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Article

Competition and Digital Game Design: a Self-Determination Theory Perspective

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Abstract

Although competition is a common feature of digital games, nuances of when and why aspects of competition influence players' motivation and well-being have been surprisingly underexplored, especially through the lens of self-determination theory (SDT). In this critical review, we: (1) describe how a mini-theory of SDT, cognitive evaluation theory (CET), can help predict when and why aspects of competition will alternatively satisfy or frustrate basic psychological needs in digital games with downstream effects on players' motivation and well-being; (2) apply the Motivation, Engagement and Thriving in User Experience (METUX) model to outline ways competition in digital games can influence motivation and well-being at multiple levels; and (3) prioritize future research directions. Finally, we argue that digital games, given their diversity, adaptability and massive reach, represent an especially powerful context for studying competition, motivation and well-being.

RESEARCH HIGHLIGHTS

- This critical review integrates self-determination theory (SDT)-guided models and research related to HCI, sports psychology and well-being supportive design to advance understanding of competition in digital games.
- Introduces a new taxonomy of competition relevant to SDT and digital games, including macro-level categories, general elements and specific features.
- Presents a competition and digital gaming specific cognitive evaluation theory (CET) model linking different aspects of competition in digital games to basic psychological need satisfaction and frustration, motivation, health and well-being.
- Applying the METUX model, we map out ways researchers and game makers can think about aspects of competition in digital games at multiple levels or spheres of influence.
- Prioritizes future directions for research, specifically related to experimentally manipulating digital feedback and digital representations of self and others in digital games.

Keywords: *self-determination theory; intrinsic motivation; competition; well-being supportive design; METUX model; user experience*

1. INTRODUCTION

Broadly, competition involves comparing one's performance against one or more others' and striving to outperform them. It is featured, often centrally, in many games and can take many forms. For example, performance relative to others, also referred to as normative feedback, is sometimes self-evident (as in a synchronous race); other times, games deliver and highlight normative feedback using features or design elements like leaderboards (a rank-ordered list) and scoreboards of various types. In his book, *Man, Play and Games*, Roger Caillois (2001) argued that competition is one of the four fundamental types of play.

In the context of human-computer interaction (HCI), competition is a common feature of many digital games. This includes competition-promoting features in digital games that are: (i) required, opt-in or opt-out; (ii) ranging in complexity and stakes; (iii) ranging from single-player and two-player to massive multi-player; and (iv) intended purely for entertainment or to promote learning or health. Despite the ubiquity of competition-promoting design features in a diversity of digital games, research on their effects with respect to players' motivation and well-being remains surprisingly underexplored. Reviewing the extant research literature reveals that findings are complex, mixed and sometimes appear contradictory.

Self-determination theory (SDT), a macro theory of motivation and well-being (Ryan and Deci, 2019; Ryan, 2023), has been applied to help understand competition in numerous contexts, including: amateur and professional sports (Vallerand, 2007), analog puzzle games (Reeve and Deci, 1996), sedentary video games for entertainment (Deci *et al.*, 1981; Sepehr and Head, 2018; Velez *et al.*, 2018), digital games for learning (Nebel *et al.*, 2016) and

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digital games for health (Song *et al.*, 2013). Findings regarding competition's influence on motivation and well-being in this cross-contextual literature are also complex and mixed. Often, however, SDT-guided research has found that, to the extent that competition distracts attention from the game itself, or frustrates basic psychological needs, it tends to undermine intrinsic motivation and well-being (Deci *et al.*, 1981; Vallerand *et al.*, 1986; Fortier *et al.*, 1995; Reeve and Deci, 1996; Song *et al.*, 2013). SDT identifies three basic psychological needs associated with both short- and long-term wellbeing (Vansteenkiste, Soenens, & Ryan, 2023, p. 85), the needs for: (i) autonomy ("the experience of volition, willingness, and authenticity in one's actions, thoughts, and feelings"), (ii) competence ("the experience of effectiveness and mastery"), and (iii) relatedness ("the experience of warmth, bonding, and care" when feeling "connected to significant others"). Taking an especially strong position, social scientist Alfie Kohn, drawing on SDT and hundreds of studies on competition across different contexts, especially education, concluded the effects of competition are overwhelmingly negative (need frustrating; poorer quality motivation, learning and well-being) and should generally, if not always, be avoided (see Kohn, 1986/1992: *No Contest: The Case Against Competition*). By contrast, psychologists David Shields and Brenda Bredemeier, also drawing on SDT and reviewing hundreds of studies on competition in sports, concluded that different types or aspects of competition can alternatively promote intrinsic or extrinsic motivation and be characterized as healthy or unhealthy for individuals and society (see Shields and Bredemeier, 2009; *True Competition: A Guide to Pursuing Excellence in Sport and Society*). The most recent reviews of this literature by SDT co-founder, Rich Ryan and Johnmarshall Reeve similarly concluded that associations between aspects of competition, motivation and well-being are complex, and can be positive or negative (Reeve, 2023b; Ryan and Reeve, 2024). However, as the title of Reeve's (2023a) chapter makes clear, the influence of competition, as understood using an SDT lens, tends to be negative ('*Competition can enhance motivation – but typically undermines it*'). In this article, we explore the complex ways that different aspects of competition can operate in digital games, specifically, to promote either intrinsic motivation and well-being or extrinsic motivation and ill-health at multiple levels.

2. SDT AND COMPETITION IN DIGITAL GAMES IS UNDEREXPLORED

Surprisingly, to date, this complex literature on competition, motivation and well-being has not been well applied or explored in the context of digital games, theoretically or empirically. To illustrate this point, a recent, high-quality review of SDT in digital games research reported on 110 CHI and CHI PLAY papers that cited SDT (Tyack and Mekler, 2020), yet this systematic review included zero references or guidance related to competition. After independently reviewing the extant literature on SDT and digital games, we confirmed that the lack of references to competition was not a shortcoming of Tyack and Mekler's (2020) review, but an accurate reflection of published work in this area—to this point, few studies have applied SDT to account for the effects of competition in digital games.

This is surprising because digital games are an especially important context for studying competition. First, with the rise of the internet and personal digital devices, there has been overwhelming shift from 'analog' to digital games, such that the digital sphere is now a dominant setting within which people play and compete. Digital games are played by billions of people and the global digital games industry now produces more revenue than the global movie and North American sports industries combined (Witkowski, 2021). Second, digital games open new possibilities for gameplay and for competition, including through linking players with new partners and integrating algorithmic adjustments that can change the dynamics between players, alter the degree of difficulty or challenge and provide detailed ongoing information about performance. This broadening of the design space stands to potentially adjust the experience of competition. Third, these dimensions of digital gameplay can be systematically manipulated with relative ease, which allows for experimental investigation of the effects of competition-related features. Finally, reflecting digital games' massive popularity, the datasets generated through digital gameplay can be unusually large, as well as rich (e.g. by leveraging passively collected digital traces and telemetry and longitudinally). Assuming these data are used ethically and with appropriate consideration of players' privacy and consent (Kröger *et al.*, 2023), this combination of factors presents an important research opportunity to understand implications of competition for motivation and well-being, in digital games and in general.

