Gamification: A Bottom-up Approach

Master Thesis

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Abstract

Recently, research has focused on the question how to use elements of play and gaming to the work context, which is referred to as ‘gamification’. While previous research has taken a top-down approach, we argue for a bottom-up approach to gamification. Bottom-up gamification aims to make tasks intrinsically motivating by approaching work as a game. The facets of gamification, competition and play, were developed along the lines of literature on games and play. We conducted two separate studies. In Study 1 (N=115) we developed a 17-item scale, which reliably measured gamification, and investigated its convergent validity. Gamification was associated to personality (i.e., openness and conscientiousness), various work features, work engagement, and creative performance, but not all expected relationships were found. In Study 2 (N=88 × 4.44 days=391) we investigated how gamification manifested itself on a daily level. Multilevel analysis revealed that open and conscientious employees are more prone to gamify their work. Gamification was especially prevalent on resourceful and cognitive demanding days, but was unrelated to daily workload. In addition, when employees gamify their work, they reported less boredom, more engagement, and more creative performance. Gamification’s relationship with creative performance was partially mediated by work engagement. Therefore, gamification appears to be an effective strategy to enhance the experience of work.

> The need for [play] is only urgent to the extent that the enjoyment of it makes it a need.
>
> –Johan Huizinga, *Homo Ludens*, 1938

When we play, be it chess, sports or a videogame, we experience joy. Unsurprisingly, virtually everyone engages in play from time to time in pursuit of this experience. Recently, research has explored whether transferring features found in games to non-game contexts replicates this sense of play (Deterding, Dixon, Khaled & Nacke, 2011). This line of research has become known as *gamification*. While the potency of gamification is apparent, due to its infancy many questions remain unanswered. When we focus our attention to the context of work, the following questions come to mind: 1) Can gamification of work improve the way employees perceive or conduct their job, and if so, 2) how is work gamified most effectively?

In the present study, we aim to begin to answer these questions. We start by briefly reviewing the relevant theoretical and empirical literature on gamification. Subsequently, we refine the definition of gamification of work as an individual work strategy using the Job-Demands Resources model (Bakker & Demerouti, 2007; 2014). This refined definition will guide further investigation into gamification of work. Our first aim is to validate a newly constructed measure, in line with this definition, and assess its psychometric properties (Study 1). Next, we investigate how this scale manifests itself at a daily level (Study 2).

These studies contribute to the literature in several ways. First, by integrating gamification into the Job-Demands Resources theory as a proactive work strategy. Previous research focuses on gamification as a top-down design strategy as opposed to a bottom-up work strategy. We propose that employees are most suited to bring the element of play into work themselves. Second, by validating the measurement of gamification and explore its dimensions. We validate its measurement, assess its psychometric properties in two studies, and explore its associations with the work environment, personality, attitudes, and creative performance. Moreover, we test whether these associations persist on a daily level.

Theoretical Background

Play and Games

Gamification, the "application of game elements to non-game contexts" (Deterding, Dixon, Khaled & Nacke, 2011, p. 10), revolves around concepts such as play and games. Following this, a question is how such an abstract concept can be defined? One of the first scholars to make such an attempt was Huizinga (1938) in his pioneering work *homo ludens*. Huizinga argued that play can be found throughout, and is fundamental to, human culture. His work went on to influence scholars such as Callois (1961) and Suits (1978).

Caillois proposed that all games can be placed on a continuum ranging from *paidia* to *ludus*. Paidia concerns play that is spontaneous and carefree arising from improvisation, whereas ludus concerns play that requires calculation, discipline, perseverance and subordination to rules. Caillois further specified that play can take the form of competition (e.g., a game of checkers) chance (e.g., playing dice), mimicry (e.g., make-believe play) and disturbing your senses (e.g., taking a ride on a rollercoaster). These forms of play can be placed on the aforementioned continuum. For instance, take two forms of competition, a game of chess and a spontaneous competitive run up the stairs. The former can be categorized as a form of ludus and the latter as paidia.

Suits (1978) asserts that to play a game, is to voluntary overcome unnecessary obstacles (i.e., self-set limitations). For instance, the objective of soccer is to send the ball in the opponent's goal. While a player could simply pick up the ball and throw it in the goal, this player would cease to play soccer. To play soccer, a player has to overcome the obstacle of scoring without the use of his or her arms. Suits discerns *closed games* and *open games*. Closed games have a goal whose achievement ends the game (i.e., checkers), whereas open games lack such goals (i.e., mimicry).

Salen and Zimmerman (2004) tried to further clarify these concepts by distilling the most important elements from definitions proposed by several influential scholars. Consequently, they defined play as "free movement within a more rigid structure" and a game as "a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome". Therefore, chess can be defined as a game, where players engage in conflict governed by the rules of chess and the act of winning or losing is quantifiable. On the other hand, using dolls and one's imagination to simulate a social interaction between adults can be defined as play as this activity concerns free movement, the act of playing around (i.e., the activity does not follow a predetermined script), within the more rigid sign structure (i.e., where the dolls represent people). These concepts form the building blocks of our refined definition of *bottom-up* gamification.

Gamification

The field of gamification has accrued much attention in recent years under the premise of various beneficial outcomes such as increased motivation, learning, engagement, satisfaction, performance, and ultimately profits (Werbach & Hunter, 2012). This surge in interest has generated many articles coming from fields such as education (e.g., Domínguez et al., 2013; Filsecker & Hickey, 2014), health (e.g., Zuckerman & Gal-Oz, 2014) and assessment (e.g.,

Attali & Arieli-Attali, 2015). The vast majority of these studies are case studies that differ substantially in their application and almost none of these studies utilize validated psychometric measurements or a coherent framework (Hamari, Koivisto & Sara, 2014). Unsurprisingly therefore, these previous studies have rendered inconsistent results. A recurrent theme in these studies is the use of game mechanics such as points, badges and leaderboards (Denny, 2013; Filsecker & Hickey, 2014; Zuckerman & Gal-Oz, 2014). Through close monitoring, badges and points are awarded for certain desired behaviors. These mechanisms provide the player with feedback, instill a sense of challenge, and guide players towards mastery of the game.

This approach assumes that gamification–a sense of play–can be induced top-down. But some scholars have also questioned whether a top-down approach to gamification might be the best option. Their argument is based on the notion that in top-down gamification a main ingredient of play may be amiss. Specifically, this form of gamification has been criticized for being solely contingent on external rewards mechanisms (i.e., points and badges) in order to improve motivation (Deterding, 2013). Moreover, it has been stated that this approach may eventually damage intrinsic motivation over time (Hanus & Fox, 2015; Ryan & Deci, 2000). What appears to be missing in the top-down approach is voluntary participation resulting from intrinsic motivation. In a similar vein, gamification has been found to be most effective when participation is a choice (Mollick & Rothbard, 2014). The same issue is found in research on workplace fun, which often conflates prescribed fun with emergent fun (Bolton & Houlihan, 2009). Fleming (2005) contends that fun workplaces created by workers themselves, independent of management, are typically the most fun.

Following the line of reasoning above, we argue that gamification at work is most successful when implemented by employees themselves: *bottom-up gamification*, which we simply refer to in the following paragraphs as gamification. The core tenet of joy experienced during play appears to be voluntary participation, which the top-down kind of gamification of work tends to lack. Furthermore, the complex work environment may be difficult to gamify in a top-down fashion effectively. During a typical work day, employees perform a wide variety of tasks. Top-down gamification requires some form of monitoring of these tasks, which creates additional costs. Apart from these costs, unintended costs may arise from gamifying certain aspects of work and missing others (e.g., an employee skips tasks that are not gamified). Moreover, the process of creating internalized meaning for game mechanisms, such as points, may be a troublesome and complex process. This is important to consider as adding points or badges that lack meaning will probably have little to no impact. Bottom-up gamification avoids these problems as employees gamify and ascribe meaning to their own tasks. Before we further

elaborate on this form of gamification we will expand on the Job-Demands Resources model (Bakker & Demerouti, 2007) which will guide our research.

Gamification, play and the Job-Demands Resources Model

Gamification–as an individual work design strategy–can be framed using the Job-Demands Resources theory (JDR: Bakker & Demerouti, 2014). The JDR-model is one of the most used and supported heuristic models of contemporary organizational psychology. This theory argues that the work environment can be captured in two main categories: *job resources* and *job demands*. In short, job resources refer to any aspect of work that gives energy (e.g., autonomy and skill variety) whereas job demands detract energy and may lead to strain (e.g., time pressure and workload). Bakker and Demerouti (2014) further discern challenge and hindrance demands. The former influences work attitudes positively whereas the latter does negatively (Crawford, LePine & Rich, 2010). These two categories affect wellbeing and motivation through two processes: the *health impairment process* and the *motivational process* (Bakker & Demerouti, 2007; Hakanen, Bakker & Schaufeli, 2006). The motivational process enhances work engagement (Bakker & Bal, 2010; Christian, Garza & Slaughter, 2011). In contrast, the health impairment process may damage health through burnout (Schaufeli, Bakker & Van Rhenen, 2009; Bakker, Demerouti & Schaufeli, 2003). Finally, findings show that job resources and job demands interact in two ways: resources either buffer the impact of job demands on strain or demands samplify the motivational potential of job resources (Bakker & Demerouti, 2007; Bakker, Hakanen, Demerouti & Xanthopoulou, 2007).

Job design is a top-down process in which a job and its features, such as tasks and skill or knowledge requirements, are constructed by the organization (Hackman & Oldham, 1976). More recently, however, scholars explored strategies by which employees themselves influence their work experience (Bakker, 2017; Bateman & Crant, 1993; Frese & Fay 2001; Wrzesniewski & Dutton, 2001). Job crafting is one of those strategies. Job crafting involves proactively changing the physical and cognitive design of work, by the employee rather than by management (Wrzesniewski & Dutton, 2001). This can be achieved by changing responsibilities (i.e., task crafting), changing with whom one interacts (i.e., relational crafting), and adjusting the perception of the meaning of work (i.e., cognitive crafting). Demerouti, Bakker and Gevers (2015) commented that the definition of cognitive crafting is problematic as individuals rarely alter their perception regarding the significance of work on a daily basis. Recently, Tims & Bakker (2010) refined job crafting as a bottom-up work strategy focused on altering job resources and job demands for the purpose of increasing person-job fit. This

reconceptualization of job crafting (Tims & Bakker, 2010) and its accompanying questionnaire (Tims, Bakker & Derks, 2012) spurred a large field of research that supported the effectiveness of bottom-up work strategies (e.g., Bakker, Tims & Derks, 2012; Rudolph, Katz, Lavigne & Zacher, 2017; Tims, Bakker & Derks, 2013)

In this theoretical context, gamification may be considered a type of job crafting, that is, as a bottom-up work strategy associated with optimizing the experience of work, but is distinct from it as we see next.

