, we looked into the correlations between the demographic and dependent variables to find possible control variables. Educational level was significantly related to flow ($r = .127$, $p = .022$) and performance ($r = .194$, $p < .001$). Having a trainer was significantly related to flow ($r = -.160$, $p = .004$), performance ($r = -.128$, $p = .020$), and meaningfulness ($r = -.133$, $p = .016$). The type of sport was significantly related to meaningfulness ($r = .172$, $p = .002$). Days spent on training each week significantly related to flow ($r = .233$, $p < .001$), performance ($r = .199$, $p < .001$), and meaningfulness ($r = .344$, $p <$

.001). The other demographic variables were uncorrelated to the dependent variables. Therefore, we controlled for educational level, having a trainer, type of sport, and days of exercise per week.

First, we investigated the fit of the model through the χ^2, RMSEA, SRMR, CFI, and TLI (Gefen et al., 2011). We found that the model showed acceptable fit (χ^2 (65) = 139.193; p < .001, RMSEA = .059, SRMR = .047, CFI = .833, TLI = .695). However, the χ^2 indicated poor fit. This is most likely due to the large sample size (Jöreskog & Sörbom, 1993). To analyze the data, we followed the same structure as for study 1: first we added the main effects (model 1), then we added the two-way interactions (model 2), and finally we added the three-way interactions to the regression equation (model 3). The final model explained most variance for flow, performance, and meaningfulness (see Table 8, 9, and 10).

Main Analysis

In hypothesis 1, we expected designing fun and designing competition to be positively related to flow. Model 1 (see Table 8) shows that designing fun (*b* = .059, *SE* = .029, p = .045) had a weak positive relation with flow, whilst designing competition showed a stronger positive relation with flow (*b* = .194, *SE* = .031, p < .001). We therefore concluded that hypothesis 1a and hypothesis 1b were supported. For hypothesis 2, we expected to find an interaction effect between complexity and PSD. Model 2 (see Table 8) revealed that the interaction between complexity and designing fun (*b* = -.024, *SE* = .021, p = .256) was non-significant. Additionally, the interaction between complexity and designing competition did not contribute significantly to flow (*b* = 007, *SE* = .023, p = .320). Therefore, there was no reason to reject the null hypothesis. Moreover, we also did not find evidence for the interaction between PSD and monotony. Both designing fun (*b* = .031, *SE* = .020, p = .124) and designing competition (*b* = -.002, *SE* = .025, p = .949) did not show a significant combined effect with monotony on flow. Therefore, hypothesis 3a and 3b were not supported either.

Hypothesis 4 proposed that there would be a three-way interaction between PSD, complexity, and monotony on flow. Model 3 showed that there was a significant interaction between designing fun, complexity, and monotony (*b* = -.039, *SE* = .015, p = .009) but a non-significant interaction between designing competition, complexity and monotony (*b* = -.019, *SE* = .015, p = .225). To further explore the direction of the effect, we plotted the data. Against our initial expectations, this plot (see Figure 6) showed that designing fun decreased flow across all hybrids of the task characteristics. The strongest decline in flow was present for complex repetitive tasks. Therefore, hypothesis 4a and 4b were not supported. In addition, we expected to find an interaction between designing fun and rumination. We found support for this interaction (*b* = .044, *SE* = .016, p = .005) and found that the effect manifested itself in the expected direction (see Figure 7). As the strongest increase in flow, due to designing fun, was present for those who reported to ruminate a lot about the COVID-19 virus, we concluded that hypothesis 5 was supported.

We expected that flow would mediate the relationship between PSD and performance. Additionally, we expected flow to mediate the relationship between PSD and meaningfulness. Again, we followed the guidelines of Baron and Kenny (1896) to establish a mediation effect. Flow made a significant and positive contribution to performance (*b* = .706, *SE* = .077, p < .001). When flow was not added to the model, we found that designing competition (see Table 9; *b* = .103, *SE* = .052, p = .047) significantly predicted performance. However, designing fun showed a non-significant effect (*b* = .028, *SE* = .046, p = .540). Therefore, we concluded that hypothesis 6a was not supported for designing fun. When flow was added to the model, we observed a decrease in the main effect of designing competition on performance (*b* = -.011, *SE* = .049, p = .826). When looking at the indirect effect, we found that designing competition (*b* = .112, *SE* = .026, p < .001) indeed showed a significant indirect effect through flow in its relationship with performance. Therefore, hypothesis 6a was only partially supported.

Then, we looked into the mediating role of flow for PSD and meaningfulness. Model 1 (see Table 10) revealed that flow had a significant relation to meaningfulness (*b* = .456, *SE* = .083, p < .001). Designing competition (*b* = .230, *SE* = .051, p < .001) and designing fun (*b* = .110, *SE* = .045, p = .016) both showed a significant positive relation to meaningfulness before flow was added to the regression. These effects decreased for designing fun (*b* = .082, *SE* = .044, p = .065) and designing competition (*b* = .153, *SE* = .051, p = .003) once flow was added to the regression. The analysis of the indirect effect showed that the relationship between designing competition (*b* = .073, *SE* = .020, p < .001) and designing fun (*b* = .032, *SE* = .015, p = .031) and meaningfulness was indeed indirect and acted through flow. Therefore, we concluded that hypothesis 6b was supported.

Discussion Study 2

One of the main goals in study 2 was to test the psychometric properties of the new PSD scale. We found that the PSD scale showed the best fit to a two-factor solution and had a good reliability. This implies that the PSD and PWD scale do not only share the same theoretical properties but also share psychometric properties. However, we detected a couple of issues with regard to the current PSD scale. For example, the last two items of the designing competition scale loaded to a third, unknown factor. Moreover, the loading of these two items to the designing competition factor was relatively low. Therefore, it may be worthwhile to reconsider the content of these items. For example, the last item of designing competition ("I try to set time records in my trainings") may not apply to all types of sports. For some sports (e.g., running) it may be very natural to take time into account, whilst for other sports time may not play as big of a role (e.g., billiards). The variety of ways to keep score for different types of sports should be accounted for to ensure the generalizability of the scale.

We found that both dimensions of PSD were positively related to competitiveness, playfulness, personal initiative, and fantasy proneness. As expected, competitiveness was especially strongly related to designing competition. The other convergent measures showed equally strong relations to both dimensions of PSD. Second, we found that the dimensions of PSD were mostly unrelated to rigidity and negative affect. Only designing fun showed a significant negative relation with rigidity. That suggests that those who report high levels of rigidity are less likely to proactively design fun whilst exercising. Moreover, those who report high levels of negative affect are not more or less inclined to use PSD behavior during their trainings.

The second goal of study 2 was to replicate the results of study 1 in the context of sports. We found that both PSD dimensions were positively related to flow, which in turn resulted in increased performance and higher levels of experienced meaningfulness. However, we found that designing fun was not mediated in its relationship to performance. When placing this finding in juxtaposition with our findings regarding the organizational context, it seems that the dimensions of PSD do not only show distinct effects relative to each other but also act through varying mechanism. depending on the context.