3. WELL-BEING SUPPORTIVE GAME DESIGN

Well-being supportive design represents a relatively new wave of HCI research, characterized by a focus on 'ethical' or alternatively 'responsible' design, a central tenet of which involves considering and measuring users' well-being across multiple levels or spheres of influence and understanding how design choices can be applied to amplify well-being and minimize harm. As noted by Peters and Calvo (2023), HCI work on ethical and well-being supportive design is informed by older, more well-established clinical and biomedical ethics framework (Beauchamp and Childress, 2019; Besel and Williams, 2023), the four pillars of which are: (i) support well-being, (ii) do no harm, (iii) support human autonomy and (iv) support justice. Importantly, well-being and autonomy are also central concepts in SDT.

Within this ethical/responsible design movement, work led by Dorian Peters and others has centered principles from SDT. Work incorporating SDT into well-being supportive design considers how technologies have the potential to support or thwart the satisfaction of basic psychological needs at multiple levels (D. Peters *et al.*, 2018a, 2020; D. Peters, 2022; D. Peters and Calvo, 2023): (i) adoption, (ii) interface, (iii) task, (iv) behavior, (v) life and (vi) society. It is through the lens of both SDT and well-being supportive design that we seek to articulate here a critical review of how aspects of competition are used in digital games, reviewing what is known, how competition-specific models can be applied to digital games and identifying underexplored questions for future research.

As we extend here an exploration of well-being supportive technology design to well-being supportive *game* design, we will center examples from a subcategory of games that are purposely designed to promote well-being, i.e. games-for-health (G4H). Centering G4H research is helpful in so far as research on G4H has historically been more likely to measure players' well-being as a primary outcome. Further, given that the target audience for G4H is often members of vulnerable groups (e.g. those with chronic health conditions or recovering from a medical procedure), risk for 'harm' is elevated, warranting even greater attention to well-being supportive game design. This said, we believe the framework we outline here for understanding the influence of aspects of competition and related game features on motivation and

well-being can be applied to all manner of games, in so far as designers care about players' well-being.

4. COGNITIVE EVALUATION THEORY AND COMPETITION

Within the larger framework of SDT, cognitive evaluation theory (CET) is the oldest of six sub-theories (or mini-theories; Reeve, 2023a). CET was developed to explain the influence of external events (e.g. receiving a reward or winning a competition) on intrinsic motivation, and later, on different forms of extrinsic motivation and well-being. CET posits that the cognitive evaluation or 'functional significance' of external events can be simultaneously interpreted as informational, controlling and/or amotivating to varying extents. This functional significance, in turn, determines whether the event supports or thwarts a person's basic psychological needs, which in turn determines the person's motivation and well-being, with need satisfaction promoting intrinsic motivation and well-being and need frustration promoting controlled motivation and ill-being.

Informational competition vs. controlling competition. A recent chapter by Ryan and Reeve (2024) outlined applications of CET for understanding competition, in general, across a wide variety of contexts (in classrooms, work settings, in sports and in games). Ryan and Reeve organized their chapter by centering the five formal proportions of CET, mapping how different 'elements' of competition relate to each proposition across contexts. Here we highlight two macro-level categories of competition derived from Ryan and Reeve: *informational competition* and *controlling competition*. These two macro categories include over a dozen individual elements of competition that are collectively referred to as informational and controlling 'competitive sets.' Ryan and Reeve then outline a series of CET-guided hypotheses that emphasize how informational elements of competition will tend to increase intrinsic motivation and well-being, whereas controlling elements of competition will tend to decrease intrinsic motivation and well-being (promoting poorly internalized extrinsic motivation or amotivation, and ill-health, instead). The net effect of a particular combination of competitive elements (i.e. a competitive set) on motivation and well-being is understood to be a function of which elements (informational vs. controlling) are most salient to players. Ryan and Reeve's general framework and elements of competition are summarized in table form in Appendix A. Where applications to elements of competition were supported by empirical research on digital games, those studies are highlighted and cited in the table.

Considering the need for relatedness. It is noteworthy that, although SDT identifies three basic psychological needs, CET originally focused on two of three needs, autonomy and competence and only later elaborations of CET include consideration of relatedness (Ryan, 1982; Reeve, 2023a). The reasons for this evolution of CET seem to have been both pragmatic and parsimonious. Research on CET began by focusing on the influence of extrinsic rewards on intrinsic motivation for *solitary activities*. Solitary activities lend themselves to simpler, cleaner experimental designs relative to interpersonal activities, a pragmatic rationale for starting there. Furthermore, with consideration of parsimony, autonomy and competence experiences appear relevant to all activities (solitary and interpersonal), but relatedness experiences appear most relevant to a smaller subset of activities that are interpersonal.

More recent elaborations of CET make clear that the need for relatedness is also relevant in the context of interpersonal activities (Reeve, 2023a), and competitions, specifically (Ryan and Reeve, 2024); see formal proposition 4 in Appendix A. Nevertheless, a review of published studies applying SDT and CET to competition in digital games reveals that the need for relatedness has frequently been ignored. For example, in one of the pioneering studies exploring competition in games-for-health and intrinsic motivation conducted by Song *et al.* (2013), only competence and autonomy were considered. This pattern wherein SDT- and CET-guided studies of digital games have frequently ignored relatedness need satisfaction (by not measuring or discussing it) was also evidenced in Tyack and Mekler's (2020) systematic review of SDT in HCI games research, where competence was most frequently discussed (85%), autonomy less (65%) and relatedness least (57%). Sepehr and Head's (2018) study on 'understanding the role of competition in video game satisfaction', focused exclusively on competence need satisfaction (perceived challenge), ignoring autonomy and relatedness. We seek to reinforce here that—despite getting less empirical attention in SDT-guided game research—relatedness need satisfaction and frustration dynamics can be crucial in digital games (Tyack and Wyeth, 2017), especially games involving competition.