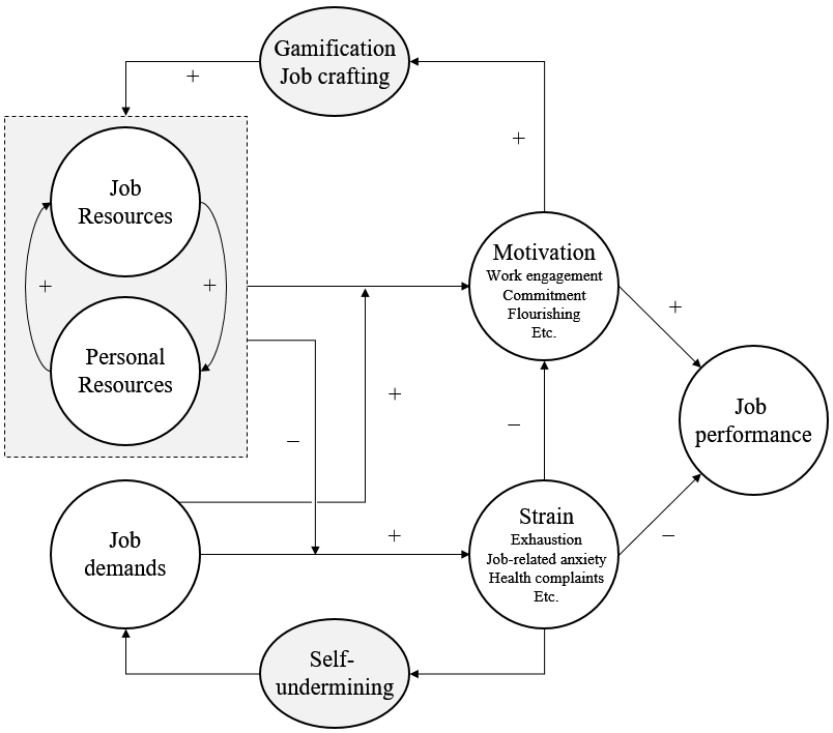

Figure 1. Gamification in the JDR model, adapted from Bakker and Demerouti (2014).

Bottom-up Gamification

We conceptualize bottom-up gamification of work as free movement–voluntarily overcoming unnecessary obstacles–within the more rigid structure of the formal job description. This implies a bottom-up work strategy of approaching tasks and incidents as a game through (1) competition and (2) play, which serves to make tasks intrinsically interesting and motivating. While these strategies are both goal-directed activities, they differ in how they make tasks intrinsically rewarding. Competition achieves this through striving for an end-state, whereas play achieves this through improvisation and lacks a predetermined desired end-state.

We assert that transfer of game elements to non-game contexts is done most effectively by employees themselves rather than management. This approach resembles the crafting techniques as defined by Tims and Bakker (2010) as proactive behavior, initiated by employees

themselves, focused on optimizing the experience of work: to increase job-person fit. However, gamification is distinct from these behaviors. Namely, gamification serves to make existing tasks intrinsically rewarding to perform, whereas crafting serves to change existing job features. Effectively, job crafting serves to alter the *actual* job features, whereas gamification mainly serves to alter the *perception* of job features.

Cognitive crafting, deserves a special mention, due to its apparent similarity to gamification. Gamification, however, differs from cognitive crafting in focus. Gamification focuses on reappraisal tasks and incidents, whereas cognitive crafting involves reappraisal of work as a whole (Wrzesnieuwski & Dutton, 2001). Effectively, this makes gamification a daily strategy, whereas cognitive crafting is not (Demerouti, Bakker & Gevers, 2015). Moreover, gamification reappraises work as a game to make it more fun, whereas cognitive crafting reappraises work to give purpose. We will now expand on the aforementioned dimensions, competition and play, of gamification accompanied with an example from qualitative research.

Competition at work is formed by creating an artificial conflict through arbitrary rules for the purpose of achieving a specified end-state, the achievement of whatever the player–the employee–defines. In other words, creating competition means striving for a predetermined end-state specified by the employee his or herself. This end-state can be improvement compared to past performance or to perform tasks within a certain time-limit. For instance, a cashier may strive to bring a smile on the face of every customer, just to make work more fun. Or, an employee of an ice cream parlor may strive to make every scoop as smooth as possible. Effectively, competition allows employees to find challenge in any task and generate constant feedback. Moreover, meeting these challenges rewards the employee with a sense of achievement. Ultimately, this process serves to make tasks more intrinsically rewarding to perform. For instance:

> Patty is a bus driver. She enthusiastically describes how she takes pride in driving gracefully, peacefully, and fluently, so passengers can enjoy their ride without being startled by bumps or sudden stops. She considers the interaction with such a wide diversity of people the most fun part of her job. She tries to get in touch and speak to as many people as possible. Difficult passengers are not of her concern, because she always knows what to say.
>
> –Adapted from Schaufeli, Taris, Le Blanc, Peeters, Bakker, and de Jonge (2001, p. 425).

The example of Patty illustrates how an employee-created artificial conflict, generates feedback and creates a challenging work environment. Patty's formal description does not

require her to ride as smooth as possible nor does it specify her to come in contact with as many passengers as possible. Patty creates these goals herself. By approaching her tasks as a game, she alters her perception of work. Every ride, every passenger, present her with an exciting challenge. And every bump, and every friendly conservation, provide her with feedback on how she progresses. Ultimately, Patty's approach creates challenge where others may experience none.

Play at work is formed through spontaneous improvisation–playing around with framing, narrative, and ideas–that lacks a specified end-state, only to be at play. In other words, this process lacks an immediate higher-order goal, apart from the momentary playful experience. Through framing, employees make tasks more fun and exciting. This framing can be done in a wide variety of forms, and only requires imagination and interest. For example, a cashier may try to guess the total cost of each customer. Or, an employee of an ice cream parlor may frame scooping up ice as a race between different flavors to see which one will 'win' by being finished first. However, again, just as with competition, this process serves to make tasks intrinsically rewarding to perform and generate constant feedback. Importantly, engaging in play differs from daydreaming. During the latter the employee disengages from reality, whereas during the former the employee focuses attention toward the task. For instance:

> Orsini is a salesman who makes a precarious living from selling antique. He goes through great lengths to preserve enjoyment in what he does. One morning, a woman asked him to name the price for a pair of wooden angels. Orsini named her an excessively high price. The woman, surprisingly, reached for her checks to pay. Orsini, barely containing his agitation, exclaimed he could not trade her the angels and escorted her out. After calming down, he explained: "If I were starving, I would have taken her money. But since I am not, why make a deal that isn't any fun? I enjoy the clash of wits involved in bargaining, when two persons try to outdo each other with ruses and eloquence."
>
> –Adapted from Csikzentmihalyi (2000, p. 47)

The example of Orsini illustrates how, through a play, any task can be reframed into something fun and exciting. Orsini was not merely interested in selling the wooden antique, nor did his approach serve to sell the wooden angels at a higher price. Instead,, Orsini was only interested in creating a sense of play by approaching his task as a game. The implicit structure of the conversation (i.e., opponents take turns in trying to outwit each other, use of physical force is not allowed) provided him with the boundaries in which he can play. In the end, Orsini is able to frame each encounter with a customer as a game, a game he loves playing.

Exploring gamification necessitates a valid questionnaire that contains the concepts of play and competition. Establishing the validity of the measurement of gamification will be the first aim of this article. Accordingly, we hypothesize that gamification consists of two core dimensions: (1) competition and (2) play.

Bottom-up Gamification

Our refined definition of gamification of work from a bottom-up perspective may be a promising venture for organizations, but an important question that is still open is under what circumstances it may be particularly relevant? No previous research has been dedicated to this form of gamification. Here, we focus our attention to personality, work environment, and work attitudes. Regarding personality, the question is: Which individuals are most likely to gamify their work? Is conscientiousness or openness to experience indicative of such individuals? Another issue is whether gamification is associated with outcomes that are beneficial to organizations. Is gamification associated with positive outcomes such as work engagement and creative performance? Is gamification a viable work strategy employed to counter job boredom? Through answering these questions, we gain insight as to when, where, and why gamification may prove to be fruitful and effective. In the next sections we discuss several propositions to these questions. Figure 2 summarizes our hypotheses using a graphical depiction.

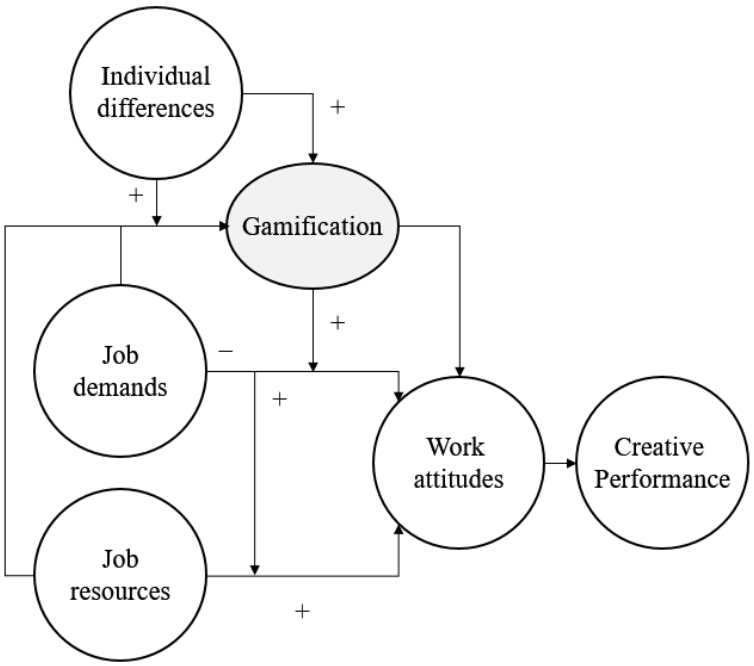

Figure 2. Conceptual overview of our hypotheses regarding the antecedents and consequences of gamification of work.

Antecedents of Gamification

Individual differences

While we assert that gamification may be a viable strategy for everyone, some individuals may be more prone than others to gamify their work. In particular, those high in trait playfulness may be keener to redesign their work playfully. Playfulness has been defined as "the predisposition to frame (or reframe) a situation in such a way as to provide oneself (and possibly others) with amusement, humor, and/or entertainment" (Barnett, 2007, p. 955). While this trait has its roots in research among children (Barnett, 1990; Lieberman, 1965), research was later expanded to adults (Barnett, 2007). Playfulness in adults is associated with subjective wellbeing, physical wellbeing (Proyer, 2013) and various strengths of character such as creativity, curiosity and vitality (Proyer & Ruch, 2011). Moreover, playfulness is positively associated with work outcomes such as job satisfaction, innovative behavior and job performance (Yu, Wu, Chen & Lin, 2007). Gamification could be the underlying mechanism that explains the link between playfulness and these work outcomes. Therefore, we hypothesize that, compared to less-playful individuals, playful individuals more often gamify their work.