Furthermore, we again found no support for the idea that the relationship between PSD and flow was moderated by task characteristics. It is possible that the task characteristics influence our model on unanticipated pathways. For example, we once again found that task complexity was positively related to designing competition and designing fun. Task monotony, on the other hand, negatively predicted designing fun and did not predict designing competition. Additionally, we found a significant interaction between designing fun and monotony on meaningfulness: designing fun showed the strongest relationship to meaningfulness during the execution of monotonous training tasks. Therefore, it would be interesting to see whether these task characteristics moderate relationships on different pathways than was previously anticipated. The final replicated effect of study 1 in the context of sport was the interaction between designing fun and rumination about COVID-19. Those who reported to ruminate a lot about the COVID-19 pandemic showed a larger increase in flow during their training due to designing fun.

A strikingly different result was found with respect to our hypothesized three-way interaction. We did not find a significant interaction for designing competition, as we did in study 1 but rather found a significant interaction between designing fun and the two task characteristics. In addition, we found that the different types of tasks in circumplex model were all negatively impacted by designing fun in terms of flow. Although it is hard to pinpoint the reason why this result contrasts our other findings so much, it shows us that that the effectiveness of playful design may not be the same during exercise as it is during work. A possible explanation for the discrepancy in results for sports and work could relate to work being mostly oriented towards individual endeavors. Sports, on the other hand, are usually more socially interactive. Therefore, it is possible that designing fun at work happens more through private cognitive transformations of a tasks (e.g., imagination). It is possible that designing fun manifests itself more through social interactions (e.g., joking around). It may be that designing fun may act as a distraction during sports and as a mean of cognitive engagement during work.

A number of limitations were present in study 2, which may have impacted our results. One of the most important limitations of this study lies within the cross-sectional design: we were unable to establish temporal associations in the data and could not infer causation of the associations (Spector, 2019). Additionally, our data may have been influenced by common method variance (Lindell & Whitney, 2001). Although we did control for demographic characteristics, we did not take transient occasion factors into account. Another important limitation may be related to our inquiry to recall behavior and experiences as they were before the COVID-19 outbreak. This may have induced recall issues for participants, which may have resulted in a subconscious blend of current and previous experiences (Rapheal, 1987).

Moreover, we have used a very heterogeneous sample to allow for generalization to the population. This may have deflated our results, as the effects may be more prominent for specific sports.

General Discussion

Theoretical Contributions to Current Literature

First and foremost, we found that PWD and PSD naturally occurred in our sample, providing support for the assumption that some individuals seek opportunities to proactively shape one's environment (Crant, 2000). For the first time, we have shown that playful design is not only present during work but also during sports. Furthermore, we have shown that playful task design acts through similar mechanisms and has comparable effects on performance and attitude towards an activity (e.g., meaningfulness). Additionally, we have developed a new scale to assess playful task design for sports. This scale was theoretically based on the already existing PWD scale and showed comparable factorial, convergent, and divergent validity (Scharp et al., *in press*). As was proposed by Bakker and Van Woerkom (2017), we have found that playful task design indeed creates opportunities to achieve an optimal experience of concentration, enjoyment, and intrinsic motivation. When exploring the mechanisms of playful design, we therefore found that it is not only the intrinsic motivation which makes play potentially successful in sports and organizations. Rather, it seems that flow offers a more complete picture of the inner workings of playful design. As proposed by Csikszentmihalyi (1990), play activities most likely possess certain characteristics which create favorable circumstances to achieve flow.

Pay has long been perceived as being counterproductive (e.g., Petelczyc et al., 2018), Similar to previous research (e.g., Fluegge-Woolf, 2014), we found that "fun at work" can boost performance. Specifically, redesigning tasks to be more playful has a positive impact on performance, through flow. This implies that the dichotomy of productivity and play is indeed unjustified (e.g., Stevens, 1980). In line with the postulations of Petelczyc (2018), we found that playful design can affect attitudes towards a task too (e.g., experienced meaningfulness). However, as we could not determine causality in our model, it is possible that the experience of meaningfulness is actually also a mechanism of play. For instance, in the job characteristics model by Hackman and Oldham (1980), we see that meaningfulness defined as a critical psychological state, which in turn results in improved performance.

Starbuck and Webster (1991) argued that effects of play may be good or bad, depending on the task's properties. We found minimal support for this idea. However, it is possible that when one redesigns a task to be more playful, one subsequently reports less task monotony and complexity. Therefore, it would be interesting to see whether our proposed moderation effects are present when using more objective measures of these task characteristics. Our current findings imply that there are very specific types of tasks, which are a hybrid of complexity and monotony, which do not benefit from designing fun during exercise. On the other hand, there are equally specific types of tasks, which benefitted from designing competition during work.

We also found that designing fun increases flow for those who tended to ruminate about COVID-19 in the context of work and sports, implying that designing fun may have a more positive impact than previously anticipated (Abramis, 1990). As proposed by DesCamp and Thomas (1993), play most likely can protect employees against stressors. This is also in line with the theory of Cotton (1984), who argued that playing may provide one with opportunities to find the capacity to cope with an emotionally demanding situation.

Interestingly, we found some results which implied that the characteristics of a task may be antecedents of PWD and PSD. When Scharp et al. (*in press*) tested the relation between PWD, boredom, and exhaustion, they did not find any significant associations. Interestingly, when looking at the task characteristics, rather than the cognitive experience of the task, direct relations with PWD can be detected. Our finding that task monotony negatively predicts designing fun contrasts the assertions of Roy (1960), who stated that one is more likely to display play behavior during the execution of monotonous tasks. This also partly goes against the stimulus seeking theory (Berlyne, 1960), which proposed that one continuously tries to reach an optimum level of stimulation. On the one hand, we see that individuals are driven to decrease overstimulation during complex tasks by implementing playful task design. On the other hand, we see no such efforts to overcome the boredom during monotonous tasks. However, it is possible that one reports less monotony due to positive impact of proactive play initiatives: one no longer experiences a task as being monotonous.

Practical Implications

Playful design may be especially advantageous due to its bottom-up approach and therefore requires careful introduction into the daily life of employees and athletes. Although some individuals may be instinctively inclined to use playful task design, others need to be made aware of its existence and potential. In both the organizational and sports context, we would like to make a recommendation for the employee/athlete and employer/trainer. From the perspective of the employee/athlete, we advocate the use of playful redesign during tasks which allow for, and would reasonably benefit from, a component of playfulness. If one is looking to integrate playful design into activities, we propose to start by listing (sub)tasks which one would like to make more challenging/entertaining. Second, one could test what variation of playful redesign fits the task and oneself best: designing fun, designing competition, or a combination of the two. Consequently, one may design a specific strategy to fit the task. Finally, one can start to fine-tune the playful task behavior until the process and outcome is satisfying.