True competition vs. decompetition. One of the most well developed models of competition and well-being was authored by sports psychologists David Shields and Brenda Bredemeier. Interestingly, this model of competition in games (sports) integrates research on SDT and centers interpersonal elements and relatedness experiences. In their 2009 handbook, *True Competition: A Guide to Pursuing Excellence in Sport and Society*, Shields and Bredemeier differentiated between two macro-level categories of competition: true competition and decompetition. They point out that the etymology of the word 'competition' originates from the Latin word 'competere', which means 'to strive together' or 'strive with.' As such, they refer to situations where competitors are engaged in a contest as partners whose goals are to push each other in the pursuit of learning and mastery as *true* competition. Sheilds and Bredemeier directly connect true competition with SDT, positing that true competition is a facilitator of intrinsic motivation and well-being. By contrast, the term *decompetition* ('striving against') is defined by competitors engaged in a contest as enemies whose goals are domination and conquest, i.e. the pursuit of superiority. Decompetition is understood to undermine intrinsic motivation, promoting controlled motivation instead (specifically introjected and external forms of regulation) and ill-being. Table 1 summarizes the ways true competition and decompetition are differentiated in terms of basic metaphor, motivation, goals, view of opponent, regulation, playing and winning and the ideal contest. Although traditional, in-person athletic sports are games (and e-sports are digital games), research from sports psychology is rarely cited in the HCI and digital game literature. We believe the true competition versus decompetition distinction can be better integrated with SDT models and offers significant value for guiding future digital game design and research efforts.

Considering aspects of competition in digital games at multiple levels. Influential conceptualizations of competition inspired by SDT, and reviewed above, have considered aspects of competition at multiple levels of granularity (Shields and Bredemeier, 2009; Ryan and Reeve, 2024), including: macro-level categories, general elements and specific game features. To help integrate different SDT-guided conceptualizations, we outline here a new taxonomy of aspects of competition, summarized in Table 2. *Specific features* represent the most concrete, numerous and narrowly defined level of this taxonomy, often mapping onto a single psychological need or 'facet' of a single psychological need. As such,

TABLE 1. Competition and Decompetition (Reproduced with permission from Shields and Bredemeier, 2009, Table 3.1)

	(True) Competition *Striving with*	**Decompetition *Striving against***
Basic Metaphor	Partnership	Battle or war
Motivation	Love of the game Shared enjoyment	Use of the game Thrill (at opponents' expense)
Goals	Learning and mastery Pursuit of excellence	Domination and conquest Pursuit of superiority
View of opponent	Partner or enabler	Obstacle or enemy
Regulation	Rules are imperfect guides to fairness and welfare Officials are facilitators	Rules are partially tolerated restraints Officials are the opponents
Playing and winning	Focus is on process (contesting)	Focus is on outcome (winning)
Ideal contest	Balanced opposition Tension, drama, story Play and seriousness in balance Positive emotions predominate	Dominated contest Certainty of outcome Seriousness overshadows play Negative emotions predominate

TABLE 2. A Multi-level Taxonomy Outlining Aspects of Competition in Digital Games

Macro-categories of competition	

• Need supporting competition
  ○ Informational competition
  ○ True competition
	• Need thwarting competition
	  ○ Controlling competition
	  ○ Decompetition

General elements of competition	
• Task-involving and relationship-supportive interpersonal climate	• Ego-involving and status-centric interpersonal climate
• Perceived optimal challenge	• Suboptimal challenge
• Winning	• Losing
• Positive effectance feedback	• Negative effectance feedback
• Positive effectance expectancies	• Negative effectance expectancies
• Goal: Attain effectance information	• Goal: Win-at-all-costs
• Task involvement	• Ego involvement
Some specific features of competition (examples)	
• Handicapping	• No handicapping
• Team/intergroup competition	• Individual competition
• Many leaderboards grouped by skill level	• One leaderboard for all
• Taunting discouraged	• Taunting encouraged
• Knowledge sharing encouraged	• Knowledge sharing discouraged
• Ability to opt-in or opt-out of other specific features of competition	• Required engagement with other specific features of competition

the effects of specific game features are posited to have relatively small effects on motivation and well-being to the extent that any digital game might have many specific game features related to competition, each varying in salience. Specific game features are nested within more abstractly defined *general elements on competition*, which tend to map onto supporting or thwarting one or more psychological need. Finally, general elements are nested within *macro-level categories of competition*, which map onto a holistic experience of competition as either supporting or thwarting of all three psychological needs.

One of the primary takeaways from our review was that, at the macro-level, several overlapping categorical labels have been used in the SDT-guided literature to describe competition that either supports or thwarts basic psychological need satisfaction. Ryan and Reeve (2024) used the terms informational and controlling competitive sets, from which we derived informational and controlling macro-level categories of competition; these categorical labels emphasize competence and autonomy, respectively. However, Ryan and Reeve (2024) made clear that relatedness is also very relevant when defining informational and controlling competition. Shields and Bredemeier (2009) used the terms true competition and decompetition to describe macro-level categories of competition; those categorical labels emphasize relatedness. However, Shields and Bredemeier (2009) clarified that competence and autonomy are also very relevant when defining those categories. Ryan and Reeve (2024) and Shields and Bredemeier (2009) both used SDT as a framework, and both differentiated macro-level categories of competition as either supporting or thwarting basic psychological needs, ultimately linking these categories of competition to health versus ill-health, respectively. As such, to facilitate integrating these two SDT-guided lines of research on competition, we propose at the top of our taxonomy a third set of macro-level terms, *need supporting competition* and *need thwarting competition*.

Quantity vs. quality. Importantly, these converging SDT-guided literatures on macro-categories of competition (Shields and Bredemeier, 2009; Ryan and Reeve, 2024) each made explicit that these distinctions reflected differences in quality, and are not associated with quantitity or intensity. That is, people can be intensely motivated by either need supporting or need thwarting competitions.

Handicapping as example. Next, to help illustrate the multi-level nature of our taxonomy, we offer as an example one specific feature of competition common in digital games, *handicapping* and explain how it can be understood as nested within larger units of analysis, including general elements and macro-level categories. Various competition handicapping systems essentially assign advantages or disadvantages to different contestants to equalize the chances of winning. This feature of competition is especially common in recreational sports (e.g. golf and bowling). In digital games, handicapping can be achieved and optimized in many ways. For example, in racing-type games, the top speed or handling of a vehicle might be adjusted to give less experienced players competitive advantages, or players might start the race