Research on playfulness further suggest possible relationships between gamification and two facets of the Big Five: openness and conscientiousness. Individuals who score high on openness to experience tend to have an active imagination, sensitivity to aesthetics and are intellectually curious (Costa & McCrae, 1992). Unsurprisingly, openness to experience is strongly associated with playfulness (Proyer, 2017) as these definitions appear to overlap. Moreover, individuals high in openness are more prone to fantasize (Costa & McCrae, 1992) and tend to be proactive (Thomas, Whitman & Viswesvaran, 2010), which resonates with gamification. Hence, we expect openness to be positively associated with gamification. On the other hand, individuals that score high on conscientiousness tend to be organized, hardworking and self-disciplined (McCrae & Costa, 1987). Moreover, conscientious individuals autonomously set goals regarding performance (Barrick, Mount & Straus, 1993). Therefore, conscientious individuals may be more inclined to create competition in their work. Hence, we hypothesize conscientiousness positively relates to competition.

Work environment

Certain features of the work environment–as in job resources and job demands–may play an important role, or may even elicit, gamification. On the one hand, a workplace that is characterized by a lack of job demands may be an important determinant of gamification. When demands are low, less cognitive resources are used. These vacant resources may be used through gamification. On the other hand, an environment full of challenges leaves less resources

available, which should limit gamification. In line with this reasoning, time pressure has been shown to restrain proactivity at work (Fritz & Sonnentag, 2009). Therefore, we expect that job demands are inversely related to gamification.

In contrast with a demanding workplace, a resourceful workplace provides employees with autonomy and a variety of tasks. Job resources, such as autonomy and task variety, are known to energize employees (Bakker & Demerouti, 2014). Subsequently, this energy can translate into proactivity at work (Hornung & Roussea, 2007; Salanova & Schaufeli, 2008). In a similar vein, job resources are expected to give rise to gamification.

In every work environment, however, both job demands and job resources are present. Gamification may especially be present when these features of the work environment interact. Gamification may be predicted by two situations. On the one hand, when job resources are abundant and demands are low, cognitive resources remain unscathed and employees are energized. In line with the reasoning above, such an environment would elicit gamification. On the other hand, job demands have been shown to amplify the motivational potential of job resources (Bakker & Demerouti, 2007). Hence, when both demands and resources are high, the employee may feel motivated to undertake additional effort, prompting gamification. Together, this implies we expect job resources to positively moderate the relationship of job demands with gamification.

Consequences of Gamification

Work Attitudes

Gamification may be employed to regulate the subjective experience of work, fueling engagement and countering boredom. Work engagement encompasses a positive and work related state of mind (Schaufeli & Bakker, 2004). This affective-behavioral construct is characterized by states of vigor, absorption, and dedication (Schaufel & Bakker, 2001, p. 245). Importantly, work engagement has been shown to positively impact job performance (Bakker & Bal, 2010; Christian, Garza & Slaughter, 2011). The work environment can stimulate work engagement through providing resources and demands. The positive relationship of work engagement with job resources is one of the main propositions of the Job-Demands Resources model (Bakker & Demerouti, 2007) and has been widely supported by research (e.g., Bakker, Hakanen, Demerouti & Xanthopoulou, 2007; Schaufeli, Bakker & Van Rhenen, 2009). While demands can give rise to strain, demands can also boost work engagement (Crawford, LePine & Rich, 2010). Gamification is expected to fuel work engagement through finding resources and challenge in tasks. More specifically, gamification is expected to energize through finding

challenge in tasks (i.e., vigor), foster immersion through channeling attention to the task (i.e., absorption), and make employees enthusiastic about their tasks by finding pride and fun (i.e., dedication).

In contrast to work engagement, job boredom, is a state characterized by low levels of energy and motivation as a response to an absence of meaning and monotonous, unchallenging work (Schaufeli & Salanova, 2014). This state ensues when challenge lacks and resources are high (Nakamura & Csikszentmihalyi, 2014) which turns attention to the passage of time. However, when employees employ gamification they create challenge and fun at work, channeling attention to the task at hand. In accordance, other bottom-up work strategies such as job crafting–seeking challenges at work–have been shown to effectively combat boredom (Harju, Hakanen & Schaufeli, 2016). Hence, we expect gamification to be inversely related to job boredom.

Apart from these direct relations, gamification may alter how the work context–as in job demands–relates to work attitudes. On the one hand, the relationship of unchallenging work with job boredom may be less pronounced for individuals that engage in gamification. A workplace that inherently consists of repetitive and monotonous tasks may incite boredom (Loukido, Loan-Clarke & Daniels, 2009). We argue, however, that gamification may be enacted in response to these situations to improve affect. Thus, while low job demands typically equate to job boredom, this relationship may diminish when employees gamify their work. On the other hand, when demands are high, gamification may amplify the motivational potential of challenge demands. Workplaces that are characterized by challenges have been shown to fuel work engagement (Crawford, LePine & Rich, 2010). Moreover, such workplaces have been shown to elicit proactive behavior (Ohly & Fritz, 2010). Thus, the relationship of job demands with work engagement may be strengthened by gamification.

Creative Performance

Gamification, play and competition, can be described as going beyond the formal job description. This resonates with extra-role behavior, such as creative performance. Creativity can be defined as the production of novel and appropriate responses, products or solutions (Amabile & Mueler, 2008). Creative employees are vital for innovation (Amabile, 1988). Hence, organizations should seek to stimulate creativity. But where does creativity originate from? And, importantly, where does gamification fit in? Two theoretical perspectives offer insight regarding the foundations of creativity: the broaden-and-built theory and the componential theory.

The componential theory proposes that creativity results from domain-relevant skills, creative thinking and intrinsic motivation (Amabile, 2012). Creative thinking skills relates trying to understand the complexity of issues, refraining from premature judgments, and reframing problems in a unique way (Amabile, 1988). Playful individuals have been found to have a preference for complexity over simplicity (Proyer, 2017), and to be more intrinsically motivated (Amabile, Hill, Hennessey & Tighe, 1994). Moreover, gamification partly consists of reframing tasks by approaching them as a game or using one's imagination. Hence, we argue that gamification will directly predict employee creative performance.

The broaden-and-built theory states that creativity is enhanced through the experience of positive affect which broadens the thought-action repertoire (Fredrickson, 2004). This assertion has been corroborated by longitudinal research (Amabile, Barsade, Mueller & Staw, 2005). Play is an exemplary activity that leads to the experience of positive affect such as joy. Similarly, gamifying work will likely foster positive affect–broadening the thought-action-repertoire–consequently enhancing creative performance. In line with this reasoning, work engagement is a positive state of mind (Schaufeli & Bakker, 2004). Moreover, engaged employees are intrinsically motivated, which relates to the third component of the componential theory. While the link of gamification with engagement and creativity has not yet been researched, the relationship between engagement and creative performance has been established (Bakker & Xanthopoulou, 2013; Demerouti, Bakker & Gevers, 2015; Schaufeli, Taris & Bakker, 2006). Hence, we posit that gamification is positively associated with creative performance directly, and indirectly through work engagement.

Study 1: Scale Development

Studying the antecedents and consequences of gamification requires a scale. Therefore, the first goal of the study is to validate the measurement of gamification. We examine whether the hypothesized 2-factor structure of competition and play best summarizes the data compared to alternative models (*Hypothesis 1*). We further examine how gamification is related to the work environment, personality, work attitudes, and performance. For personality, in line with the reasoning in the introduction, we expect gamification to be positively associated with openness and playfulness, and competition to be positively associated with conscientiousness (*Hypothesis 2*). For the work environment, we hypothesize that gamification is positively to job resources, negatively to job demands, and that the positive relationship of job resources is amplified by presence of job demands (*Hypothesis 3*). For work attitudes, we expect gamification to be positively associated with positive attitudes, negatively with negative

attitudes, and to amplify and buffer the relationship of job demands with positive and negative work attitudes, respectively (*Hypothesis 4*). Finally, we expect gamification to be positively associated with creative performance directly, and indirectly through work engagement (*Hypothesis 5*).

Method

Participants

We recruited students through the course credit program of the Erasmus University of Rotterdam (EUR) who worked at least one day a week and worked a minimum of 7 hours a week. In total 164 respondents participated in the study. However, 49 respondents were dropped, because one item (i.e., "answer disagree to not be excluded from this study") indicated they were negligent in their responses. The final sample (N=115) had an average age of 20.8 (SD=2.63) and tenure of 2.28 (SD=2.02). Most were female (75.5%) and, on average, worked 12.18 hours a week (SD=4.51).

Material

Personality

Big Five. The personality traits of the Big Five were measured using the BFI questionnaire consisting of 19 items developed by John, Donahue & Kentle (1991). The subscales measured openness to experience (α=.74) and conscientiousness (α=.69). An example item is "I am someone who is a reliable worker".

Playfulness was measured using the OLIW questionnaire developed by Proyer (2017) which consists of four subscales and a total of 28 items. The subscales measured four kinds of playfulness: other-directed (α=.40), lighthearted (α=.61), intellectual (α=.41) and whimsical (α=.70). Participants were instructed to rate their habitual actions and attitudes on a 7-point scale (1=strongly disagree, 7=strongly agree). An example item is "Also as an adult I still like to play good natured, funny tricks on others".

Job resources

We measured several job resources using subscales of the Dutch translation (Gorgievski, Peeters, Rietzschel & Bipp, 2016) of the Work Design Questionnaire (Morgeson & Humphrey, 2006). In the present study we focused on the following resources.

Work autonomy was measured using three scales, totaling 9 items, measuring work-scheduling (α=.90), decision-making (α=.89) and work methods autonomy (α=.91). Participants were instructed to rate the extent to which sentences described their work on a 5-

point scale (1=strongly disagree, 5=strongly agree). An example item is “The job allows me to decide on my own how to go about doing my work”.

Skill variety (α=.89) was measured using a subscale of the Dutch translation (Gorgievski, Peeters, Rietzschel & Bipp, 2016) of the Work Design Questionnaire (Morgeson & Humphrey, 2006) consisting of 4 items each. Participants were instructed to rate the extent to which sentences described their work on a 5-point scale (1=strongly disagree, 5=strongly agree). An example item is “My job involves performing a variety of tasks”.

Job developmental opportunities (α=.73) was measured using the job opportunities scale developed by Kristensen & Borg (2003) which consists of 7 items. Participants were instructed to answer several questions regarding characteristics of their work on a 5-point scale (1=almost never, 5=always). An example item is “do you learn new things at work?”.

Job demands

Task complexity (α=.85) was measured using the task complexity subscale of the Dutch translation (Gorgievski, Peeters, Rietzschel & Bipp, 2016) of the Work Design Questionnaire (Morgeson & Humphrey, 2006) consisting of a total of 4 items. Participants had to rate the extent to which sentences described their work on a 5-point scale (1=strongly disagree, 5=strongly agree). An example item is “the job requires that I only do one task or activity at a time”.

Work attitudes

Work engagement (α=.93) was measured using the UWES questionnaire consisting of 9 items developed by Schaufeli, Bakker, and Salanova (2006). Participants were instructed to rate to what extent statements applied to them on a 6-point scale (1=never, 6=always). An example item is “At work, I feel that I am bursting with energy”.

