

# Designing for Bodily Play Experiences Based on Danish Linguistic Connotations of “Playing a Game”

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## ABSTRACT

Designing for bodily play in HCI is increasingly gaining attraction, including research on the experiential dynamics leading to that. Within this research, however, there has been little investigation into the differences between bodily playing and bodily gaming and associated implications for design. This paper investigates such differences and proposes an understanding derived from the Danish linguistic connotations of the four different combinations of bodily “playing/gaming” a “play/game”. We exemplify these through four different examples and extract four strategies for designers to implement in their future bodily designs. With our work, we hope we are able to expand the range of diverse bodily play and game experiences within HCI.

## CCS CONCEPTS

• Human-centered computing ~ Human Computer Interaction (HCI) ~ HCI theory, concepts and models • Human-centered computing ~ Interaction Design ~ Interaction Design Theory, Concepts and Paradigms

## KEYWORDS

Bodily play, movement-based game, play design, game design, embodiment, design methods

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## 1 Introduction

There is a growing interest in HCI around designing for bodily play (e.g. [7,34,43,46,49,59,63–65,88]), together with the development of guidelines, lenses, tactics and frameworks for

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such experiences, often described under the terms body-centric games, movement-based games, exertion games, or exergames (e.g. [46,47,60,61:10,67–70,72]). Alongside this development, there is a growing interest within the game culture literature on the phenomenon called play and the relation to game experiences and design (e.g. [14,44,78,83,84]). While several scholars [8,12,19,54,75,83,86] have proposed an account of the experiential differences between the two phenomena of play and game, little such focus has yet been given to the implications for bodily play in HCI. We believe that such investigations can bring novel perspectives on the experiential dynamics in bodily play and game experiences and subsequently further our design knowledge. Concretely, we are interested in bodily play, in particular, bodily play experiences, and how to design for it.

In this article, we build on the fact that it is an established practice in HCI to draw on other languages to understand technologically-augmented experiences, e.g. [44,62,66]. Here, we look at the Danish language to understand the difference between four different combinations of “playing/game-ing” a bodily “play/game”. The phrase “playing a game” translates in Danish into two different versions; *at lege en leg* and *at spille et spil*. Where the English language only has play as verb (except “the play” for theatric performances) and game as noun (except “to game the system”, but this is a different context). The Danish language, in contrast, has play and game as both verbs - *at lege* (to be “playful”) or *at spille* (to be “gameful”) - and nouns - *en leg* (a “play”<sup>1</sup>) or *et spil* (a game). We believe

## Danish Correlations of “Playing a Game”

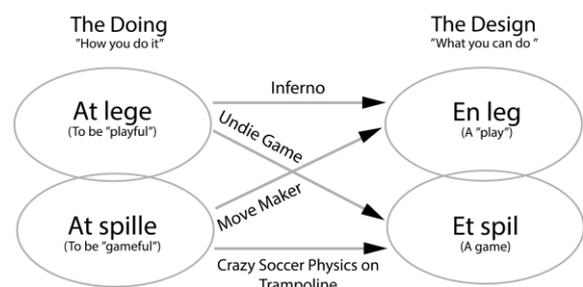


Figure 1: The different combinations of play and game as both verbs and nouns forming different bodily play and game experiences.

<sup>1</sup> This is not similar to the English “theatre play”, but the noun correlating to “being playful”.

that this offers some valuable nuances in the conception of play and game that are different from the English use of the words. This is important to highlight, we find, as although bodily play is played across the world, English is the predominant language of scientific papers within HCI and hence can influence our understanding of bodily play from a narrow perspective.

The Danish connotations of playing a game reveal two ways of playing and two types of games – making up four different correlations (figure 1): The commonly understood correlations of playing a game; *at lege en leg* (to be “playful” in a “play”) and *at spille et spil* (to be “gameful” in a game). When we switch the verbs and nouns, we reveal two additional correlations; *at lege et spil* (to be “playful” in a game) and *at spille en leg* (to be “gameful” in a “play”). This allows us to ask the questions: What can these four linguistic correlations of playing a game (in a bodily experiential perspective) tell us about bodily play and game experiences? Moreover, how can we address these when we design for bodily play and game experiences?