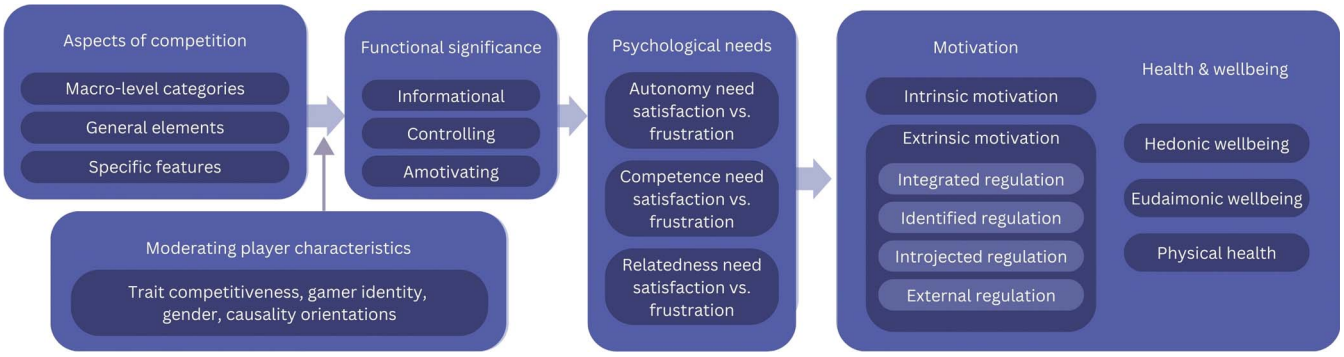

FIGURE 1. Conceptual path model.

at different positions on the same track or course (affording less experienced players a head start). In combat-style games, the characters or avatars offered to less experienced players might be capable of inflicting or absorbing more damage requiring that more experienced players use better skills and strategies to win. Handicapping is a 'specific feature' that promotes several 'general elements', including *perceived optimal challenge* (vs. sub-optimal challenge) and *the goal of attaining effectance information* (vs. to just win). As a function of promoting those elements of competition, it follows that handicapping will tend to support the three overlapping macro-categories of competition referred to as *informational* (vs. controlling competition), *true* (vs. decompetition) and *need supporting* (vs. need thwarting competition).

Cognitive evaluation theory and competition. With this multi-level taxonomy of aspects of competition in digital games defined, we move onto placing aspects of competition into a conceptual CET path model that links aspects of competition in digital games to functional significance, need satisfaction or frustration and outcomes like motivation and well-being (see Fig. 1). According to this path model, we expect that the specific feature of handicapping will typically result in greater psychological need satisfaction, more intrinsic motivation and higher well-being.

Moderating player characteristics (individual differences). When predicting how players will experience and respond to different aspects of competition in digital games, it is also helpful to consider that individual differences exist, including personality traits, demographics and social identities. Player characteristics appear at the bottom left corner of Fig. 1, as moderators of associations between aspects of competition and their functional significance. Past research on SDT and CET has found that several individual differences moderate how people interpret many types of external events and respond in terms of intrinsic motivation and well-being. A subset of these moderators have been identified by studies of competition in games, specifically. Song *et al.* (2013) assessed general trait competitiveness and found competition in a digital game benefited highly competitive participants while undermining the intrinsic motivation of less competitive participants. A large cross-sectional survey study by Neys *et al.* (2014) explored Gamer Identity Strength (i.e. hardcore gamers, heavy gamers, or casual gamers) and found that hardcore gamers reported being more intrinsically motivated by competition as a means to get competence need satisfaction, while casual and heavy gamers reported being more intrinsically motivated by competition as a means to get relatedness need satisfaction. Deci *et al.* (1981) found that**,** in general**,** competition undermined intrinsic motivation for a puzzle game, but more so for women.

Within SDT, the trait construct that has been most studied is referred to as *causality orientation*. See Koestner and Levine (2023) for an overview of causality orientation theory (COT), one of the six mini-theories that make up SDT. Causality orientations are understood as relatively stable characteristic adaptations to socialization that indicate how people will orient toward environments, including game environments. COT distinguishes between three orientations: autonomy orientation, controlled orientation and impersonal orientation. People with a high autonomy orientation seek out choices and experience their behavior as self-initiated; people with a high controlled orientation tend to seek out controls and to interpret their environment as controlling; people high in impersonal orientation are often overwhelmed by their environment. Hagger and Chatzisarantis (2011) found those with high controlled orientation experienced more undermining of their intrinsic motivation after receiving a reward. In a parallel way, causality orientation likely moderate the influence of aspects of competition on intrinsic motivation in digital games, i.e. those with high controlled orientation may experience more undermining when need thwarting aspects of competition are introduced. Controlled orientation has also been positively correlated with dehumanizing others and with aggression (Moller and Deci, 2010), consistent with relatedness need frustration. A related study by Vansteenkiste *et al.* (2010a) found in the context of a competitive soccer league that controlling talk from coaches (an aspect of competition) led to greater dehumanization of opponents, which in turn was associated with lower player well-being and higher rates of anti-social behavior directed toward opponents, referees and even teammates.

5. APPLYING THE MULTI-LEVEL METUX MODEL TO COMPETITION AND WELL-BEING SUPPORTIVE GAME DESIGN

In 2018, Peters, Calvo and Ryan introduced the Motivation, Engagement and Thriving in User Experience (METUX) model—the first overarching, multi-level model integrating SDT into the technology user experience. By centering 'thriving' as a critical outcome, the METUX model is also an important instance of the growing well-being design movement in HCI, and a review by Burr *et al.* (2020, p. 2325) referred to METUX as 'the most comprehensive framework for evaluating digital well-being to date.' The METUX model provides a framework for considering how diverse technologies can be experienced as either need satisfying or need frustrating at six different levels or 'spheres' of technology experience: (i) adoption, (ii) interface, (iii) task, (iv) behavior, (v) life and (vi) society. Further, it allows for the possibility of parallel or contradicting experiences at different levels. Although, to the best of our knowledge, this has not been done before, the METUX model can be

applied to both organize past research findings and generate new testable hypotheses related to aspects of competition in digital games. Table 3 summarizes themes and METUX-guided hypotheses at all six levels. Below, we elaborate on each level, in turn.

Adoption. At the adoption level, digital games are marketed in various ways, with particular aspects of competition and gameplay highlighted or deemphasized to varying extents. A marketing campaign that highlights a player or their avatar standing in triumph over a defeated opponent may orient players not only to competition, but more specifically to dominance and decompetition. Digital games frequently allow current players to invite peers to play with them (e.g. by sharing a link or promo code). Characteristics of those invitations can vary considerably, emphasizing different aspects of competition and influencing players' experiences during game adoption. Players' experiences in the adoption sphere are also influenced by expectations based on past experiences with a video game franchise, publisher, or theme. For example, many video games are simulating real-world contexts that feature deeply ingrained norms related to competition, e.g. popular video game simulations of traditional in-person professional sports leagues (NBA 2K, FIFA 22, Madden NFL, EA Sports UFC, etc.). Other popular digital games are based on well-established narratives from other media (films, novels) or historical events that can color players' expectations and experiences related to competition during the adoption phase. For example, prospective players encountering a soccer (European football) simulation video game title based on the fictional television series, Ted Lasso (which promoted need supporting competition), might experience the adoption of that video game very differently than an alternative soccer simulation, like FIFA 22, based on a real-world professional league with a different set of competition-related norms. For a complementary empirical analysis of themes identified from the paratexts on covers of top-selling video games, see Oliva *et al.* (2018), and for an overview of SDT-guided research in marketing contexts, see Gilal *et al.* (2019).