Job boredom (α=.86) was measured using the Dutch Utrecht Boredom Scale developed by Reijseger et al. (2013) which consists of 8 items. Participants were instructed to rate the extent to which sentences regarding applied to them on a 7-point item scale (1=never, 7=always). An example item is “I feel bored at my job”.

Underqualified work (α=.83) was measured using the subscale of the UBORS developed by Schaufeli (2009) which consists of 3 items. Participants were instructed to rate the extent to which sentences regarding applied to them on a 5-point item scale (1=never, 5=always). An example item is “I experience my job as mind numbing”.

Cynicism (α=.89) was measured using the cynicism subscale of the UBOS (Schaufeli & Van Dierendonck, 2000) which consists of 4 items. Participants were instructed to rate the

extent to which sentences regarding work applied to them on a 7-point item scale (1=never, 7=always). An example item is “I doubt the significance of my work”.

Performance

Creative Performance

Creativity (α=.89) was measured using the scale developed by Miron, Erez & Naveh (2004) consisting of 4 items. Participants were instructed to rate to what extent statements applied to them on a 7-point scale (1=totally disagree, 6=totally agree). An example item is “I have many creative ideas at work”.

Strategy of analysis

In order to analyze the data of our first study exploratory factor analysis is conducted in IBM SPSS 23. None of the demographic variables were related to the study variables and were therefore not used as controls. To investigate the hypothesized interactions and mediations, we mean centered predictors and conducted multiple regression is IBM SPSS 23 and mediation analysis in PROCESS (Version 2.16; Hayes, 2012), respectively.

Results

Exploratory Factor Analysis

We first conducted principal axis factoring with oblique rotation in SPSS. We discarded factors with less than 3 items and only retained items with a factor loading of .35 or higher on the expected factor (Costello & Osborne, 2005; Floyd & Widaman, 1995). In addition, the scree plot was taken into account. This iterative process resulted in a 10-item *competition* scale and a 7-item *play* scale that both showed strong reliability (see Table 1). This solution was chosen over a more parsimonious 2-factor solution (i.e., consisting of a 6-item competition scale and 6-item play scale) for the purpose of retaining conceptual validity (i.e., otherwise it was mainly about optimizing work flow). We also rejected a 3-factor solution (i.e., consisting of a 14-item competition scale, 8-item play-fantasy scale, and a 6-item play-fun scale), because the 6-item scale showed 2 cross loadings. In total 15 items were deleted, mostly due to overly high cross-loadings. The two retained factors explain 38.17% of the variance, 29.02% (Eigenvalue=4.93) and 8.27% (Eigenvalue=1.56), respectively. This factor solution supports Hypothesis 1. Table 2 reveals that competition and play are strongly correlated (see Table 2; r=.45, p < .001), and that competition is enacted more frequently than play. Table 2 reveals that the amount of work hours a week and having a supervising job were associated with competition behaviors, but not with play.

Table 1

The items of the playful work design and their means, standard deviations and reliability.

					Factor	
	Abbreviated item	*M*	*SD*	*α*	1	2
	Competition			.85		
1	I look for ways to optimize my workflow	3.23	0.95		.75	
2	I experiment with new ways to do things at work	3.18	1.00		.69	
3	I challenge myself to complete tasks efficiently	3.81	0.66		.66	
4	I challenge myself in different ways at work	3.32	0.89		.63	
5	I make my work experience smooth and efficient	3.79	0.61		.62	
6	I try to keep score in all kinds of work activities	3.21	1.00		.60	
7	I keep track of my progress, when I don't have to	3.44	0.98		.52	
8	I try to set time records in my work tasks	3.30	1.08		.50	
9	I compete with myself at work, because I enjoy it	3.17	1.00		.48	
10	I push myself to do better, even when not expected	3.70	0.79		.48	
	Play			.81		
1	I come up with stories about my tasks	2.10	1.03			.87
2	I use my imagination to my work more interesting	2.70	1.06			.75
3	I think of ways to turn my work into a game	2.19	1.02			.56
4	I make and test predictions within my tasks	2.42	1.02			.53
5	I create a story when faced with a stressful situation	2.09	1.01			.53
6	I look for ways to make my work more fun	3.45	0.82			.45
7	I approach my work in a playful way	3.10	0.85			.36

Note. Factors loadings > .35 are shown. Abbreviated translated items are shown.

Convergent Validity

We first investigated the theorized antecedents of gamification, personality and the work environment. As Hypothesized, Table 2 reveals that that competition was significantly associated with both conscientiousness and openness to experience, and that play was associated with openness to experience. These findings support Hypothesis 2. This implies that individuals that individuals who tend to be open to experiences and conscientious exhibit more competition behaviors and those who tend to be open to experiences also exhibit more play behaviors.

Our hypotheses concerning the work environment were largely disconfirmed. Competition was positively associated with developmental opportunities, work scheduling autonomy, decision making autonomy, skill variety, but not with work methods autonomy or task complexity (see Table 2). Unexpectedly, play was not associated with any of the measured job resources or job demands. We conducted several multiple regression which revealed that competition was not associated with the interaction of task complexity and the job resources; developmental opportunities (b=.12, p=.176), work scheduling autonomy (b=.05, p=.432), decision making autonomy, (b=.06, p=.373), work methods autonomy (b=.04, p=.535), and skill variety (b=.10, p=.109). Play was also unassociated with the interaction of job demands and job resources; developmental opportunities (b=.186, p=.055), work scheduling autonomy (b=.11, p=.09), decision making autonomy, (b=.14, p=.053), work methods autonomy (b=.09, p=.21), and skill variety (b=.10, p=.181). These findings, except that job resources are related to competition, are contrary to Hypothesis 3. Hence, Hypothesis 3 receives only partial support.

Concerning work attitudes, competition was associated with work engagement, but not with job boredom, cynicism or experience of under qualified work (see Table 2). Furthermore, competition did not moderate the relationship of task complexity with work engagement (b=-.20, p=.358), job boredom (b=-.09, p=.601), cynicism (b=-.33, p=.206) or underqualification (b=-.01, p=.958). Thus, competition appears to be associated with positive work attitudes, but not with negative work attitudes. Play was positively associated with underqualification, but unassociated with work engagement, job boredom, and cynicism (see Table 2). Furthermore, play did not moderate the relationship of task complexity with job boredom (b=.24, p=.137) and cynicism (b=.25, p=.294). Play, however, did moderate the relationship of task complexity with work engagement (b=.46, p=.023) and of task complexity with underqualification (b=-.35, p=.034) as depicted in Table 3 and Figure 2a and Figure 2b, respectively. Simple slope analysis revealed that task complexity is only associated with work engagement when employees reported medium to high levels of play behaviors (*M-1SD*: b=.23, p=.180, *M*: b=.54, $p < .001$, *M+1SD*: b=.84, $p < .001$). Task complexity was associated with underqualification at all levels of play behaviors (*M-1SD*: b=-.36, p=.011, *M*: b=-.58, $p < .001$, *M+1SD*: b=-.80, $p < .001$). These findings provide only partial support for Hypothesis 4. In line with our hypotheses, competition was associated with work engagement and play amplified the motivational potential of task complexity. Contrary to our expectations, however, was that competition did not moderate the relationship of job demands with work attitudes, and that play amplified, rather than buffer, the relationship of task complexity with experienced under qualification.

Table 2.

Means, standard deviations and correlations.

	Mean	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. Sex (male)	0.22	.41																			
2. Age (years)	20.53	2.09	.07																		
3. Tenure (years)	2.26	1.60	-.01	.20																	
4. Work hours (p/w)	11.63	3.99	.22*	.37**	.19*																
5. Supervising job	0.16	.36	.12	-.11	.20*	.07															
6. Competition	3.41	.59	.17	.16	.13	.22*	.20*														
7. Play	2.58	.65	.12	.16	.10	.16	.07	.45**													
8. Development Opp.	2.81	.70	.07	.01	.13	.20*	.25**	.21*	.04												
9. Work Scheduling AU	3.03	1.05	.16	.03	-.01	.01	.15	.23*	.01	.25**											
10. Decision Making AU	3.19	1.00	.11	.08	.06	.01	.26**	.19*	-.01	.38**	.72**										
11. Work Methods AU	3.17	1.06	.05	.12	.03	.02	.12	.05	-.08	.33**	.72**	.80**									
12. Skill Variety	3.01	.96	.09	-.02	.05	.14	.25**	.20*	-.01	.74**	.16	.30**	.24**								
13. Task Complexity	3.33	.87	-.02	.09	.08	.18*	.20*	.03	-.15	.60**	.15	.18	.20*	.66**							
14. Openness	3.57	.55	.17	.09	-.01	.14	-.01	.25**	.21*	-.05	.06	.01	.01	-.04	-.17						
15. Conscientiousness	3.77	.50	-.11	.01	.14	-.12	.17	.27**	.08	.17	.08	.12	.12	.08	.11	.02					
16. Engagement	4.04	1.22	-.01	.16	.13	.17	.14	.24**	.07	.68**	.18	.34**	.31**	.51**	.36**	-.02	.23*				
17. Job Boredom	3.80	.97	.12	-.06	-.17	-.05	-.18	-.16	.13	-.41**	-.26**	-.45**	-.41**	-.37**	-.37**	.09	-.34**	-.49**			
18. Cynicism	2.56	1.38	-.06	.01	.02	.01	-.06	-.16	.03	-.49**	-.26**	-.41**	-.39**	-.39**	-.23*	.03	-.30**	-.63**	.67**		
19. Underqualification	2.76	1.05	.03	.05	.03	.01	-.11	-.01	.20*	60	-.26**	-.40**	-.43**	-.54**	-.49**	.17	-.12	-.60**	.57**	.58**	
20. Creativity	4.70	1.16	.11	.01	.13	.18	.22	.39**	.28**	.33**	.14	.29**	.23*	.22*	.06	.44**	.15	.30**	-.20*	-.24**	-.08

Note. *$p < .05$; **$p < .01$; n=115. Development Opp.=Development Opportunities. AU=Autonomy.

Table 3.

Results of the moderation analyses.

		Engagement		
Predictor	*b*	*SE*	*t*	*p*
Constant	4.07	.11	38.48	.001
Play	.20	.16	1.23	.221
Task Complexity	.54	.12	4.42	.001
Play × Task Complexity	.46	.20	2.30	.023
Level of moderator (play)				
Low	.23	.17	1.35	.180
Medium	.54	.12	4.42	.001
High	.84	.18	4.55	.001
		Underqualification		
Predictor	*b*	*SE*	*t*	*p*
Constant	2.73	.08	32.30	.001
Play	.22	.13	1.71	.090
Task Complexity	-.58	.10	-6.01	.001
Play × Task Complexity	-.35	.16	-2.15	.034
Level of moderator (play)				
Low	-.36	.14	-2.57	.011
Medium	-.58	.10	-6.01	.001
High	-.81	.15	-5.49	.001

Note. *n*=115. Unstandardized regression coefficients are reported. The variables were mean centered prior to analysis.