To answer these questions, and in order to be able to construct the four perspectives of “playing a game”, we first investigate the differences between the two verbs as a doing; *at lege* (to be “playful”) and *at spille* (to be “gameful”). We then investigate the two nouns; *en leg* (a “play”) and *et spil* (a game) - in the form of designable structures. From these investigations, we explain the four perspectives and demonstrate them through examples. We use these to draw out four strategies for designers to implement in their designs. As our focus is on bodily play experiences, we conduct our investigations from a bodily experiential perspective informed by phenomenological [21,30,51,94,95] and postphenomenological [31,32,77] theories of perception, bodily movement [81,82] and action [71,89] in combination with play and game theories [8,19,27,84,86].

We use the Danish connotations of “playing a game” in combination with theoretical ideas of bodily perception and movement to build the four perspectives of bodily play and game experiences. We regard the results as residing within the methodology of the bridging concept [11].

We intend this paper for game design scholars interested in bodily play and game experiences either in the form of practical design guidance or to use for analysis of such experiences and the corresponding designs.

In the next section, we go through prior contributions of bodily (play) experiences within HCI and how our work is related to those. In order to do so, we turn to different areas; experiential perspectives on bodily play, bodily interaction design, and play versus game within the HCI community, as well as experiential perspectives on computer games.

## 2 Previous Investigations of Experiential Perspectives to Bodily Play and Interaction Design Within HCI

Within the field of experiential accounts of bodily play sits the work by Mueller et al. [53,54,55], who highlight in their work that it is essential to unpack the bodily play experience. We learn from this work that such unpacking is essential, and like them, we begin by unpacking it into two separate, but interconnected aspects. The authors unpacked the notion of the human body into two perspectives (Körper / Leib), which

is useful to understand the overall experience but does not yet help us understand the difference between game-ing and playing in bodily play experiences. Berthouze [4] also investigates bodily play experiences by examining the role of body movement for player engagement and develops an engagement model. Berthouze provides essential knowledge of the bodily play experience from a physiological perspective on cognitive and emotional processes but does not cover the differences between game-ing and playing for the bodily play experience.

Within studies of the experiential account of interaction design, Svanæs [88] examines design implications through the lens of Merleau-Ponty’s “Phenomenology of Perception” and demonstrates how technology can become an integral part of our body schema, while Loke and Robertson [43] contribute with the “moving” and “making strange” design methodology. While these contributions unpack experiential factors for action and interaction with technology, we still need to link such perspectives with experiential factors of game-ing and playing in order to get an understanding of the experiential factors to bodily play and game.

As one of the few contributions within HCI concerning the differences between play and game (but not specific to *bodily play*), Lucero et al. [44], examine playful versus gameful design. The notions of playful and gameful are the closest understanding to the Danish *at lege* (to be “playful”) and *at spille* (to be “gameful”). They draw on Caillois’ “paidia/ludus” dichotomy [8] for their work, while we extend these perspectives with a linguistic understanding to derive implications for design as structures.

Within play and game studies, Keogh examines the embodied player experience and develops two player characters: The hacker, who is in charge of the system, and the cyborg, who becomes one with the system across bodies and worlds [38]. Keogh refers to embodied experiences in general, while we refer to bodily experiences in particular. We look specifically at bodily play and game experiences in which bodily perception and movement are fundamental for the experience. We turn to phenomenology and postphenomenology to understand how we create meaning in bodily play and game experiences through bodily perception and movement. In this understanding, perception is active [71], and so we perceive the world through movement [81]. We use the following understandings of bodily meaning-making in our analysis of examples of designs and also later in the presented design strategies. However, before explaining these theoretical concepts from which we draw our understanding of bodily meaning-making, we go through our methodology for doing so.

## 3 Our Knowledge Contribution as Bridging Concepts

As mentioned in the introduction, we regard the presented descriptions of the Danish correlations of “playing a game” as residing within the methodology of the bridging concept as introduced by Dalsgaard and Dindler [11]. Bridging Concepts, as intermediary knowledge contributions, serve as translations of existing theoretical ideas or perspectives into design concepts through accompanying examples. We use the Danish connotations of “playing a game” in combination with

theoretical ideas of bodily perception and movement from phenomenology and postphenomenology to build the four perspectives to bodily play and game experiences.

From the accompanying examples, we extract design strategies. We chose the examples because of their specific design qualities to demonstrate our arguments. Also, we have personal experience with these as either designer, an audience, or players [17]. We present the design strategies as generative resources and, as such, these should be assessed on their generativity in combination with the designer's design practice [17].