From the perspective of the employer/trainer, it is especially important that PWD/PSD is not implemented as a top-down strategy. We suggest that it is possible to provide individuals with collective PWD/PSD trainings but only when considering individual preferences and providing employees/athletes with plenty of opportunities for trial-and-error. Ultimately, a manager who is looking to implement playful design in a work or sports context, must realize that the strategy may be effective for some but not for all. After all, it would be unreasonable to expect that if all tasks were constructed like games, everyone would be able to enjoy them (Csikszentmihalyi, 1990). Finally, it may be possible to stimulate playful behavior through leading by example (West et al., 2013). A leader has the ability to enhance the followers' behavior by acting as a role model (Yukl, 1998). This is especially effective for behaviors which are not already stimulated through formal systems (Yaffe & Kark, 2011). In doing so, it may be important for leaders to explicitly discuss their playful design tactics, as PWD and PSD are often covert behaviors.

Directions for Future Research

As research on playful task redesign is still in its early stages, there is an abundance of research which is still to be done. Based on our findings, however, some specific questions may be worthwhile to look into during future research. For instance: what are the environmental antecedents of playful design? We have found indications that task characteristics may play a role in whether one proactively approaches a task through PWD or PSD. However, it would be interesting to explore what other environmental cues may be present in explaining playful task design. Additionally, it may be informative to place personality and environmental characteristics in juxtaposition regarding the self-starting behavior of playful design. For example: do personality traits play a bigger role in explaining playful design than environmental characteristics? Furthermore, future research could investigate the combined effect of personality and task characteristics, for instance: do complex tasks only evoke playful design for individuals with a playful personality?

Another avenue for future research may be to explore alternative moderators on the relationship between playful design and flow. Possibly, this relationship is moderated by other types task characteristics, such as duration of a task (Petelczyc et al., 2018). In general, future research may benefit from measuring task characteristics at the task-level, rather than at the day-level. This will likely provide a more accurate picture of the effectiveness of playful design. Moreover, it may very well be possible that personality characteristics play a bigger role than environmental factors in the relationship between PWD, PSD, and flow. Additionally, it may be beneficial for our understanding of the current model to test for causal relations. Through doing so, one could assess research questions like: is experienced meaningfulness a mechanism or an outcome of playful task design?

Also, we have seen that playful design does not positively impact flow during activities in some cases. Therefore, it would be worthwhile to explore what makes PWD and PSD advantageous in some situations but not in others. Specifically, future research could explore in which contexts playful design occurs and what makes or breaks its success. Moreover, we argue that it would be extremely beneficial to the field of playful task design to study this proactive behavior through an intervention. First, we could determine whether playful task design can be learned. Second, we could compare the long-term effectiveness of a playful design intervention to a gamification intervention. Only then, we can definitively determine whether it is more beneficial to use a bottom-up or top-down approach.

Finally, the next step in validating the new PSD questionnaire is to adjust some of the items to fit the context of sports even better. Future research could be oriented towards formulating items which are compatible with all types of sports. Moreover, it possible to add items which fit the definition of playful design but are not currently included in the original PWD measure (e.g., “I try to think of new rules to make my training more challenging” or “I try to challenge myself during my training by continuously trying to improve my performance”). Additionally, it may be interesting to look into PSD separately for professional and recreational athletes. Possibly, there is a difference between these two different groups (e.g., how PSD manifests itself and what effects it has). Therefore, it is important for future research to attempt to cross-validate the questionnaire across different groups. Finally, it may be worthwhile to establish test-retest reliability.

Conclusion

In this thesis, we have shown that playful task design is a worthwhile behavioral orientation. For the first time, we have shown that playful design is not only present in an organizational context but also in a sports context. Our findings suggest that playful design generally led to an increase in flow, which results in elevated levels of performance and a more meaningful experience of the task. Playful task design may therefore be beneficial on an individual level and may also positively impact the overarching organization (e.g., company or team). In sum, playful task design may be a cost-effective and assessable way to increase full immersion in an activity, stimulate a positive attitude towards a task, and boost performance during work or sports endeavors.

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Figure 1.

Hypothesized model of playful work design (study 1)

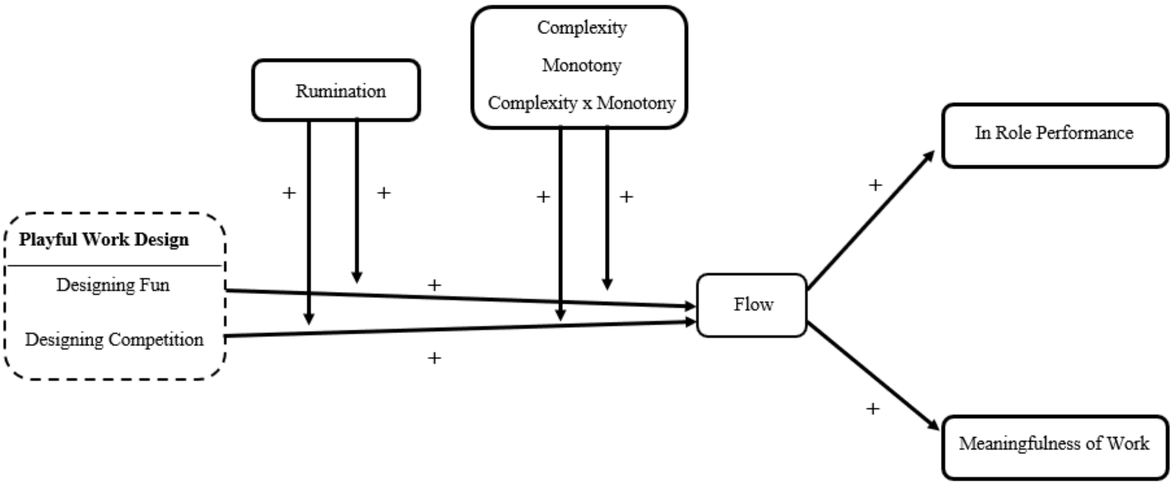

Figure 2.