Interface. Within digital games, the interface level refers to how players engage with and experience controllers and the game's digital display. The design of digital game interfaces varies in many ways that can make competition and comparisons with other players more (or less) salient. For example, historically, many digital games have required players to view a single leaderboard (top scores) at the end of each session. These leaderboards can be segmented to reflect different levels of experience (e.g. expert level vs. novice level), or different sizes and qualities of player pools (e.g. by displaying only the top 10 vs. 1000s of players), with each design choice influencing players' experience. An interface designed to promote need supporting competition might, in addition to displaying information about other players' performance, also offer opportunities to *learn* from other players' performance (e.g. by providing links from leaderboards to tutorial-oriented streaming platforms featuring tips from players). Streaming tutorials are especially common for many competitive multiplayer video games, such as Apex Legends, Counter-Strike: Global Offensive, Fortnite and League of Legends. However, game interfaces vary in how effectively they link players with high-quality skill-based streaming or other player-produced tutorials. For a recent review on different motivations and forms of viewer engagement with videogame streaming, see El Afi and Ouiddad (2021).

Task. Within the task sphere of digital games, aspects of game tasks or missions invited or required during gameplay can include various specific features of competition. In this sphere especially, digital game designers have tremendous latitude to directly manipulate specific features of competition and study their impacts on motivation and well-being (e.g. using optimization designs). We previously discussed handicapping, which operates in the task sphere, and determines how individuals' performance is translated into relative ranking. By virtue of promoting optimal challenge, handicapping is expected to support competence need satisfaction, more intrinsic motivation and higher well-being. Digital games can also define tasks or missions as requiring individual or intergroup competition. Research by Tauer and Harackiewicz (2004) found that intergroup competition was consistently associated with higher levels of intrinsic motivation and performance relative to individual competition. An SDT account for this pattern is that intergroup competition provides more opportunities for cooperation and relatedness need satisfaction among teammates.

Behavior. At the behavior level, some digital games are designed for the sake of entertainment only and promote relatively value-neutral behaviors, such as gameplay or relaxation. Other digital games are designed to promote behaviors that players could more deeply endorse as valuable or personally meaningful (e.g. games that promote learning, healthy behavior change, energy conservation, or citizen science). In those later cases, a player could feel basic need satisfaction (e.g. for autonomy) at the behavior level, even while contradictorily feeling neutral or relatively controlled by features of the game's interface or tasks. To illustrate this, we offer research conducted by members of our team designing and testing a digital exergame called *Fantasy Sports for Health* (Moller *et al.*, 2014; Keeney *et al.*, 2019). Traditional versions of the category of digital games collectively called "fantasy sports" are sedentary and involve competition based on players' ability to predict the future performance of professional athletes (value-neutral behaviors). Fantasy Sports for Health involves competition based on both predicting the performance of professional athletes (value-neutral behavior) and meeting individually calibrated physically activity goals (value-positive behavior). In pilot studies, participants consistently reported that they preferred the version of fantasy sports that promoted physical activity. Although these studies lacked power to interpret this finding in greater depth, one METUX-derived hypothesis is that adding a value-positive behavior to this competitive game made it more enjoyable because it increased support for autonomy need satisfaction at the behavior-level.

Games can also vary in terms of encouraging formal and informal communication between players (a category of game-related behavior). Indeed, Kniffin and Palacio (2018, p. 353) argued that "the ways in which players talk to each other are among the more colorful but understudied dimensions of competition." Many players regard 'trash talk' (putting down or making fun of other players) during competition as either part-of-the-game or as an informal game-within-a-game (Kowert, 2020). Data related to communication between players can be relatively easily recorded within digital games and analyzed using digital tools (e.g. using automated natural language processing) offering many opportunities for game designers and researchers. An SDT-guided research hypothesis in this sphere is that need supporting aspects of competition will tend to promote more affiliative trash talk and humor, whereas need thwarting aspects of competition will tend to promote more hostile trash talk and humor. Digital game makers guided by SDT might consider experimenting with specific features of competition that encourage affiliative communication styles and/or sanction hostile communication styles.

TABLE 3. Using the Motivation, Engagement and Thriving in User Experience (METUX) Model to Consider and Direct Future Research on Competition in Digital Games Across Multiple Levels or Spheres of Influence

Levels/Spheres of Influence	Themes related to competition in digital games at each level	Examples of speculative hypotheses to illustrate applications at each level
(i) Adoption	• Marketing of digital games that promote different aspects of competition. • Backstories (e.g. digital games adapted from other media sources or historical events) that include different aspects of competition.	• Marketing that highlights need supporting competition (two players shaking hands) will be associated with greater intrinsic motivation and well-being relative to marketing that highlights decompetition (one player standing over another, taunting them)
(ii) Interface	• Affordances of the game controller and digital display can directly promote different aspects of competition. ○ Leaderboards can display normative performance feedback anonymously and privately or identifiably and publicly to a wide audience. ○ Leaderboards and other features of a game's digital interface can offer informational feedback to varying degrees.	• Playing a digital game that allows players to have options with regard to how leaderboard information will be presented (if at all) will be associated with greater intrinsic motivation and well-being. • A digital leaderboard that promotes opportunities for learning from other players will be associated with greater intrinsic motivation and well-being than one that does not.
(iii) Task	• Digital games can define tasks or missions that promote different aspects of competition, or no competition at all (e.g. single-player mastery-oriented games or cooperative games).	• Playing digital game that define tasks in terms of intergroup competition or cooperation will be associated with greater intrinsic motivation and well-being relative to playing comparable games that promotes individual competition.
(iv) Behavior	• Digital games can incorporate competition related to a range of bodily movements or behaviors that vary in terms of being personally meaningful or valuable to players (e.g. tapping buttons vs. health-promoting moderate-to-vigorous physical activity).	• Playing a digital game that promotes a valued behavior (e.g. physical activity or learning) will be associated with greater intrinsic motivation and well-being relative to playing a comparable game that promotes behavior purely for the sake of entertainment or relaxation.
(v) Life	• Long-term exposure to different forms of competition in digital games may result in cross-context and cross-activity generalization, e.g. from simulated driving to real-world driving, or from within-game social interaction styles to outside-game social interaction styles.	• Months of playing digital games that promote need supporting competition will be associated with higher relationship quality relative to months of playing comparable games that promote need thwarting competition.
(vi) Society	• Long-term exposure to different forms of competition in digital games may result in cross-context and cross-activity generalization that have implications for how communities manage limited resources. • Coordinated efforts across digital game publishers can include using aspects of competition to promote targeted society-level impact (e.g. the UN organized Playing for the Planet Alliance and Green Game Jam events[2])	• Communities whose members are exposed to digital games that promote need supporting competition will experience higher collective well-being and manage limited resources more equitably (e.g. support for policies advancing environmental sustainability and a strong social safety net) relative to communities whose members are exposed to otherwise comparable games that promote need thwarting competition. • Green Game Jam events designed to promote need supporting competition among game makers will tend to produce digital games that promote need supporting competition among game players, resulting in more positive societal and environmental impact