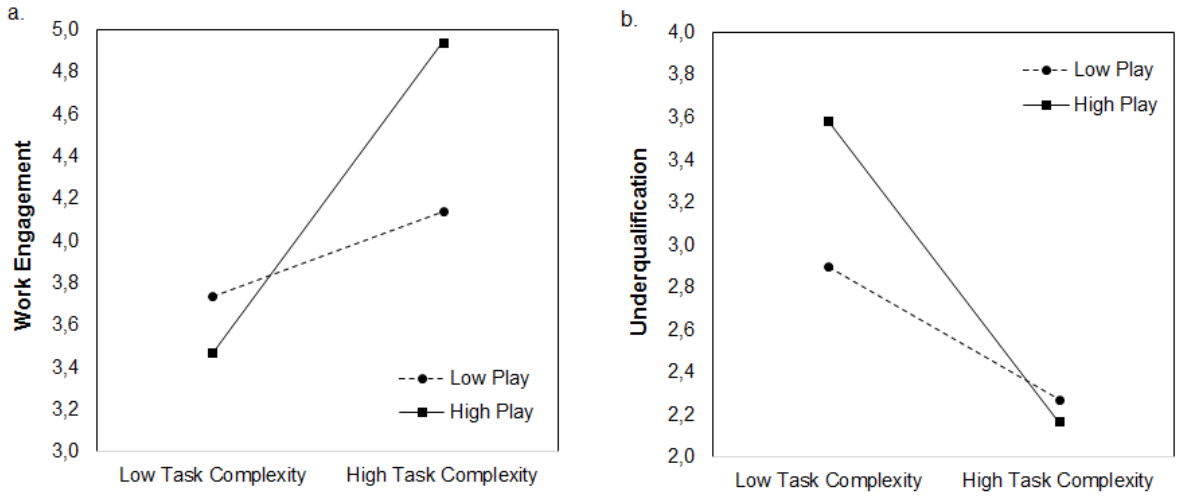

Figure 3. Moderation Effect of Play on the Relationship (a) Between Task Complexity and Work Engagement, (b) Between Task Complexity and experienced underqualified work.

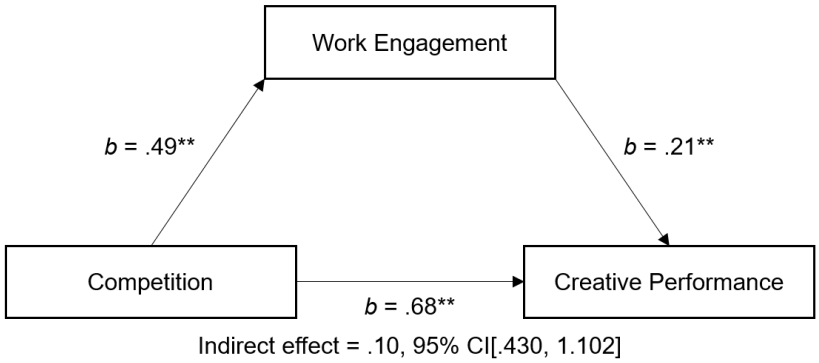

Figure 4. Mediation of competition on creativity through work engagement. Unstandardized regression coefficients are reported. The variables were mean centered prior to analysis. Bootstrap sample size=10.000.

Competition and play were both associated with creative performance (see Table 2). We used the PROCESS macro (Version 2.16; Hayes, 2012) to test the mediations as proposed in Hypothesis 5. This method allows us to bootstrap the indirect effect which is preferred over the causal steps approach of Baron and Kenny (1986) and the Sobel test (Sobel, 1982) as it is more powerful and valid (Hayes, 2009). Play did not have an indirect association with creativity through engagement (*b*=.03, 95% CI= -.052, .159). Competition, however, did have an indirect association with creativity through engagement (*b*=.10, 95% CI=.009, .277) as depicted in Figure 4. These findings largely support Hypothesis 5. This implies that the association of competition with creativity is partly due to the association the variables share with work

engagement, whereas the association of play with creativity appears to be independent of work engagement.

Simple correlations revealed that neither play nor competition was associated with job boredom or cynicism. However, this changed when play and competition were regressed simultaneously. More specifically, the association with job boredom became significant for play (b=.37, p=0.015) and competition (b=-.44, p=.009). The association with cynicism remained insignificant for play (b=.27, p=.216), but became significant for competition (b=-.51, p=.037).

Discussion and Conclusion Study 1

Our first study aimed to explore the factor structure of the gamification scale and investigate its convergent validity. Based on factor-analytical steps we extracted two factors, competition and play, that both showed strong reliability. The extracted competition dimension encompasses two elements that are frequently observed in games (Caillois, 1964; Salen & Zimmerman, 2004), generation of feedback and mastery of the game. Here, the game refers to work, and feedback is created by employees monitoring their performance. The extracted play dimension encompasses reframing tasks or incidents at work using one's imagination and finding fun through improvisation. This is typical for playing around (Barnett, 2007) and is present in most games such as chess and monopoly (Caillois, 1964; Salen & Zimmerman, 2004). These two PWD dimensions appear to be independent of age, sex, and tenure. The competition dimension, however, was related to the amount of work hours per week and whether respondents occupied a managerial position. This may imply that competition behaviors depend on whether work is appraised as significant or important.

The second goal of Study 1 was to investigate convergent validity of the PWD scale. In line with our hypotheses, conscientious and open individuals were more prone to gamify their work. The work environment, however, was largely unrelated to gamification. Only job resources were related to gamification, and only to competition. Does this indicate that the work environment is less important than personality? Possibly, but this assertion should be interpreted with caution for the several reasons. We measured only one job demand (i.e., thus interactions with other demands remain viable) and our design may cloak existing day-to-day relationships. For instance, while personality may determine the general tendency of gamification, daily incidents at work may determine *daily* gamification. Furthermore, our sample consisted of students rather than full-time employees. Finally, our sample consisted of a wide variety of occupations, which may have diluted contextual effects.

Gamification appears to be a viable strategy to enhance creativity at work, and competition appears to boost work engagement. On the other hand, the role of play was less straightforward. Unlike competition, the effect of play appears to be more context specific. Namely, the effect of play strongly differed depending on the complexity of work. Specifically, employees appear to use play to immerse more fully into challenging work, but also as an escape mechanism when doing underqualified and simplistic work. This may indicate play behaviors may be employed as a form of escapism. This is in line with research that posits *distancing through fantasy* is an emotion-focused coping strategy employed when a situation is unlikely to change (Scheier, Weintraub & Carver 1986). While this is in line with the partly buffering hypothesis, play being used in response to an unchallenging environment, there does not appear to be a statistical buffering effect. Possibly, this is because work tasks were not truly made more challenging or fun, but only more doable through emotionally distancing oneself. Possibly, when tasks are truly appraised as more fun this relationship changes. In line with this reasoning, when task complexity was high, play *did* boost work engagement, which is indicative of immersion.

On the other hand, the cross-sectional design may be responsible for play's positive association with negative attitudes. More specifically, respondents may have reported the general *appraisal* of their tasks opposed to the general affect *experienced* during their tasks. Employees are free to 'move' within their task description to make it more fun. For instance, a passenger can appraise a bus ride as a boring activity. The same passenger, however, may not experience boredom on rides where he or she socially interacts with others. For us, the bus ride equates to the tasks, and the social interaction equates to gamification. This may explain why individuals report high levels of play while also reporting high levels of gamification. Thus, accurate investigation of gamification necessitates a dairy design.

Finally, while gamification appeared unrelated to boredom and cynicism, associations arose when its two dimensions were simultaneously regressed on these negative attitudes. What does this mean? Conceptually, this implies that the overlap in variance between the two dimensions seem to suppress their association with job boredom and cynicism. The association becomes significant after this portion of unexplained variance is accounted for.

Two limitations that have to be mentioned that may have influenced our results. Namely, our sample (i.e., students) and design. Possibly, gamification is especially important when work is a significant part of life. Finally, as argued above, our cross-sectional design may distort or mask existing relationships as gamification is a daily strategy. Therefore, we aim to investigate other job demands than task complexity, replicate our findings using a diary design, and use a

sample of incumbents with a full-time contract in Study 2. Altogether, taking these limitations into account, the convergent validity appears sufficient for the use of the scale in the daily study.

Study 2: Diary Survey

In this study we assess how gamification manifests itself on a daily level. Gamification is an individual work strategy focused on tasks and incidents at work. Hence, we focus on daily demands (i.e., time pressure and mental demands) and daily resources (i.e., autonomy and skill variety) on the task level. Furthermore, we assess how gamification relates to outcomes on a daily level. Previous research has shown that affective states, such as work engagement (Breevaart et al., 2014), and work performance, such as creativity at work (Amabile, Barsade, Mueller & Staw, 2005; Ohly & Fritz, 2010), fluctuate. These fluctuations can best be analyzed using a diary design (Ohly, Sonnentag, Niessen & Zapf, 2010). Observations at the day level are nested within persons and are therefore best analyzed using multilevel analysis. This technique allows us to more fully understand how gamification operates. Do individuals experience more work engagement on days they create competition? Do employees redesign their work relatively more on resourceful days? And, do employees relatively report more creativity on days where they gamify work? In search of answers to these questions and more, we hypothesize the following.

For personality, we expect personality to be indicative of baseline gamification (*Hypothesis 1*). For the work environment, we hypothesize that daily gamification is positively associated with daily job resources, negatively to job demands, and that the daily positive relationship with job resources is amplified by the presence of job demands (*Hypothesis 2*). For work attitudes, we expect daily gamification to be positively associated with work engagement, negatively with job boredom, and to amplify and buffer the relationship of job demands with engagement and boredom, respectively (*Hypothesis 3*). Finally, we expect daily gamification to be positively associated with daily creative performance directly, and indirectly through work engagement (*Hypothesis 4*).

Method

Participants

The study used a convenience sample. Participants were informed on the goal of the study (i.e., investigating how behavior at work influences work experience) and the procedure. In order to reduce drop-out rates and motivate subjects to participate, a lottery was offered as an incentive in which participants can win a one-day trip to Paris or one of several gift vouchers.

Approximately a week before the daily surveys a general survey that contained trait measures was sent to each participant's email address. Subsequently, from Monday to Friday participants received an email containing the daily questionnaire.

In total, 88 respondents participated in the diary study. The participants had an average age of 32.18 (*SD*=11.13) and tenure of 4.44 (*SD*=5.24). Most were male (53.4%).

Material

The general questionnaire contained questions regarding demographic variables, personality (i.e., playfulness, openness to experience, and conscientiousness) and various trait measures of job resources (i.e., autonomy and skill variety), job demands (i.e., task complexity, time pressure, cognitive demands), gamification, work engagement, and creative performance. For the daily questionnaires we adjusted the time frame of these scales to specifically refer to the activities of that day. For example, the following item of trait work engagement "At work, I feel that I am bursting with energy" is changed to "Today, I felt like I was bursting with energy at work" for day-level work engagement. Some scales were shortened for the purpose of reducing the total length of the questionnaire.