Circumplex model of monotonous and complex tasks

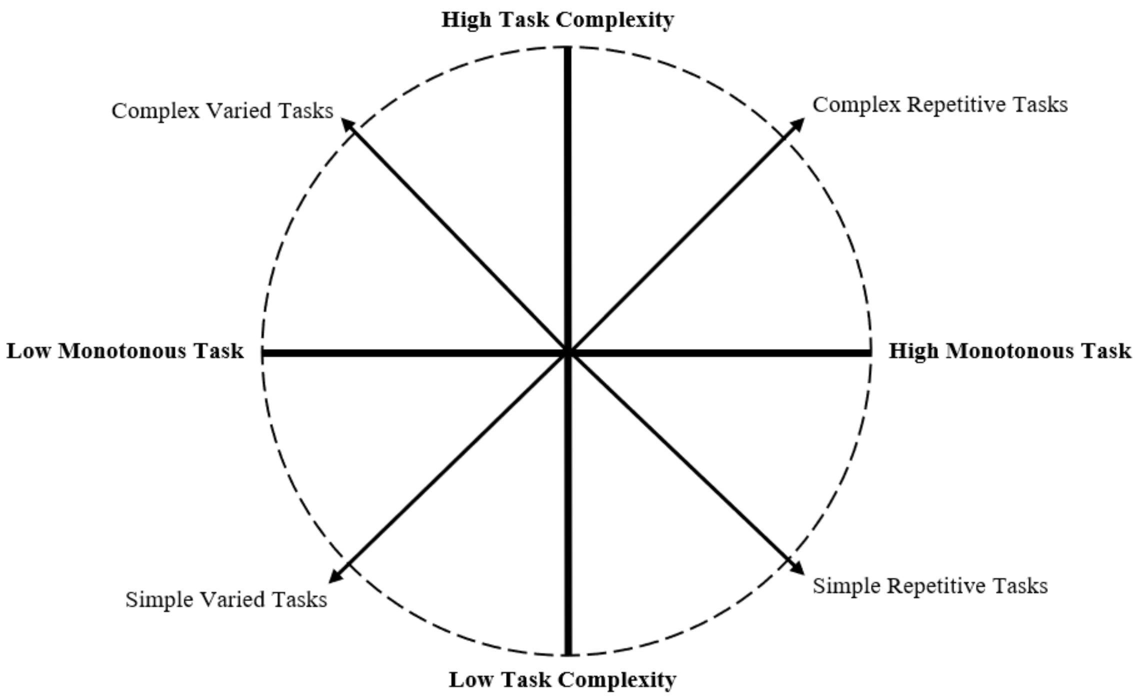

Table 1.

Means, standard deviations, correlations, and alpha-levels of modeled variables (study 1)

	Mean	SD	1	2	3	4	5	6	7	8
1. PWD (F)	4.02	1.243	*.823 - .915*							
2. PWD (C)	3.92	1.158	.593**	*.813 - .840*						
3. Flow	4.59	.952	.391**	.526**	*.855 - .908*					
4. Performance	5.42	.955	.265**	.381**	.533**	*.838 - .923*				
5. Meaningfulness	4.13	1.164	.366**	.475**	.556**	.338**	*.830 - .873*			
6. Monotony	3.30	1.325	-.105**	-.063	-.318**	-.171**	-.295**	*.804 - .877*		
7. Complexity	4.12	1.300	.206**	.332**	.359**	.197**	.432**	-.368**	*.811 - .856*	
8. Rumination	3.31	1.664	.106**	.039	-.044	.102**	.102**	.187**	-.078*	*.928 - .962*

Note. PWD (F) = designing fun, PWD (C) = designing competition. Day-level variables were averaged across five days. The range of alpha-levels over the days can be found on the diagonal and are marked in italic.

N = 167 (within-person), N=763 (between-person)

*p > 0.05, two-tailed; **p > 0.01, two-tailed

Table 2.

Multilevel estimates predicting flow (study 1)

		Model 1								*Model 2*								*Model 3*						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R^2	.280								.288								.300							
ΔR^2									.008								.020							
Constant		4.584	.062	74.299	.000	4.463	4.705	6.056		4.584	.062	73.897	.000	4.462	4.705	6.058		4.572	.063	72.956	.000	4.449	4.572	5.995
Direct Effects																								
Designing Competition (DC)		.322	.034	9.450	.000	.255	.389	.335		.323	.035	9.326	.000	.255	.390	.355		.297	.036	8.283	.000	.227	.367	.327
Designing Fun (DF)		.118	.033	3.609	.000	.054	.181	.132		.121	.033	3.698	.000	.057	.186	.137		.125	.034	3.704	.000	.059	.192	.141
Complexity (C)		.041	.026	1.594	. 111	-.009	.092	.057		.044	.026	1.693	.090	-.007	.095	.060		.023	.027	.852	.394	-.030	.077	.032
Monotony (M)		-.112	.026	-4.350	.000	-.162	-.061	-.155		-.116	.027	-4.337	.000	-.168	-.063	-.161		-.109	.027	-4.078	.000	-.162	-.057	-.152
Rumination (R)		-.031	.022	-1.396	.109	-.074	.012	-.046		-.031	.022	-1.377	.168	-.074	.013	-.046		-.033	.022	-1.511	.131	-.077	.010	-.050
Two-Way Interactions																								
DC x C										.000	.047	.003	.998	-.092	.092	.000		.005	.048	.109	.913	-.089	.099	.006
DF x C										-.020	.046	-.435	.663	-.110	.070	-.021		-.030	.047	-.639	.523	-.122	.062	-.031
DC x M										.010	.047	.222	.824	-.082	.103	.011		-.007	.049	-.137	.891	-.103	.089	-.007
DF x M										-.017	.039	-.442	.659	-.095	.060	-.021		-.009	.040	-.230	.818	-.088	.070	-.011
DC x R										-.054	.042	-1.288	.198	-.136	.028	-.059		-.061	.042	-1.458	.145	-.143	.021	-.067
DF x R										.085	.041	2.094	.036	.005	.164	.099		.091	.041	2.224	.026	.011	.170	.106
Three-Way Interactions																								
C x M																		-.050	.031	-1.621	.105	-.110	.010	-.079
DC x C x M																		-.087	.034	-2.576	.010	-.153	-.021	-.131
DF x C x M																		.009	.027	.345	.730	-.044	.062	.015

Note. Person-mean centering was used to acquire these results. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Table 3.

Multilevel estimates predicting performance (study 1)

		Model 1								*Model 2*								*Model 3*						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R^2	.244								.255								.263							
ΔR^2									.011								.019							
Constant		5.412	.055	99.207	.000	5.305	5.412	8.790		5.403	.055	97.950	.000	5.495	5.511	8.792		5.398	.056	96.944	.000	5.507	5.398	8.766
Direct Effects																								
Flow		.541	.055	9.785	.000	.432	.649	.438		.538	.055	9.738	.000	.430	.646	.435		.546	.055	9.836	.000	.437	.654	.441
Designing Competition (DC)		.098	.047	2.099	.035	.006	.189	.087		.109	.047	2.318	.020	.017	.202	.097		.100	.048	2.078	.038	.006	.195	.089
Designing Fun (DF)		.027	.042	.654	.513	-.054	.109	.025		.020	.042	.486	.627	-.062	.103	.019		.043	.043	1.000	.317	-.042	.129	.040
Complexity (C)		.001	.033	.024	. 981	-.064	.065	.001		.007	.033	.222	.824	-.057	.072	.008		.024	.035	.689	.491	-.044	.092	.026
Monotony (M)		.015	.033	.445	.656	-.050	.080	.017		.022	.034	.645	.519	-.045	.089	.025		.025	.034	.773	.464	-.042	.093	.028
Rumination (R)		-.016	.028	-.561	.575	-.070	.039	-.019		-.009	.028	-.315	.753	-.064	.046	-.011		-.013	.028	-.477	.634	-.068	.042	-.016
Two-Way Interactions																								
DC x C										.111	.057	1.956	.050	.000	.223	.096		.115	.058	1.976	.048	.001	.229	.099
DF x C										-.105	.056	-1.850	.064	-.215	.006	-.087		-.109	.058	-1891	.059	-.222	.004	-.091
DC x M										.029	.057	.506	.613	-.083	.141	.025		.021	.060	..355	.723	-.096	.139	.018
DF x M										-.069	.048	-1.422	.155	.-163	.026	-.065		-.085	.049	-1.711	.087	-.182	.012	-.081
DC x R										.076	.051	1.493	.136	-.024	.176	-.068		.075	.051	1.474	.140	-.025	.176	.067
DF x R										-.014	.050	-.275	.783	-.111	.084	-.013		-.022	.050	-.439	.661	-.120	.076	-0.21
Three-Way Interactions																								
C x M																		.019	.038	.504	.614	-.055	.093	.024
DC x C x M																		-.008	.042	-.187	.851	-.091	.075	-.010
DF x C x M																		.067	.034	1.977	.048	.001	.133	.086