#### **4 Meaning-Making through Bodily Perception and Movement as our Basis for Understanding Bodily Play and Game Experiences**

Within postphenomenology (building on phenomenology), Ihde explains how we bodily make sense of the world through micro- and macroperception: microperception deals with internal bodily perception as the basis for bodily meaning-making, whereas macroperception refers to how bodily meaning-making is influenced perceptually by the social and cultural dimensions of our lifeworld [32,77]. Bodily meaning-making is a process of both macroperception and microperception [32,77]. We explain these theoretical concepts in the following sections. We begin by discussing microperception in regards to bodily play and game:

A microperceptual perspective of bodily play and game experiences is that players create meaning from the designed bodily game mechanics in the form of *kinetic joy rides* (see below), these are sequences of movements [81] that the players are ready to do [71]. We argue that players are ready to do different movements when they *leger* (are “playful”) or *spiller* (are “gameful”) than they would do in other situations. The macroperceptual perspective of bodily play and game experiences are explained afterwards.

##### **4.1 Microperception: Bodily Meaning-Making from Kinetic Joy Rides and Enacted Perception**

Sheets-Johnstone links movement with play and points out how meaningful movement is not constituted by separate movements but as a sequence of movements in a kinetic dynamic – “a sequence of sensations felt as a whole, a process, as an entire experience,” which she terms a kinetic joy ride [81]. Sheets-Johnstone puts forth the idea that we perceive the world through movement as a repertoire of “I can’s” [80,81] drawing on Husserl’s idea of “I can’s” as our bodily capabilities [30,94]. These arguments also build on theories of bodily perception as pre-reflective knowledge from Merleau-Ponty.

To Merleau-Ponty, bodily perception is the foundation for our understanding of the world as a pre-reflective consciousness; before thought becomes a thought, our body has already sensed and interpreted the action [50,51] into bodily knowledge. Moreover, we bodily perceive the world through our senses [51]. Continuing Merleau-Ponty’s thoughts, Nöe explains bodily knowledge to entail action; perception is not passive, but enacted [71]: “*What we perceive, is determined*

by *what we do*, (or what we know how to do); it is determined by what we are *ready to do*.” [71]. Hence, we argue that in the pursuit of the kinetic joy rides offered in *en leg* (a “play”) or *et spille* (a game), players are ready to do other sequences of movements than they would otherwise do in other situations. However, the kinetic joy rides that we are ready to pursue are also formed by whether we prefer *at lege* (to be “playful”) or *at spille* (to be “gameful”). We further link these arguments to the examples and later design strategies in later sections.

While kinetic joy rides and enacted perception form part of our internal processes of bodily making sense of the world, bodily perception also involves social and cultural factors. Hence, we next explain how these factors influence bodily perception.

##### **4.2 Macroperception: Bodily Meaning-making from Social and Cultural Perception**

Our ability to *at lege* (to be “playful”) or *at spille* (to be “gameful”) is also based on social and cultural relations. As such, macroperception as the ability to perceive social and cultural contexts is concerned about external processes of bodily perception. Ihde explains this notion in terms of perceiving various dimensional perspectives in images [32]. He argues that in such images, we can decode cultural and social dimensions. As a further explanation of this, we turn to phenomenologists Moran [58] and Gallagher & Zahavi [21], who explains how we are social and cultural about something that joins us socially and culturally in our activities. Within our bodily play terminology, we further contrast this referring to Suits [86], who tells us that play is always relative to something. In the following section, we examine this something as the object for perception, which in this paper also refers to *en leg* (a “play”) and *et spille* (a game).

###### **4.2.1 The Design as Object for Perception**

The structures of *en leg* (a “play”) and *et spille* (a game) allows for certain kinetic joy rides that unfold as either *at lege* (to be “playful”) or *at spille* (to be “gameful”). Bodily perception is always relative to something [15,21]. When we play, it is relative to play and game as objects – or objects constituted for play and game. As Suits argues, we always play with something, an excess resource be it food, time, nature, etc.: “*play is concerned with a use of resources for which those resources were not initially intended, where the original allocation was for instrumental activities and the new allocation is for autotelic activities*” [86]. Critical voices might say: “*but what about toys, then? Are toys not resources initially intended for play?*” The short answer is yes, with one explanation that toys are already excess resources initially designed for autotelic activities (play). What we are hinting at here is not a discussion of toys, but how “things” (toys, instruments, technologies, etc.) in play can be allocated very different roles: in a game of catch, an armchair (made for resting and sitting) is turned into a hindrance for the catcher and a rescue for the other players. In another situation, the armchair can be turned into a carousel. Depending on the objective of the players, a design’s structure can encourage bodily movements as either “I can’s” – get past the chair, or as perceptual stimulation – get dizzy from turning. Players’ objective for these experiences is

grounded in the doings; *at spille* (to be "gameful") or *at lege* (to be "playful").