Life. The life sphere captures psychological need satisfaction and frustration beyond immediate use. To facilitate consideration of research questions at the life sphere level, we offer readers speculative hypotheses related to digital games designed to simulate situations frequently encountered outside of gameplay. To illustrate, simulated auto racing is a popular theme for video games (e.g. Forza, Need for Speed, Grand Turismo and Burnout), and it simulates an activity many players regularly perform in life outside of gameplay (e.g. driving to work). To the extent that need thwarting competition is encouraged by the design of a digital game, this might encourage a need thwarting competition orientation outside of gameplay, with implications for players' well-being and physical safety in the life sphere. Striving to win a digital racing competition by weaving through simulated traffic could subtly encourage or condition some players to view driving to work as a race to be won or lost. Going deeper, a digital racing game that promotes need thwarting competition, specifically, may especially encourage players to drive in ways that are antisocial (e.g. intentionally obstructing other drivers' progress or ability to merge, just for the sake of 'winning' or establishing dominance), promoting dangerous, real-life conflicts. These are speculative, but testable hypotheses directly inspired by the METUX model and SDT research on motivational transfer, also referred to as cross-context and cross-activity generalization (Vansteenkiste *et al.*, 2010b). Although it is noteworthy that hypotheses linking simulated violence in digital games to real world aggression have not been well-supported (Przybylski and Weinstein, 2019), simulated driving is a behavior that parallels real-world driving

especially closely and with frequent opportunities for action, and associations between simulated auto racing games and risky real-world driving behavior have been identified in several studies (Fischer *et al.*, 2007; Stinchcombe *et al.*, 2017).

Looking across contexts, researchers applying the METUX model could also explore whether digital games promoting different aspects of competition influence interpersonal relationships outside of gameplay. For example, a decompetition orientation promoted by a favorite digital game might undermine relationship quality with friends and family if players come to see their friends and family as competitors to be defeated or dominated in a zero-sum game of life. For example, 'he who dies with the most toys wins' was a popular bumper sticker slogan because it captures a sentiment many people endorse, that we are all engaged in a life level competition with material wealth (an extrinsic aspiration or life goal) as the yardstick for judging winners and losers. Other extrinsic aspirations identified by research on SDT include gaining fame and normative standards of physical beauty. Life level competition can also involve abstract standards, like competition for respect or esteem among peers, a form of controlled motivation SDT researchers refer to as *ego involvement*, and link to more fragile, contingent forms of self-esteem and lower well-being (Moller *et al.*, 2006; van der Kaap-Deeder *et al.*, 2016). Regardless of the standard used, when people view their friends and family as competitors in the game of life, especially through the lens of need thwarting competition, they are less likely to take pleasure from their friends and family's achievements, robbing them of a well-being promoting and relationship strengthening process called *capitalization* (B. J. Peters *et al.*, 2018b).

Society. Finally, we can consider the potential effects of competition in digital games at the society or population level, beyond the experience of individual users. This includes consideration of how billions of people playing digital games that alternatively promote need supporting or need thwarting competition may impact population-level wellbeing. Population-level wellbeing has been consistently associated with how groups manage and share resources, including natural resources (resulting in environmental threats to the planet and many armed conflicts), housing, education and health care. Furthest removed from game play, the society sphere is the most speculative and difficult level of analysis to study. However, we note that scholarship on competition is rich with discussion of implications at this level. The absolute objections of Alfie Kohn to encouraging competition at all levels and in all contexts are partially rooted in his concern for societal harm (Kohn, 1986/1992: *No Contest: The Case Against Competition*). Similarly, the sports psychologists David Shields and Brenda Bredemeier made explicit right in the title of their seminal handbook that they see these dynamics playing out beyond sport, at the wider society level (*True Competition: A Guide to Pursuing Excellence in Sport and Society*). Checkpoint Magazine is an interactive online publication entirely dedicated to '*the impact of gaming on society and culture.*'

Finally, at the societal level, the important work of policymaking is often understood as a (political) competition, taking various rule-based form, and often led by individuals with especially strong orientations toward competition. To the extent that policymakers are often gamers, game makers may wish to consider whether they want policymakers playing games that orient them toward need supporting or need thwarting forms of competition. Readers interested in pursuing research on how of aspects of competition in digital games may influence outcomes at the societal level are encouraged to review Rigby's (2023) chapter in the Oxford Handbook of SDT ('Flourishing in digital environments: The case for self-determination theory as a beneficial framework for individuals, industry and society') and later chapters in the handbook section titled 'The self in society.'

Measuring aspects of competition, motivation and well-being at multiple levels. Another important contribution of the METUX model involved mapping specific, well-validated measures related to basic psychological needs, motivation and well-being at these six levels or spheres of analysis.[1] It is also worth noting that several SDT measures have been developed for the digital game context, specifically. Our review of the extant research literature related to digital games and competition revealed some researchers have relied on scales developed for other (non-digital gaming) contexts and/or older scales that lack the best available granularity (e.g. excluding relatedness need experiences, or assessing need satisfaction only without also assessing need frustration).

The first validated and most cited measure applying SDT to digital games was the Player Experience of Need Satisfaction (PENS) scale (Ryan *et al.*, 2006). Other digital game specific SDT-measures include the Gaming Motivation Scale (GAMS), which assesses types and subtypes of player motivation (Lafrenière *et al.*, 2012; Johnson *et al.*, 2018), the Player Experience Inventory (PXI; Abeele *et al.*, 2020) and miniPXI (Haider *et al.*, 2022), which are tailored to provide insights for game developers, and the Ubisoft Perceived Experience Questionnaire (Azadvar and Canossa, 2018). Recent scholarship by Ballou *et al.* (2024) has focused on validating measures of both psychological need satisfaction and frustration in video games (Basic Needs in Games Scale; BANGS), an important consideration highlighted in our conceptual model. Finally, the Basic Psychological Need Satisfaction for Technology Use (BPN-TU), represents another suitable option for HCI researchers working with digital games and other interactive digital technologies (e.g. digital voice assistants, chatbots and social robots) where aspects of competition might be considered; it assesses satisfaction of users' needs for autonomy, competence, relatedness to others and also relatedness to technology, and has been validated in English and German (Moradbakhti *et al.*, 2024).