Note. Person-mean centering was used to acquire these results. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Table 4.

Multilevel estimates predicting meaningfulness (study 1)

		Model 1								*Model 2*								*Model 3*						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R^2	.278								.286								.305							
ΔR^2									.008								.027							
Constant		4.136	.078	53.031	.000	3.983	4.289	.4291		4.139	.079	52.595	.000	3.985	4.419	4.274		4.154	.078	53.110	.000	4.000	4.307	4.332
Direct Effects																								
Flow		.320	.049	6.498	.000	.224	.417	.284		.317	.049	6.430	.000	.220	.413	.281		.319	.049	6.485	.000	.223	.415	.282
Designing Competition (DC)		.083	.042	1.998	.046	.002	.165	.081		.083	.042	1.976	.048	.001	.166	.081		.086	.043	1.994	.046	.001	.170	.083
Designing Fun (DF)		.009	.037	.245	.807	-.064	.082	.009		.010	.037	.255	.799	-.064	.083	.010		-.005	.039	-.138	.890	-.081	.070	-.005
Complexity (C)		.112	.029	3.807	.000	.054	.169	.136		.115	.029	3.913	.000	.058	.173	.140		.101	.031	3.276	.001	.041	.161	.122
Monotony (M)		-.172	.030	-5.829	.000	-.230	-.114	-.212		-.158	.031	-5.179	.000	-.218	-.099	-.195		-.144	.031	4.680	000	-.204	.083	-.177
Rumination (R)		-.040	.025	-1.614	.106	-.089	.009	-.054		-.035	.025	-1.399	.162	-.084	.014	-.047		-.034	.025	1.357	.175	-.083	.015	-.045
Two-Way Interactions																								
DC x C										.005	.053	.089	.929	-.099	.109	.004		.048	.054	.886	.375	-.058	.153	.045
DF x C										-.070	.052	-1.349	.177	-.172	.032	-.064		-.025	.053	-.477	.633	-.129	.078	-.023
DC x M										.075	.053	1.410	.158	-.029	.179	.071		.029	.055	.529	.597	-.079	.137	.028
DF x M										-.073	.044	-1.638	.102	-.160	.014	-.076		-.037	.045	-.821	.412	-.126	.052	-.039
DC x R										.011	.047	.230	.818	-.082	.103	.011		.029	.047	.608	.543	-.064	.121	.028
DF x R										-.014	.046	-.306	.759	-.104	.076	-.015		-.038	.046	-.824	.410	-.128	.052	-.0392
Three-Way Interactions																								
C x M																		.114	.035	3.266	.001	.045	.182	.159
DC x C x M																		-.003	.038	-.090	.928	-.079	.072	.-.005
DF x C x M																		-.052	.030	-1.720	.085	-.112	.007	-.074

Note. Person-mean centering was used to acquire these results. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Figure 3.

Three-way interaction plot between designing competition, task complexity, and task monotony (study 1)

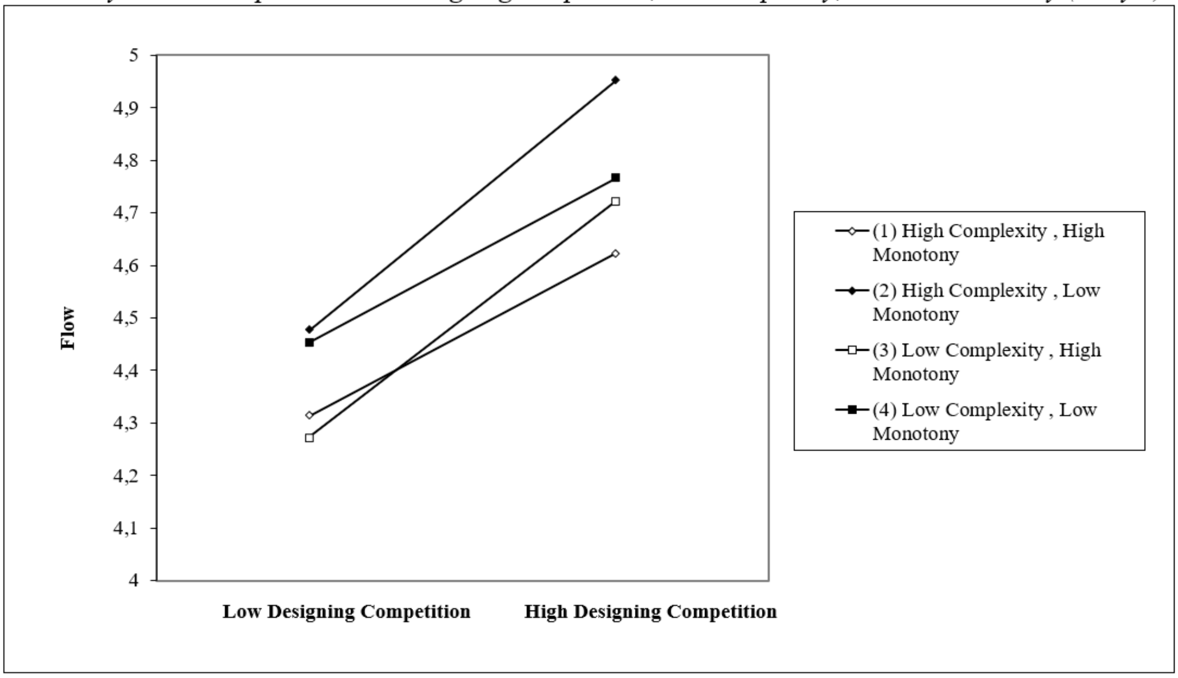

Figure 4.