Trait measures

Individual differences

Openness to experience (α=.78) and conscientiousness (α=.55), were measured using subscales of the BFI questionnaire consisting of 19 items developed by John, Donahue & Kentle (1991).

Trait Playfulness (α=.86) was measured using the 5-item SMAP questionnaire developed by Proyer (2012) which is highly correlated with the OLIW playfulness scale (Proyer, 2017). Participants are instructed to rate their rate their habitual actions and attitudes on a 7-point scale (1=strongly disagree, 7=strongly agree). An example item is "I frequently do playful things in my daily life".

Trait job resources

We assessed autonomy (α=.83) and skill variety (α=.71) with 3 items each. These scales were developed by Bakker, Demerouti and Verbeke (2004). Participants had to rate the extent to which these resources affected their work on a 7-point scale (1=strongly disagree, 7=strongly agree). An example item of autonomy is "I can decide how I perform my work" and of skill variety is "I have to do many different things at my work".

Trait job demands

We assessed time pressure and cognitive demands. Time pressure (α=.83) and cognitive demands (α=.82) were measured with 3 items each. These scales were developed by Bakker,

Demerouti, Taris and Schaufeli (2003). Participants had to rate the extent to which these demands affected their work on a 7-point scale (1=strongly disagree, 7=strongly agree). An example item of time pressure is "I have to work very quickly" and of cognitive demands is "My work requires a lot of concentration".

Trait work attitudes and creative performance

Work engagement (α=.94), job boredom (α=.76) and creative performance (α=.86) were assessed with the scales reported in Study 1.

Daily measures

Day level job resources

Daily autonomy (α ranging from .72 to .84, *M*=.79) and skill variety (ranging from .65 to .82, *M*=.75) were measured with the items of the trait level questionnaires that were adjusted to the day-level.

Day level job demands

Time pressure (α ranging from .87 to .93 *M*=.90) and cognitive demands (ranging from .81 to .91, *M*=.88) were measured with items of the trait level questionnaires that were adjusted to the day-level.

Day level gamification

Daily playful work design, play (α ranging from .79 to .88, *M*=.84) and competition (α ranging from .82 to .88, *M*=.86), was measured using adjusted items of the trait level questionnaire.

Day level attitudes and creative performance

Daily work engagement (α ranging from .91 to .95 *M*=.93), daily job boredom (α ranging from .52 to .73, *M*=.83), daily creative performance (α ranging from .87 to .94, *M*=.91) were measured using adjusted items of the trait level questionnaires. Furthermore, we abbreviated the daily job boredom measure to four items, corresponding to the four dimensions.

Strategy of analysis

Observations at the day level (level 1, *N*=398) are nested within persons (level 2, *N*=88) and are therefore best analyzed using multilevel modelling. Multilevel analysis was conducted using MLwin 2.36. To support the use of multilevel modeling we conducted a deviance (–2×log) difference test and calculated the intra-class coefficient (ρ). The results justify a multilevel approach as the use improves model fit, and sufficient variance is located at the day-level for competition (ρ=.67; Δ–2×log=218.80, p<.001), play (ρ=.75; Δ–2×log=304.52, p<.001), work engagement (ρ=.65; Δ–2×log=214.11, p<.001), job boredom (ρ=.75, Δ–2×log=254.07, p<.001), and creative performance (ρ=.56, Δ–2×log=156.81, p<.001).

In the present study we centered level 2 predictors (i.e., playfulness, openness to experience, conscientiousness, and trait measures) around the grand mean and centered level 1 predictors (i.e., daily measures) at the person mean. This eliminates the between-person variance which implies predictors only reflect intra-individual processes. We only used demographic variables (i.e., age and tenure) as controls when they were significantly related to the outcome variable (i.e., for daily competition, daily job boredom)[1]. We further controlled for general tendencies (i.e., trait measures). This allows us to examine associations between day-level fluctuations after taking into account the person's baseline on the respective variable.

Results

Descriptive statistics

The means, standard deviations and correlations between the study variables are presented in Table 4.

Hypothesis testing

Several models were tested to investigate how personality (Hypothesis 1) and features of the work environment (Hypothesis 2) were associated with daily competition and daily play. We controlled for the respective baseline, and demographics (i.e., age and tenure) when they were significantly related to the outcome variable (model 1). This model was then extended with openness, conscientiousness, and playfulness (model 2). Subsequently, we entered features of the work environment (model 3). Lastly, we included the interaction terms of resources with demands (model 4). In line with our hypotheses, Table 4 reveals that openness and conscientiousness were indicative of baseline competition, and openness to experience and playfulness to be indicative of baseline play. These findings support Hypothesis 1.

Next, we extended the model with job resources (i.e., job autonomy and skill variety) and job demands (i.e., time pressure and cognitive demands) for play (Table 5) and competition (Table 6). This improved model fit for competition (Δ–2×log=62.39, p<.001) and play (Δ–2×log=21.54, p<.001). Table 5 reveals that competition was positively associated to daily autonomy (γ=.128, *SE*=.026, p<.001), daily skill variety (γ=.085, *SE*=.029, p=.004), and daily cognitive demands (γ=.064, *SE*=.030, p=.034), but not to time pressure (γ=.031, *SE*=.026, p=.235). Table 6 reveals daily play was positively associated with daily skill variety (γ=.110, *SE*=.028, p=<.001), but not with daily autonomy (γ=.016, *SE*=.025, p=.523), daily time pressure (γ=.029, *SE*=.025, p=.247) or daily cognitive demands (γ=-.044, *SE*=.029, p=.129). Finally, in

[1] The results remain the same when excluding demographical control variables for all hypotheses.

Table 4

Means, standard deviations and correlations among the study variables.

	Mean	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Sex (male)	.54	.50							-.12	-.04	-.04	-.04	-.08	.08	-.26*	-.13	-.17
2. Age (years)	31.87	11.06	.13						-.43**	-.19	.01	-.32**	.02	.10	-.02	-.06	-.06
3. Tenure	4.35	5.23	.08	.70**					-.24*	-.08	.10	-.25*	.02	.16	.09	.11	.06
4. Openness	3.75	.51	.02	-.05	-.03				.24*	.24*	.27*	-.07	.43**	.18	.31**	.13	.12
5. Conscientiousness	3.73	.55	-.11	-.29**	-.20	.19			.18	.17	-.01	.13	.18	-.12	.23*	.26*	.33**
6. Playfulness	4.61	1.22	.07	-.06	-.13	.26*	-.07		.16	.39**	.16	.08	.24*	.12	-.05	.01	-.08
7. Competition	3.48 (3.09)	.47 (.72)	-.17	-.36**	-.30*	.23*	.31**	.14		.60**	.36**	.03	.43**	.14**	.27**	.23**	.25**
8. Play	2.59 (2.26)	.62 (.74)	.04	-.07	-.05	.28**	.14	.43**	.34**		.37**	.06	.49**	.06	.16**	.07	.01
9. Work Engagement	4.89 (4.40)	1.14 (1.24)	.04	.05	.09	.27*	-.03	.09	.25*	.38**		-.34**	.62**	.36*	.43**	.19**	.30**
10. Job Boredom	1.74 (1.53)	.50 (.70)	-.11	-.16	-.24*	.06	.17	.21	-.04	-.02	-.53**		-.17**	-.18**	-.33**	-.35**	-.29**
11. Creativity	5.34 (4.51)	1.06 (1.36)	.02	.22*	.21	.55**	-.05	.21	.32**	.38**	.46**	-.23*		.34**	.42**	.20	.21**
12. Autonomy	5.89 (5.73)	2.05 (1.20)	-.26*	-.12	-.18	.08	.20	-.21	.11	-.11	-.27**	.21*	-.139		.22**	.04	.05
13. Skill Variety	5.37 (5.41)	1.44 (1.12)	.01	-.17	-.06	-.26*	.08	-.14	-.10	-.09	-.17	.09	-.28**	.13		.52**	.60**
14. Time Pressure	5.89 (4.81)	2.07 (1.56)	-.03	-.13	-.05	.07	-.18	-.10	.08	.09	.04	.09	.03	.09	-.10		.66*
15. Cog. Demands	5.94 (5.22)	2.15 (1.33)	.05	-.07	-.14	.05	.09	.03	-.09	.05	-.11	-.05	.02	.26*	.19	.03	

Note. Day-level means and standard deviations are given within brackets. Correlations below the diagonal depict person-level correlations (*N=88*). Correlations between person-level and day-level observations were calculated using the person-mean. Correlations above the diagonal depict day-level correlations (*N=391)*. Cog. Demands = Cognitive Demands.

model 4 we added the interactions between the job resources and job demands. This did not improve fit for competition (Δ–2×log=6.66, p=.311), but did for play (Δ–2×log=15.08, p=.009). This improvement in fit was due to the interaction between cognitive demands and job autonomy (γ=.089, SE=.030, p=.003). Interestingly, the same interaction was significant in model 4 for competition (γ=.065, SE=.031, p=.036). For competition, these findings suggest employees tend to enact these behaviors more on days when job resources (i.e., job autonomy or skill variety) or cognitive demands are present. Moreover, competition appears especially prevalent on days where autonomy as cognitive demands are present. These findings largely overlap with those for play. For play, only daily skill variety and the interaction (i.e., job autonomy × cognitive demands) appear to be important. These findings partially support Hypothesis 2.

Several models were tested to investigate the relationship work attitudes with gamification (Hypothesis 3). First, we entered controls, and the respective baseline (model 1). Next, we added play and competition (model 2). Finally, we extended the model with job demands (model 3) and the interactions between job demands and gamification (model 4). We followed this procedure for estimating daily work engagement (Table 7) and job boredom (Table 8). In line with our hypotheses, model 2 increases fit (Δ–2×log=65.97, p<.001) and reveals competition (γ=.571, SE=.099, p<.001) and play (γ=.382, SE=.111, p<.001) are both positively associated with work engagement. Model fit, however, does not increase when we add the interactions of gamification with job demands (model 3; Δ–2×log=2.086, p=.055). We followed a similar procedure for estimating daily job boredom (Table 9). In line with our hypotheses, model 2 reveals competition (γ=-.283, SE=.067, p<.001) and play (γ=-.160, SE=.075, p=.034) are negatively associated with job boredom. However, when the interactions between gamification and job demands were added to the model, the association of play with job boredom became insignificant (γ=-.131, SE=.070, p=.062). Overall, these findings offer partial support to Hypothesis 3. This constitutes that while gamification enhances work attitudes, gamification does not alter job demands' relationship with work attitudes.