Aspects of competition can also be measures at multiple levels or spheres of experience, though it is most frequently assessed at the trait level (or life sphere). At the trait level, the widely used Competitiveness Orientation Measure (Newby and Klein, 2014) includes four subscales of trait competitiveness (dominant competitiveness, competitive affectivity, personal enhancement competitiveness, and general competitiveness). Dominant competitiveness, defined as a trait-level desire for superiority (e.g. 'I like to be better than others at almost everything.'), represents one level of need thwarting competition. *Personal enhancement competitiveness*, defined as a trait-level desire to self-improve through competition (e.g. 'I can improve my competence by competing'), represents one level of need supporting competition. More research is needed validating and using measures that differentiate aspect of competition at other levels or spheres of experience.

[1] A collection of those measures with references, items, and scoring instructions can be found on the regularly updated Center for Self-Determination Theory website: https://selfdeterminationtheory.org/questionnaires/

6. FURTHER OPPORTUNITIES FOR RESEARCH ON COMPETITION IN DIGITAL GAME DESIGN

Not only can SDT-guided HCI research on competition help designers and game publishers create better digital games—that is, digital games that promote players' well-being at multiple levels—but it is also the case that digital games represent an ideal context for studying competition and advancing SDT, in general. Before highlighting several additional research directions that we consider especially interesting, it is worth noting some of the reasons why digital games represent uniquely powerful research playgrounds. As noted earlier, the (i) number and diversity of people and (ii) collective hours of human engagement dedicated to digital gameplay are impressive. Recent estimates are that 3.2 billion people played video games in 2022, projected to reach 3.6 billion by 2025; (Newzoo Global Games Market Report, 2022). Digital games have the potential to collect massive data sets both actively (via automated, integrated survey prompts) and passively (via telemetry). Digital games can also be altered either by the game publishers themselves or by 3rd parties given access to dashboards or mod engines. This facilitates the potential for conducting high-fidelity experiments, a distinction that stands in contrast especially to traditional analog games, like chess or athletic sport competitions, which are often rigidly bound to specific rules and features, limiting researchers' freedom to conduct experiments. Recently, scholars have begun discussing at a meta-level both the power and challenges of using digital games for rigorous theory testing and theory-building research (Zendle *et al.*, 2022; Ballou, 2023) and building partnerships with large digital game publishers to facilitate ethical data sharing (Johannes *et al.*, 2021; Vuorre *et al.*, 2023). For example, Vuorre *et al.* (2023) collaborated with FuturLab to collect data on player behavior (15 million events), enjoyment based need satisfactions (300 k survey responses), and well-being (200k survey responses) recorded before and during video game sessions. Their protocol, data, code and codebooks were all subsequently made freely available on the Open Science Framework.

Competition-related digital feedback. One important difference between studying competition in digital versus analog games is the relative potential for delivering different feedback to different players, especially as a function of their relative performance in competitions. Whereas performance feedback in analog games typically directs all players' attention to the same normative information (e.g. a common scoreboard), digital games can tailor the qualities and timing of performance feedback for winners and losers differently to maximize need satisfaction and minimize need frustration. This unique feature invites multiple opportunities for future research at the intersection of HCI and SDT.

Straight-forwardly, features in digital games can support autonomy need satisfaction by offering players opportunities to tailor the salience of normative feedback to their preferences (e.g. opting in or out of seeing a leaderboard) or by tailoring who players compare themselves with. For example, the gamified digital learning app *Duolingo* tailors normative feedback by grouping and regularly re-grouping peers onto weekly peer leaderboards that include only peers with similar levels of recent engagement to help promote competition perceived as optimally challenging (a general element of competition consistent with need supporting competition). At the end of each week, the top 3 Duolingo users in each league move up to a higher league; this is referred to as an 'infinite league' of leaderboards (O'Brien, 2023).

Well-being supportive digital game design might include not only task and performance feedback, but also feedback related to emotion regulation from digital sensors (e.g. heart rate variability). SDT-guided research on emotion regulation supports the hypothesis that need supporting competition will be more conducive to healthier (integrative) emotion regulation, while need thwarting competition will be more conducive to less healthy (suppressive) emotion regulation and dysregulation (e.g. of anger; see Benita, 2020). Research that experimentally adds or removes these and other forms of feedback in digital games using optimization designs is a promising direction for well-being supportive game design.

Specific features of competition predicted to promote need supporting competition might encourage players to learn from their opponents in a variety of ways. For example, to support achieving an optimal level of challenge, digital leaderboards could provide a player with tips from an opponent that has outperformed them by a small margin. In some digital games, it may be possible for a player to watch recorded split-screen clips to distinguish when and how their in-game choices deviated from an opponent ranked just ahead of them on a leaderboard. Recent research using computational models suggests that individually tailored gaming tips could also be automated and delivered in real-time, even by nonplayer characters. In one study, a conversational agent offered human-like explanations or strategic rationales for decisions it made while playing the digital game *Frogger* (Ehsan *et al.*, 2019). An exciting direction for future research would involve adapting this technology to support players seeing other players and nonplayer characters as resources to learn from instead of adversaries to dominate or be dominated by, consistent with need supporting competition.

Digital games could also be designed to support compensatory psychological need satisfaction, such as relatedness need satisfaction during a moment when players' competence need is frustrated by competition. We hypothesize that competitive settings generally, and moments following a loss especially, may heighten people's sensitivity to experiencing relatedness need satisfaction or frustration (Moller *et al.*, 2008). To illustrate, following his team's 41–38 overtime loss to Florida State in 2021, Notre Dame head football coach Brian Kelly remarked: '*our entire team needs to be executed after tonight.*' This remark illustrates the potential for competitors who lose to experience relatedness frustration in the form of love withdrawal, or even hostility, from important relationship partners. Although virtual fans or teammates can deliver relatedness need support at any time, we suspect relatedness need support following competitive loses (competence need frustration) may be especially satisfying. Conversely, social rejection (relatedness need frustration) following competitive loses may be especially painful. Feedback tailored to the winners of digital games might emphasize competence need support, while also encouraging compassion for opponents. Research by Adachi and Willoughby (2011) demonstrated that competitive aspects of some digital games, not violent content, predicted players' subsequent aggressive behavior. However, the ways that aspects of competition are highlighted could very well moderate that association. Przybylski *et al.* (2014) suggested that narrative and motivational features are 'key to understanding the potential of competitive gaming scenarios to foster social isolation, player alienation and possibly aggression' (p. 454). SDT research in other contexts has shown that treating others poorly (e.g. gloating, belittling, taunting) can harm both the target and the perpetrator (Legate *et al.*, 2013), suggesting that winning with grace could be mutually beneficial for everyone involved. Digital games researchers

have proposed encouraging pro-social interactions by moderating communication channels and promoting positive norms (Seering *et al.*, 2017); however, this work has not yet extended to rigorous experimental tests or considered how aspects of competition, specifically, shape those social interactions.