Two-way interaction plot between designing fun and rumination (study 1)

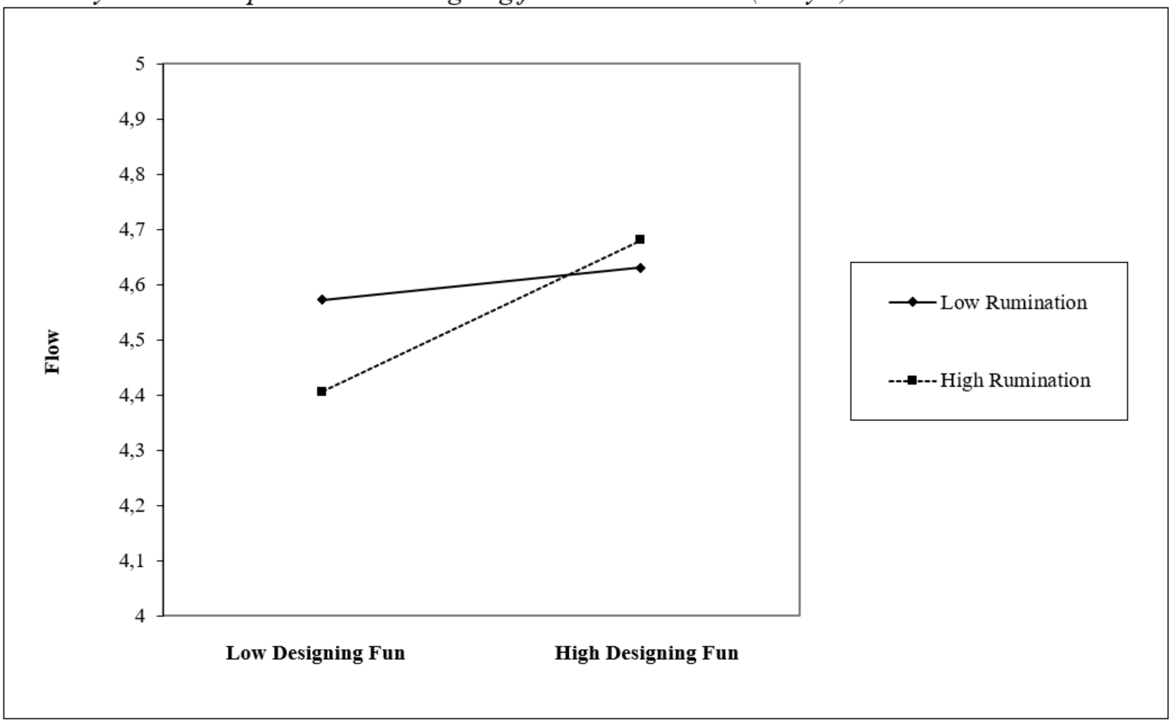

Figure 5.

Hypothesized model of playful exercise design (study 2)

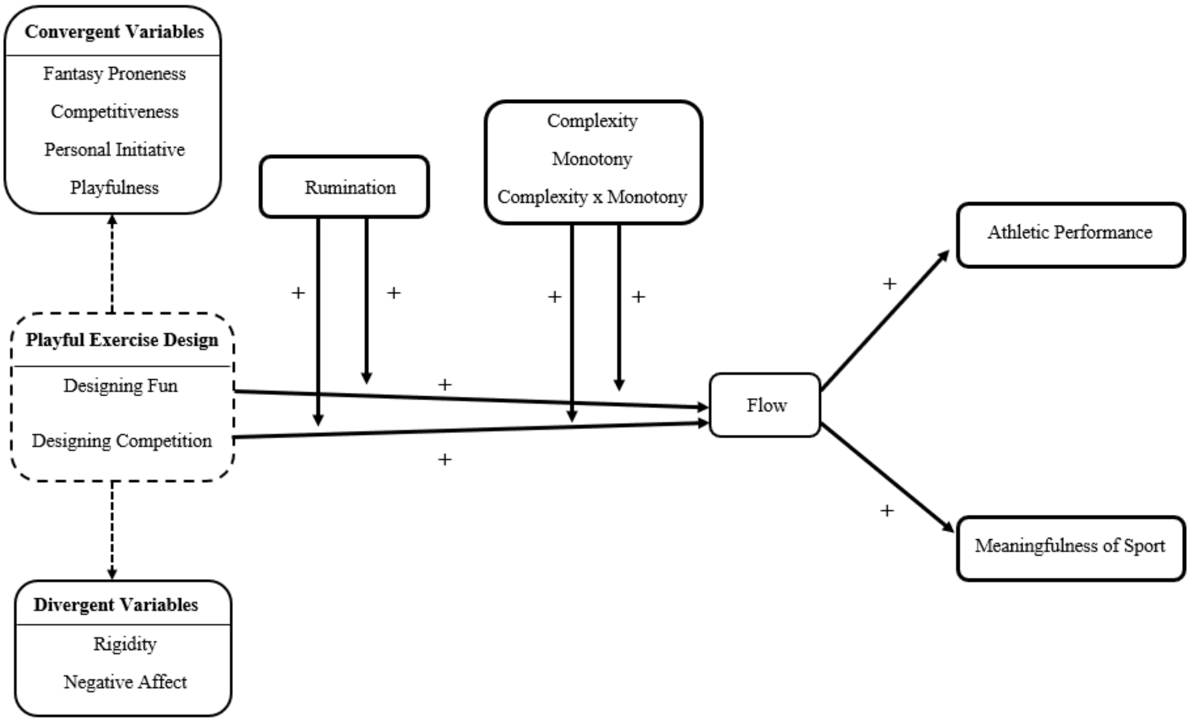

Table 5.

Means, standard deviations, correlations, and alpha-levels of modeled variables (study 2)

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PWD (F)	3.76	1.247	*.889*													
2. PWD (C)	4.35	1.137	.503**	*.802*												
3. Competitiveness	5.56	.740	.210**	.389**	*.646*											
4. Fantasy Proneness	3.44	1.401	.307**	.221**	.053	*.880*										
5. Personal Initiative	5.39	.792	.220**	.298**	.573**	.066	*.841*									
6. Playfulness	4.54	1.300	.397**	.172**	.129*	.407**	.234**	*.905*								
7. Rigidity	3.38	.823	-.243**	-.065	-.311**	-.063	-.472**	-.266**	*.692*							
8. Negative Affect	2.54	.743	-.008	.055	-.144**	.336**	-.221**	.002	.249**	*.822*						
9. Flow	5.66	.627	.317**	.449**	.426**	.047	.437**	.222**	-.171**	-.193**	*.760*					
10. Performance	5.03	.886	.149**	.255**	.331**	-.105	.204**	.083	-.166**	-.263**	.510**	*.673*				
11. Meaningfulness	5.28	.998	.368**	.386**	.271**	.230**	.222**	.242**	-.169**	.019	.433**	.327**	*.828*			
13. Monotony	4.39	1.249	-.215**	.072	-.058	.190**	-.012	.001	.124*	.135*	.005	-.006	-.021	*.755*		
14. Complexity	4.39	1.326	.235**	.199*	.098	.012	.007	-.039	.065	.027	.097	-.055	.116*	-.252**	*.814*	
15. Rumination	4.42	1.531	.166**	.098	.081	.253**	.037	.250**	-.137*	.169*	.068	.079	.259**	-.054	.099	*.923*

Note. PWD (F) = designing fun, PWD (C) = designing competition. The alpha-levels can be found on the diagonal and are marked in italic.