We conducted a series of analyses to investigate whether gamification was directly and indirectly associated with creative performance (Hypothesis 4). First, model 2 in Table 7 shows competition (γ=.571, SE=.099, p<.001) and play (γ=.382, SE=.111, p<.001) are both positively associated with work engagement. Second, table 9 reveals daily work engagement is positively associated with creative performance (γ=.636, SE=.058, p<.001). Furthermore, the association of competition and play decreased, but remained significant, by including daily work engagement as a predictor. This finding indicates the presence of a partial mediation effect. To

Table 5

Multilevel estimates of models predicting daily competition (N=88 persons, N=391 days)

Variable	Null Model			Model 1			Model 2			Model 3			Model 4		
	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Intercept	3.08	0.07	46.01	3.09	0.05	64.40	3.09	0.05	65.77	3.09	0.05	65.77	3.09	0.05	64.48
Age				-0.02	0.01	3.33***	-0.02	0.01	3.17**	-0.02	0.01	3.17**	-0.02	0.01	3.00**
Tenure				0.02	0.01	1.62	0.02	0.01	1.46	0.02	0.01	1.46	0.02	0.01	1.31
Trait Competition				0.77	0.11	6.88***	0.65	0.11	5.84***	0.66	0.12	5.37***	0.66	0.12	5.43***
Openness to experience							0.04	0.06	0.61	0.04	0.06	0.61	0.03	0.06	0.57
Conscientiousness							0.15	0.08	1.80	0.15	0.08	1.80	0.15	0.08	1.84
Playfulness							0.05	0.04	1.24	0.05	0.04	1.27	0.06	0.04	1.39
Daily job autonomy										0.13	0.03	4.92***	0.14	0.03	5.42***
Daily skill variety										0.09	0.03	2.93**	0.07	0.03	2.47*
Daily time pressure										0.03	0.03	1.19	0.03	0.03	1.00
Daily cog. demands										0.06	0.03	2.13*	0.07	0.03	2.29*
Job autonomy × time pressure													-0.02	0.03	-0.81
Job autonomy × cog. demands													0.07	0.03	2.10*
Skill variety × time pressure													0.02	0.03	0.50
Skill variety × cog. demands													-0.03	0.03	-0.84
–2×Log (lh)	628.74			571.85			567.22			503.83			498.18		
Δ–2×Log				56.89***			4.63			62.39***			6.66		
df	1			3		R^2	3		R^2	4		R^2	4		R^2
Day level variance	0.18	0.01		0.18	0.01	0.00%	0.18	0.01	0.00%	0.14	0.01	6.26%	0.14	0.01	53.67%
Person level variance	0.35	0.06		0.17	0.03	35.48%	0.16	0.03	37.38%	0.16	0.03	35.86%	0.16	0.03	46.33%

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Est. = Estimate. *SE* = Standard error. Cog. demands = Cognitive demands.

Table 6

Multilevel estimates of models predicting daily play (N=88 persons, N=391 days)

Variable	Null Model			Model 1			Model 2			Model 3			Model 4		
	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Intercept	2.27	0.07	31.90	2.26	0.05	43.40	2.26	0.05	43.38	2.26	0.05	43.38	2.27	0.05	43.62
Trait play				0.74	0.09	8.63***	0.71	0.10	7.44***	0.71	0.10	7.44***	0.71	0.10	7.46***
Openness to experience							0.07	0.07	1.03	-0.07	0.07	1.03	-0.07	0.07	1.05
Playfulness							0.07	0.05	1.38	0.06	0.03	1.38	0.07	0.05	1.57
Daily job autonomy										0.02	0.03	0.64	0.03	0.03	1.36
Daily skill variety										0.11	0.03	3.93***	0.09	0.03	3.29**
Daily time pressure										0.03	0.03	1.16	0.02	0.03	0.09
Daily cognitive demands										-0.04	0.03	1.52	-0.04	0.03	1.23
Job autonomy × time pressure													-0.03	0.03	1.00
Job autonomy × cog. demands													0.09	0.03	2.97**
Skill variety × time pressure													0.01	0.03	0.07
Skill variety × cog. demands													-0.04	0.03	1.27
–2×Log (lh)	571.44			517.18			514.50			492.93			477.85		
Δ–2×Log				54.26***			2.71			21.54***			15.08**		
df	1			1		R^2	2		R^2	4		R^2	4		R^2
Day level variance	0.14	0.01		0.14	0.01	0.00%	0.14	0.01	0.00%	0.13	0.01	1.62%	0.12	0.01	2.88%
Person level variance	0.42	0.07		0.21	0.04	37.12%	0.20	0.04	38.38%	0.21	0.04	38.02%	0.21	0.04	37.84%

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Est. = Estimate. *SE* = Standard error. Cog. demands = Cognitive demands.

Table 7

Multilevel estimates of models predicting daily work engagement (N=88 persons, N=391 days)

Variable	Null Model			Model 1			Model 2			Model 3			Model 4		
	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Intercept	4.39	0.11	38.82	4.40	0.06	73.33	4.40	0.06	73.35	4.40	0.06	73.35	4.42	0.06	73.60
Trait engagement				0.79	0.05	14.91***	0.79	0.05	14.91***	0.79	0.05	14.91***	0.79	0.05	15.27***
Daily competition							0.57	0.10	5.77***	0.45	0.10	4.48***	0.44	0.10	4.24***
Daily play							0.38	0.11	3.44***	0.40	0.11	3.66***	0.40	0.11	3.63***
Daily time pressure										0.03	0.04	0.79	0.03	0.04	0.77
Daily cognitive demands										0.14	0.05	2.82**	0.13	0.05	2.68**
Competition × time pressure													-0.09	0.12	0.72
Competition × cog. demands													-0.07	0.15	0.49
Play × time pressure													-0.05	0.14	0.34
Play × cognitive demands													0.06	0.15	0.39
–2×Log (lh)	1060.92			949.08	0.05		883.11			866.60			863.92		
Δ–2×Log				111.85***	0.03		65.97***			16.50***			2.69		
df	1			1		R^2	2		R^2	2		R^2	4		R^2
Day level variance	0.54	0.04		0.54	0.03	0.00%	0.43	0.05	6.87%	0.40	0.05	8.37%	0.41	0.03	8.44%
Person level variance	0.99	0.17		0.19	0.05	52.45%	0.21	0.03	50.88%	0.22	0.03	50.56%	0.21	0.05	51.01%

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Est. = Estimate. *SE* = Standard error. Cog. demands = Cognitive demands.

Table 8

Multilevel estimates of models predicting daily job boredom (N=88 persons, N=391 days)

Variable	Null Model			Model 1			Model 2			Model 3			Model 4		
	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*	Est.	*SE*	*t*
Intercept	1.153	0.06	25.85	1.52	0.05	32.26	1.52	0.05	32.36	1.52	0.05	32.34	1.50	0.05	32.04
Age				-0.02	0.01	2.50*	-0.02	0.01	2.50*	-0.02	0.01	2.50*	-0.01	0.01	2.33*
Tenure				0.01	0.01	0.69	0.01	0.01	0.69	0.01	0.01	0.69	0.01	0.01	0.62
Trait job boredom				0.66	0.11	6.25***	0.66	0.11	6.25***	0.66	0.10	6.25***	0.66	0.10	6.31***
Daily competition							-0.28	0.07	4.22***	-0.16	0.07	2.51*	-0.15	0.07	2.27*
Daily play							-0.16	0.08	2.13*	-0.16	0.07	2.33	-0.13	0.07	1.41
Daily time pressure										-0.10	0.03	3.46***	-0.10	0.03	3.56***
Daily cognitive demands										-0.09	0.03	2.69*	-0.06	0.03	2.19*
Competition × time pressure													-0.02	0.08	0.33
Competition × cog. demands													0.14	0.10	1.01
Play × time pressure													0.06	0.10	0.95
Play × cognitive demands													0.10	0.10	1.11
–2×Log (lh)	667.35			635.47			601.36			559.40			542.66		
Δ–2×Log				31.88***			34.11***			41.95***			16.74**		
df	1			3		R^2	2		R^2	2		R^2	*4*		R^2
Day level variance	0.22	0.02		0.22	0.02	0.21%	0.19	0.01	5.00%	0.17	0.01	12.08%	0.16	0.01	12.08%
Person level variance	0.26	0.05		0.14	0.03	24.38%	0.15	0.03	23.33%	0.15	0.03	22.29%	0.15	0.03	22.29%

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Est. = Estimate. *SE* = Standard error. Cog. demands = Cognitive demands.

Table 9

Multilevel estimates of models predicting daily creative performance (N=88 persons, N=391 days)

Variable	Null Model			Model 1			Model 2			Model 3		
	Estimate	*SE*	*t*	Estimate	*SE*	*t*	Estimate	*SE*	*t*	Estimate	*SE*	*t*
Intercept	4.52	0.02	265.94	4.52	0.05	96.19	5.52	0.10	44.32	4.52	0.10	44.33
Trait creativity				0.50	0.10	5.20***	0.51	0.10	5.21***	0.51	0.10	5.22***
Daily competition				d			0.66	0.12	5.58***	0.32	0.11	3.04**
Daily play							0.60	0.13	4.53***	0.36	0.11	3.16**
Daily work engagement										0.64	0.06	10.97***
–2×Log (lh)	1189.40			1165.70			1086.10			985.14		
Δ–2×Log				23.71***			79.64***			100.94***		
df	1			1		R^2	2		R^2	2		R^2
Day level variance	0.80	0.07		0.80	0.07	0.05%	0.62	0.05	10.14%	0.44	0.04	19.73%
Person level variance	1.02	0.18		0.74	0.14	15.45%	0.78	0.14	13.21%	0.82	0.14	11.12%

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. SE = Standard error.

confirm this, we conducted the Monte Carlo Method for Assessing Mediation (MCMAM) which estimates a 99% confidence interval for the indirect effect (Selig & Preacher, 2008). This procedure revealed daily work engagement to be a significant mediator of the relationship of daily competition with daily creative performance (99% CI=0.19, 0.56), and of the relationship of daily play with creative performance (99% CI=0.06, 0.44). These findings support Hypothesis 4.

Discussion and conclusion Study 2

Our second study aimed to investigate how gamification would manifest itself on a daily level. In accordance with Study 1, personality traits (i.e., openness, playfulness, and conscientiousness) were indicative of the general tendency to gamify work. While personality predicted the general tendency, daily job resources and demands predicted the daily level. That is, competition was positively associated with a daily resourceful environment (i.e., autonomy and skill variety) and cognitive demands, but was unrelated to time pressure. Similarly, play was positively associated to daily skill variety, and to the interaction between daily autonomy and daily cognitive demands. This may indicate that gamification is employed when employees feel energized, and that it is independent of workload. Furthermore, gamification appears to be a strategy to remain task focused.