Digitally representing the self and others in competition. A second important difference between studying competition in digital versus analog games is the potential for: (i) representing the self digitally, and (ii) competing against a wider range of digitally represented competitors (human and automated), with each significantly increasing the variability of design controllability and psychological experience for players. These aspects of competition operate at the interface and task level of the METUX model. For example, within digital games, representing oneself in avatar forms that are strategically different from one's true self may help protect against ego threat. By contrast, players who represent themselves in avatar forms that closely match their offline identities (as many players do; see Lin and Wang, 2014) may be more vulnerable to feeling controlled by ego threats during competition.

In addition to race and sexual orientation, another important social identity that can be represented by avatars in digital games is gender (Malkowski and Russworm, 2017). On this note, there are numerous ways that gender and competition intersect in the context of digital games. For example, although contemporary measures of masculinity and femininity explicitly recognize that different cultures and subcultures hold different standards (Thompson Jr. and Bennett, 2015), older measures, like the Sex Role Inventory (Bem, 1974), included 'competitive' and 'dominant' as gender-stereotypical traits associated exclusively with masculinity. Looking across contexts, competition scholars have suggested that need thwarting orientations toward competition (e.g. dominant competitiveness) are sometimes associated with traditional masculine gender norms and social identification (Kohn, 1986). Within digital gaming, issues related to gender-based anti-social behavior have also been well documented (Cote, 2020). Meanwhile, rates of loneliness have been rising especially among men (Buecker *et al.*, 2021; Reeves, 2022). While the issues of loneliness and gender-based discord are likely influenced by many factors, we believe experimental research into how different aspects of competition may contribute to both could be studied with uncommon rigor in the context of digital games. Specifically, future research could test whether exposure to digital games designed to encourage need supporting competition helps reduce both loneliness and gender-based discord, especially among men.

7. CONCLUSION

The primary aims of this paper were to articulate the value of prioritizing more rigorous SDT-guided HCI research and thoughtful design consideration of competition in digital games. After reviewing related SDT literature with special attention to effects on players' health and well-being, we proposed a new taxonomy outlining aspects of competition that integrated two complementary approaches, Ryan and Reeve's (2024) distinction between informational and controlling aspects of competition and Shields and Bredemeier's (2009) distinction between true competition and decompetition. Next, we explored how this taxonomy could be applied to both CET and METUX frameworks to guide future research and well-being supportive game design. Finally, we offered some high priority areas for future research. The specific hypotheses presented here, however, represent just a fraction of those that could be generated using these frameworks.

In the future, we hope to see new research on aspects of competition in digital games exploring these issues with the highest levels of empirical rigor, including: (i) more collaborations between HCI researchers and game publishers, (ii) larger, more diverse samples, (iii) use of longitudinal and experimental optimization designs, (iv) use of combined self-report and telemetry measures and (v) greater adherence to best practices for open science. We hope game designers reading this paper will think carefully about which aspects of competition they choose to encourage, and how their own histories of socialization may color competition-related assumptions and design choices. In closing, we look forward to entering a new period of creative dialogue and combinatory play with other SDT-HCI researchers and game makers interested in competition and well-being supportive design.

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Appendix A

Application of CET's Five Formal Propositions to Competition according to Ryan and Reeve (2024).

TABLE 3. Using the Motivation, Engagement and Thriving in User Experience (METUX) Model to Consider and Direct Future Research on Competition in Digital Games Across Multiple Levels or Spheres of Influence

CET's Five Formal Propositions	Applications of CET Proposition to Competition
1. *External events vary in how supportive of autonomy or controlling they are. The more controlling the event is (or is perceived to be), the more likely it is to frustrate autonomy, undermine intrinsic motivation and promote external regulation. The more non-controlling and autonomy supportive the event is, the more likely it is to maintain intrinsic motivation.*	Elements of competition that tend to be experienced as more *controlling* include: • Internal or external pressure to win • Promoting winning as the primary goal • Competitively contingent rewards, tangible or symbolic, especially when high value/stakes
2. *External events vary in how informational they are. Informational events are those that communicate or aid one's sense of effectance. The more informational the event is, the more likely it is to satisfy competence needs and enhance intrinsic motivation. The more the event communicates ineffectance, the more likely it is to frustrate a sense of competence, undermine intrinsic motivation and promote amotivation.*	Elements of competition that tend to be experienced as more *informational* and *communicate effectance* (vs. ineffectance) include: • Feedback and competitive outcomes are positive and effectance-relevant (vs. negative or absent information), e.g. when winning (vs. losing) • Optimal challenge: players are well-matched in terms of skill; opportunities for leveling up and challenge regulation
3. *External events have three aspects—a controlling aspect, an informational aspect and an amotivating aspect. The relative salience of these three aspects determines the 'functional significance' of the event, or how that event will affect the person's intrinsic motivation. Events salient as informational enhance intrinsic motivation, those salient as controlling or as conveying incompetence undermine it.*	Elements of competition that influence the *relative salience* of controlling, informational and amotivating aspects of an event, include: • The distribution and amount of competitively contingent rewards (e.g. all-or-none and high value rewards increase controlling aspects) • How scores are posted and evaluated (e.g. salience of headlines, rankings, leaderboards, private communication; (Hanus and Fox, 2015) • Avatar customization options; choice in character crafting support autonomy; dynamic challenge regulation, points for 'heroism' support competence (Peng *et al.*, 2012)
4. *Interpersonal contexts vary with regards to how controlling, autonomy supportive, or amotivating they are. Autonomy-supportive interpersonal contexts enhance basic psychological need satisfactions and intrinsic motivation. Controlling and amotivating social contexts frustrate people's basic psychological needs and undermine intrinsic motivation.*	Elements of competition related to *interpersonal context* include: • Relationship qualities (e.g. warmth, secure attachment style) with managers, coaches, leaders, teammates, competitors • Communication styles (e.g. word choices, tone, prosody) • Competition-contingent regard
5. *Intrapersonal events vary in how internally informational, internally controlling, or internally amotivating they are. Internally informational events enhance intrinsic motivation by facilitating autonomy and competence, whereas internally controlling events undermine intrinsic motivation by frustrating autonomy; and internally amotivating events undermine intrinsic motivation by frustrating competence.*	Elements of competition related to promoting *intrapersonal events* that are relatively internally informational, internally controlling, or internally amotivating, include: • Ego-involvement or motivation driven by competition-contingent self-esteem is internally controlling. • Self-talk (inner speech, internal dialogue, verbal rehearsal) can include inner praise or self-encouragement (informational), self-pressuring or self-attacking talk (controlling), or self-blaming or self-neglecting talk (amotivating).