N = 327

*p > 0.05, two-tailed; **p > 0.01, two-tailed

Table 6.

Results of the exploratory factor analysis (study 2) for the playful sports design measure

	Item	Mean	SD	Factor 1	Factor 2
	Designing Fun				
1	I approach my training activities creatively to make them more interesting.	3.74	1.530	.816	
2	I approach my trainings in a playful way.	3.79	1.478	.716	
5	I look for humor in the things I need to do during my trainings.	3.58	1.622	.851	
6	I look for ways to make my training activities more fun for everyone involved.	3.90	1.642	.611	
9	I use my imagination to make my trainings more interesting.	3.60	1.555	.897	
10	I look for ways to make my trainings more fun.	3.96	1.494	.681	
	Designing Competition				
3	I push myself to do better, even when it isn't expected.	4.86	1.376		.766
4	I approach my trainings as a series of exciting challenges.	4.38	1.507		.654
7	I complete with myself during trainings, not because I have to, but because I enjoy it.	4.77	1.438		.843
8	I try to make my trainings into a series of exciting challenges.	4.28	1.465		.602
11	I try to keep score in all kinds of training activities.	4.39	1.915		.513
12	I try to set time records in my training.	3.45	1.846		.411

Note. Factor loadings above .35 are shown. Factor 1 = designing fun, Factor 2 = designing competition.

Table 7.

Result of the confirmatory factor analysis (study 2) for the playful sports design measure

Model	χ^2	df	GFI	RMSEA	NNFI	CFI	IFI	Model Comparison	$\Delta\chi^2$	*df*	p
Model 1: 2-Factor Model	401.41	53	.83	.24	.81	.83	.83				
Model 2: 1-Factor Model	702.97	54	.70	.19	.67	.69	.69	M1 – M2	301.56	1	.000
Null Model	2149.430	66	.33	.14	–	–	–				

Note. *N* = 327, χ^2 = chi-square, df = degrees of freedom, GFI = goodness-of-fit index, RMSEA = root mean square error of approximation, NNFI = non-normed fit index, CFI = comparative fit index, IFI = incremental fit index, $\Delta\chi^2$ = chi-square difference.

Table 8.

Regression estimates predicting flow (study 2)

		Model 1						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R²	.196							
ΔR²								
Constant		4.444	.209	21.233	.000	4.034	4.855	7.212
Direct Effects								
Designing Competition (DC)		.194	.031	6.256	.000	.133	.255	.358
Designing Fun (DF)		.059	.029	2.006	.045	.001	.116	.119
Complexity (C)		.023	.024	.953	.341	-.024	.069	.049
Monotony (M)		.006	.026	.220	.826	-.045	.056	.011
Rumination (R)		.003	.020	.254	.800	-.034	.044	.012

		Model 2						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R²	.226							
ΔR²	.030							
Constant		4.464	.209	21.338	.000	4.054	4.873	7.234
Direct Effects								
Designing Competition (DC)		.193	.031	6.183	.000	.132	.254	.335
Designing Fun (DF)		.064	.030	2.166	.030	.006	.123	.130
Complexity (C)		.017	.024	.701	.483	-.031	.065	.037
Monotony (M)		.010	.026	.392	.695	-.041	.062	.021
Rumination (R)		-.001	.020	-.034	.973	-.039	.038	-.002
Two-Way Interactions								
DC x C		.007	.023	.320	.749	-.037	.052	.020
DF x C		-.024	.021	-1.137	.256	-.066	.018	-.068
DC x M		-.002	.025	-.064	.949	-.052	.048	-.004
DF x M		.031	.020	1.537	.124	-.009	.071	.090
DC x R		-.009	.018	-.527	.598	-.045	.026	-.030
DF x R		.044	.016	2.811	.005	.013	.074	.162

		Model 3						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R²	.263							
ΔR²	.067							
Constant		4.617	.217	21.254	.000	4.191	5.043	7.486
Direct Effects								
Designing Competition (DC)		.159	.033	4.822	.000	.095	.224	.293
Designing Fun (DF)		.069	.029	2.349	.019	.011	.127	.140
Complexity (C)		.006	.025	.235	.814	-.042	.054	.012
Monotony (M)		.019	.026	.745	.457	-.032	.070	.039
Rumination (R)		.001	.019	.038	.969	-.037	.038	.002
Two-Way Interactions								
DC x C		.002	.023	.101	.920	-.043	.048	.007
DF x C		-.005	.023	-.194	.846	-.050	.041	-.013
DC x M		.001	.025	.053	.958	-.048	.050	.003
DF x M		.019	.020	.916	.360	-.021	.059	.053
DC x R		-.008	.018	-.455	.649	-.044	.027	-.026
DF x R		.051	.016	3.235	.001	.020	.081	.188
Three-Way Interactions								
C x M		.006	.019	.335	.738	-.031	.044	.018
DC x C x M		-.019	.015	-1.214	.225	-.049	.011	-.073
DF x C x M		-.039	.015	-2.613	.009	-.068	-.010	-.161

Note. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Table 9.

Regression estimates predicting performance (study 2)

		Model 1								*Model 2*								*Model 3*						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R^2	.258								.264								.275							
ΔR^2									.006								.017							
Constant		1.313	.442	2.971	.003	.447	2.179	1.506		1.232	..449	2.744	.006	.352	2.111	1.413		1.296	.473	2.742	.006	.370	2.223	1.487
Direct Effects																								
Flow		.702	.075	9.353	.000	.555	.850	.496		.711	.076	9.345	.000	.562	.860	.503		.706	.077	9.114	.000	.554	.858	.449
Designing Competition (DC)		.026	.045	.575	.556	-.063	.115	.034		.021	.046	.449	.654	-.070	.111	.027		-.011	.049	-.220	.826	-.106	.085	-.014
Designing Fun (DF)		-.017	.041	-.426	.670	-.097	.063	-.025		-.023	.042	-.550	.582	-.105	.059	-.033		-.020	.042	-.463	.643	-.102	.063	-.028
Complexity (C)		-.068	.033	-2.068	.039	-.132	-.004	-.103		-.056	.034	-1.651	.099	-.124	.011	-.086		-.039	.035	-1.116	.264	-.108	.030	-.059
Monotony (M)		-.032	.035	-.914	.361	-.102	.037	-.046		-023	.037	-.609	.542	-.095	.050	-.032		-.016	.037	-.434	.664	-.089	.056	-.023
Rumination (R)		.031	.027	1.123	.262	-.023	.084	.054		.030	.027	1.087	.227	-.024	.084	.052		.028	.027	1.014	.310	-.026	.081	.049
Two-Way Interactions																								
DC x C										-.038	.032	-1.185	.236	-.101	.025	-.075		-.023	.033	-.708	.479	-.088	.041	-.046
DF x C										.011	.030	.367	.713	-.048	.070	.022		-.006	.033	-.195	.846	-.071	.058	-.013
DC x M										-.046	.036	-1.293	.196	-.116	.024	-.081		-.048	.036	-1.348	.178	-.118	.022	-.085
DF x M										.004	.029	.143	.887	-.052	.061	.008		.010	.029	.330	.742	-.047	.067	.019
DC x R										.013	.025	.502	.616	-.037	.062	.029		.030	.026	1.173	.241	-.020	.081	.069
DF x R										-.013	.022	-.580	.562	-.056	.030	-.034		-.024	.023	-1.072	.284	-.069	.020	-.064
Three-Way Interactions																								
C x M																		-.007	.027	-.247	.805	-.060	.046	-.013
DC x C x M																		-.051	.022	-2.337	.019	-.094	-.008	-.142
DF x C x M																		.030	.021	1.421	.155	-.012	.072	.089