Next, we investigated the consequences of gamification. Gamification was positively associated with daily work engagement and negatively with daily job boredom. Unexpectedly, however, gamification did not amplify or buffer against the relationship of job demands with these work attitudes. Thus, while gamification appears to be a fruitful avenue to boost employee morale, it does appear to affect the relationship of time pressure or cognitive demands with daily work attitudes. It is important to note, however, that further research is needed before a definite conclusion can be drawn. As explained above, our diverse sample of occupations may have weakened contextual effects. Finally, as expected, gamification was directly related to creative performance and indirectly through work engagement. The direct path between gamification and creative performance remained significant when work engagement was included. Just as in Study 1, this implies that other mediators are present.

General Discussion

Research on proactive work strategies and the use of game elements in non-game contexts is flourishing. The present study sought to combine these two lines of research. We aimed to investigate how employees implement game elements into work (i.e., bottom-up gamification).

Therefore, the aim of our study was threefold. First, we defined bottom-up gamification as a work strategy of approaching and reappraising tasks and incidents at work in a game-like manner by creating *competition* and *play*. Second, for the purpose of investigating gamification, we developed a 17-item scale in line with this definition. Third, we investigated how gamification manifests itself on a daily-level.

The results were generally in line with our expectations. As expected, gamification appears to be more prevalent among certain personalities (i.e., openness to experience, playfulness, and conscientiousness) and work environments (i.e., when job resources and cognitive demands are high). Importantly, gamification appears to foster positive work attitudes (i.e., more work engagement and less job boredom) and creative performance. Contrary to our expectations, however, was that gamification did not influence the association of job demands with work attitudes. And, gamification was not inversely related to job demands. Specifically, cognitive demands were positively associated with gamification. Finally, some of the results of the two studies appear to diverge which is probably due to differences in design (i.e., cross-sectional vs. diary) and sample (i.e., students vs. full-time employees).

Theoretical contributions

Personality

Our study extends research on personality by showing *how* personality may translate to behavior in the workplace. In line with expectations, personality was an important determinant of baseline gamification. Openness was positively associated with both dimensions of gamification, which replicates and extends previous research that shows openness is associated with achievement motivation (Busato, Prins, Elshout & Hamaker, 2000), intrinsic motivation to learn (Chamorro-Premuzic & Furnham, 2009), and proneness to fantasize (Costa & McCrae, 1992). Conscientiousness predicted competition, which resonates with studies showing that conscientious individuals set goals regarding their performance (Barrick, Mount & Straus, 1993). Moreover, our findings finding may explain why conscientious and engaged employees perform better, and actively learn (Bakker & Demerouti, 2012). Finally, trait playfulness–the general tendency of reframing events using one's imagination–appears to extend to the workplace. Namely, we found that playfulness was positively associated with play, but not with competition. This may be due the emphasis of playfulness on the use of fantasy, which is evident in play, but not in competition. While personality was an important determinant of the general tendency to gamify, daily gamification was predicted by the day-to-day experience of work.

Work environment

Our study extends research on how the work environment may influence proactive behavior at work. As hypothesized, individuals exhibited competition behaviors relatively more on days where autonomy, skill variety, and cognitive demands were present. Similarly, play behaviors were reported more on days where skill variety was present, and especially when autonomy and cognitive demands were simultaneously present. The importance of a resourceful work environment is in line with previous theoretical (Tims & Bakker, 2010) and empirical (Salavona & Schaufeli, 2008) work on proactivity at work.

The relationship of job demands and gamification was less clear cut. Interestingly, while an inverse relationship was expected, gamification was positively related to cognitive demands, but unrelated to time pressure. More specifically, we expected gamification to be especially prevalent when demands were low. The data, however, indicates that gamification behaviors were employed more often on days where tasks required a lot of attention. Moreover, gamification was independent of workload. It is possible, though, that our diverse sample of occupations diluted the effect of workload.

What does this total pattern of findings imply? One possibility is that employees use both competition as play behaviors as strategies to remain task focused. While the outcome of play and competition–attentional focus–overlaps, their mechanisms to achieve this may differ. Beal, Barros, and Macdermid (2005) suggest that employees' performance critically depends on the regulation of one's attention. They further argue this regulation is, among other things, contingent on task attentional pull (i.e., intrinsic interest, task goals, deadlines) and affective experiences. Competition may facilitate attentional pull by creating intrinsic interest by striving for mastery, setting deadlines, and creating short-term goals. On the other hand, play may achieve this through making employees genuinely curious how their prediction, activity, or story develops. Furthermore, regulating attention through manipulating the affective experience may especially be salient for play.

Beal et al. (2005) further argue that employees can use emotion regulation strategies such cognitive reappraisal or expression-suppression. While both strategies occupy cognitive resources, the former does not appear to be harmful, whereas the latter is (Richards & Gross, 1999; 2000). This finding could explain the seemingly contradictory findings concerning play in Study 1. More specifically, this may explain why play was associated to work engagement when task complexity was high (i.e., through cognitive reappraisal to make work more fun), but was also very prominent when work was appraised as simplistic and below one's

qualifications (i.e., through expression-suppression; inhibiting signs of over emotions). Specifically, that when play is used as a cognitive reappraisal strategy and work is *truly* reappraised as more fun, benefits follow. On the other hand, when play is used to suppress expressions, resources are constantly depleted, negative outcomes occur. In other words, play should be used to up-regulate positive emotions, opposed to down-regulate negative emotions.

Interestingly, when we inspect baseline correlations of Study 2 as in Study 1, most of the results are replicated. Namely, gamification appears to be related to personality, but largely unrelated to the work environment and negative work attitudes. This stresses the importance of using a daily design when investigating daily work strategies, such as gamification.

Work attitudes

Our study further contributes to literature on proactive work strategies and their relationship to work engagement (Bakker, 2017) and also contributes to the relatively scarce literature on job boredom. As expected, employees tend to experience higher levels of work engagement and lower levels of job boredom on days that they gamify their work. In a similar vein, studies have found that job crafting is positively associated with work engagement (Tims, Bakker & Derks, 2013) and negatively with job boredom (Harju, Hakanen & Schaufeli, 2016). Contrastingly, the mechanism *how* enhanced attitudes are achieved by job crafting and gamification may actually differ. Whereas job crafting focuses on changing the *actual* work environment (i.e., taking on extra tasks, approaching colleagues for support), gamification focuses on the *experience* of the work environment (i.e., making work more fun, partitioning tasks). Thus, while activities are altered through job crafting, they remain the same for gamification.

This may explain why gamification did not moderate the relationship of job demands with work attitudes. Possibly, through competition and play, employees optimize the experience of job demands (i.e., through creating an optimum amount of challenge to remain task-focused) and minimize the negative experience of job demands (i.e., through making tasks more fun to do). Thus, the experience of job demands mays actually mediate the effect of gamification on work attitudes. This assertion is in line with the JDR model (Bakker & Demerouti 2007; 2014). Investigating this would prefer an alternative phrasing of questions regarding the experience of job demands. Namely, instead of asking whether job demands were present, the question should focus on the experience of the job demand (e.g., “to what extent were you bothered by today’s workload?”, “to what extent did you enjoy today’s tasks”). To recapitulate, we argue that while

the work environment may determine the use of gamification, gamification may fuel engagement through reappraising job demands.

Creative Performance

Finally, our study contributes to literature on employee creativity. Namely, we found gamification to be associated with creative performance both directly as indirectly through work engagement. This finding corroborates previous research that found proactivity at work to be associated with creative performance through work engagement (Demerouti, Bakker & Gevers, 2015). The partial mediation we found, however, indicates that other mediators are present. While a full discussion of these mediators is beyond the scope of this article, we would like to briefly discuss a few of the mediators we consider important. Three mediators may explain the direct relationship between gamification and creative performance; cognitive resource allocation, mastery, and challenging work.

Creative performance depends on available cognitive resources (Amabile, 1997). Hence, an important underlying mechanism may be effective *cognitive resource allocation*. Through the use competition and play, employees may remain more fully task-focused by creating an intrinsic interest in the task, in turn enhancing creativity (Amabile, 1997). On the other hand, competition may serve creativity by retaining cognitive resources mastery. This would imply that more cognitive resources remain available for creative processes. This proposition is in line with previous work which shows routinization–automaticity in work–enhances creativity (Ohly, Sonnentag & Pluntke, 2006). Finally, competition may serve creativity through creating challenging work. Challenging work has been theorized to promote creativity (Amabile, Conti, Coon, Lazenby & Herron, 1996), an assertion corroborated by research (Ohly & Fritz, 2010).

Limitations and future research

The current research has some limitations that should be acknowledged. Our first study consisted of students and employed a cross-sectional design which may have distorted relationships. We also mentioned that the difference between our samples may be explained by the importance of work. Hence, it may be interesting to investigate whether task significance moderates the association of work strategies with work attitudes. Task significance may determine how play is used. Namely, as a mechanism to escape from work or immerse more fully into work. However, it also important to note that the main purpose of Study 1 was to develop the PWD scale, and that we used a representative sample of full-time employed incumbents in Study 2.

Second, we only used self-reports of creative performance. Future research would benefit from other-rated performance measures. Finally, the work context may be important for gamification. Therefore, the use of a heterogeneous sample may have deflated true relationships. Future research may reveal that gamification is especially effective in certain occupations. On the other hand, this sample makes our results generalizable to a larger population. In short, future research may address these limitations by using supervisor-ratings of creative performance and by sampling a single company.

In addition to these limitations, it may be interesting to investigate how gamification is related to, the aforementioned mediators (i.e., experienced challenge, mastery, resource allocation), personal resources, and thriving. Personal resources refer to positive core self-evaluations such as self-efficacy, hope, optimism (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2007). These resources operate, just as gamification, on a cognitive level. Hence, gamification may especially be effective in accruing personal resources. Moreover, competition may specifically enhance self-efficacy and hope through mastery. In addition, gamification may fuel thriving–a sense of vitality and learning–as individual agentic work behavior that promotes task focus and exploration, following the social embeddedness model of thriving (Spreitzer, Sutcliffe, Dutton, Sonenshein & Grant, 2005).

Practical implications

Taken together, our findings suggest gamification may be a viable strategy to enhance the experience of work, and subsequently improve creative performance. While personality was an important determinant of the general tendency of gamification, the work environment was determined its daily use. Employers should therefore seek to stimulate gamification by designing a resourceful and challenging work environment. Furthermore, employers could look for open and conscientious individuals during the selection procedure. Another viable option is to provide employees with training on how to enact gamification. Ultimately, these strategies should increase work engagement, decrease job boredom, and enhance creative performance. It should be noted, however, that gamification should not be used as a remedy for a poorly designed work environment or as an alternative to other proactive work strategies. We argue employees and employer's benefits most when gamification is used complementary to top-down design, and other proactive work strategies such as job crafting.

Conclusion

Can game elements produce joy in non-game contexts? And how are game elements transferred effectively? In our thesis, we argued for a bottom-up approach. Gamification appears to be an apt strategy to create joy in the workplace. While this serves to make tasks intrinsically rewarding, this joy should relate to other benefits such as increased performance and well-being. Hence, joy in the workplace is not only important to the employee, but also to the employer. Thus, the need for gamification is urgent, because its enjoyment makes it a need.

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