Note. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Table 10.

Regression estimates predicting meaningfulness (study 2)

		Model 1								*Model 2*								*Model 3*						
		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.		Est.	SE	z	Sig.	LLCI	ULCI	St. Est.
R^2	.267								.289								.304							
ΔR^2									.022								.037							
Constant		1.231	.447	2.582	.010	.297	2.167	1.269		1.469	.447	3.076	.002	.533	2.404	1.519		1.246	.503	2.477	.013	.260	2.232	1.291
Direct Effects																								
Flow		.453	.082	5.518	.000	.292	.614	.288		.425	.081	5.243	.000	.266	.584	.271		.456	.083	5.467	.000	.292	.619	.291
Designing Competition (DC)		.098	.048	2.026	.043	.003	.192	.114		.115	.049	2.330	.020	.018	.211	.135		.153	.051	3.002	.003	.053	.253	.180
Designing Fun (DF)		.116	.043	2.667	.008	.031	.201	.148		.097	.043	2.293	.025	.012	.182	.125		.082	.044	1.846	.065	-.005	.169	.105
Complexity (C)		.006	.035	.163	.871	-.063	.074	.008		.011	.036	-.292	.771	-.082	.061	-.015		-.020	.037	-.547	.584	-.092	.052	-.028
Monotony (M)		-.005	.038	-.133	.894	-.079	.069	-.006		.009	.039	.224	.823	-.067	.085	.011		.002	.039	.062	950	-.073	.078	.003
Rumination (R)		.142	.029	4.889	.000	.085	.199	.223		.137	.029	4.747	.000	.080	.193	.216		.137	.029	4.793	.000	.081	.194	.218
Two-Way Interactions																								
DC x C										.011	.034	.322	.747	-.055	.077	.019		.003	.035	.076	.939	-.065	.070	.004
DF x C										-.044	.033	-1.330	.184	-.108	.021	-.078		-.035	.035	-1.025	.306	-.103	.032	-.063
DC x M										-.038	.037	-1.015	.310	-.111	.035	-.060		-.041	.037	-1.099	.272	-.114	.032	-.065
DF x M										.075	.031	2.446	.014	.015	.136	.138		.075	.030	2.455	.014	.015	.134	.137
DC x R										-.006	.019	.748	.748	-.044	.031	-.016		-.018	.022	-.805	.421	-.062	.026	-.048
DF x R										-.017	.022	.442	.442	-.061	.027	-.035		-.007	.027	-.257	.797	-.060	.046	-.014
Three-Way Interactions																								
C x M																		-.033	.024	-1.379	.168	-.079	.014	-.077
DC x C x M																		-.002	.028	-.060	.952	-.057	.054	-.003
DF x C x M																		.046	.023	2.015	.044	.001	.091	.116

Note. R^2 = explained variance, ΔR^2 = difference in explained variance, Est = unstandardized estimate, SE = standard error, LLCI= lower level confidence interval, ULCI = upper level confidence interval, St. Est= standardized estimate.

Figure 6.

Three-way interaction plot between designing fun, task complexity, and task monotony (study 2)

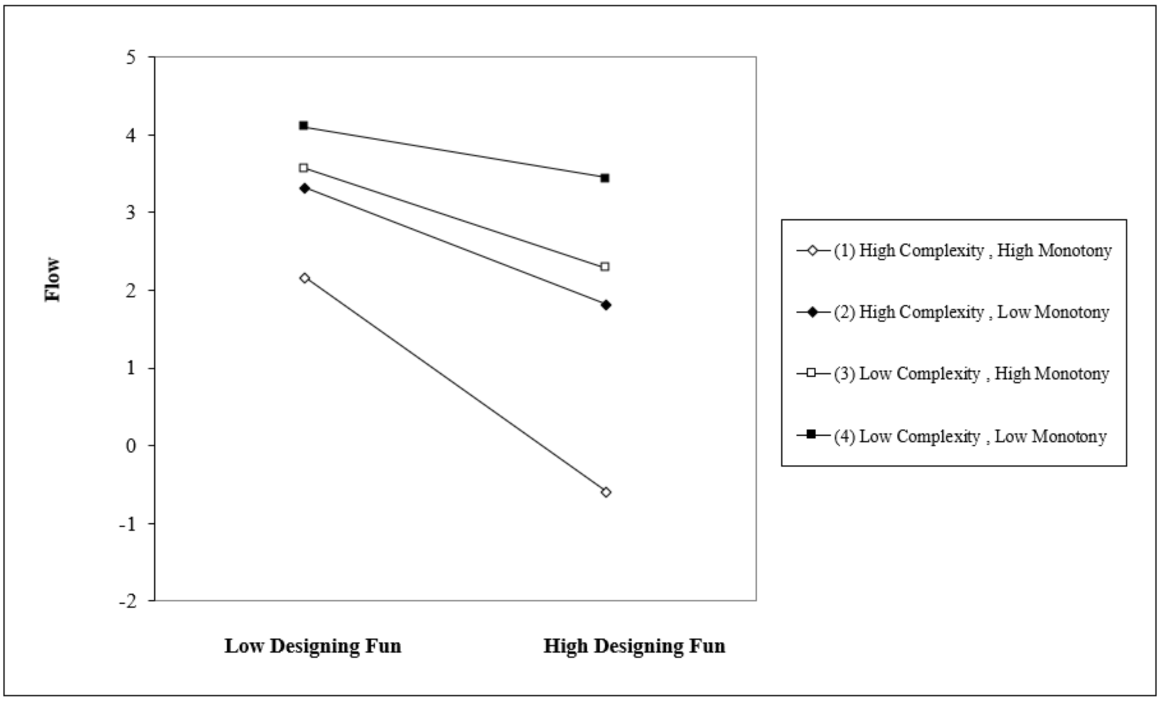

Figure 7.

Two-way interaction plot between designing fun and rumination (study 2)