In bodily play and game experiences, players create meaning through movements that we are *ready to do*. The bodily skills that we apply or seek to achieve in these experiences are our repertoire of *I can's*. While bodily play and game experiences are based on bodily perception, the designs as an object in the form of either *en leg* (a "play") or *et spil* (a game) connect us socially and culturally as the *object for perception*. Whether we *leger* (are "playful") or *spiller* (are "gameful") is connected to the object for perception – in our case, the structure of the design. These concepts form the basis for our further understanding and analysis of the Danish connotations of "playing a game".

We will, in the following sections, dive into the, for our arguments in this paper, main differences in play and game as a doing – the verbs *at spille* (to be "gameful") and *at lege* (to be "playful") and subsequently the structure between *et spil* (a game) and *en leg* (a "play") as they are understood in the Danish language.

## 5 The "Doings" of *at spille* (to be "gameful") and *at lege* (to be "playful")

We now investigate each of the verbs *at spille* (to be "gameful") and *at lege* (to be "playful") as a doing. We argue, that when we *spiller* (are "gameful") and *leger* (are "playful") from a bodily perspective, we are ready to do bodily actions that we would otherwise not do or find ridiculous, odd, unnecessary or inappropriate – and that this particular form of meaning arises in reciprocity to the design. We further argue that *at spille* (to be "gameful") is concerned with bodily achievements and challenges, *at lege* (to be "playful") is concerned with bodily perceptual stimuli and exploration. And, both are fueled by curiosity, however, in different ways.

### 5.1 *At spille* (to be "gameful")

In the Danish dictionary, *at spille* (to be "gameful"), refers to the action of doing something with the purpose of reaching a goal [96]. Therefore, when we *spiller* (are being "gameful") it is always with a purpose. The verb describes an achievement seeking behavior and covers activities like music, which is always *spillet* ("gamed"). In the case of *at spille musik* (to play music) the achievement is the music. Likewise, engaging in games of chance like lottery and gambling (which Caillois calls *Alea* [8]) can never be *leget* (played) in Danish. In such games there is always an outcome, a result, that is sought [19]. Table 1 illustrates some of the differences between English and Danish connotations of play and game as a doing in often used phrases.

Drawing on Caillois' notion of *Ludus*, *at spille* ("being gameful") can be seen as a quest for achievements with success or failure as the outcome. Caillois describes *Ludus*: "*Ludus inspires in the player the hope of succeeding*" [8]. This achievement-seeking behavior drives players to pursue unnecessary [86] and arbitrarily chosen [8] obstacles as ways of testing and improving abilities [33,36,42,54,55]. *Spiller* (are "gameful") leads to an irreversible outcome of victory or failure with the emotional states of *fiero* [42] or being flawed

[36]. The latter, as Juul describes, "*has the double function of creating in us a feeling of being flawed and forcing us to reconsider our strategies in order to escape that feeling.*" [36]. In this way failure is also linked to the very act of completing a game with an immanent opportunity for improvement [8,36].

### 5.1.1 Bodily Forms of *at spille* (to be "gameful")

From a bodily perspective, meaning is found in pursuing bodily achievements and skills. This is most notably in sports [19,55]; it is (almost) only the achievement that counts, and it is also evidenced in self-tracking where training apps and exergames are being developed to suit the desire for improved health, endurance, etc. (e.g. [20,45]). In the perspective from the previous section on bodily meaning-making in movements, these activities create bodily meaning for the players through the sequences of movements supporting a desired outcome in the form of e.g. quantifiable measurements. Often such measurements depend on technological resources, however, two *spillende* ("gameful") players can create a contest by using each other as comparing measurement. Any such possibilities occur in relation to the allocated resources, which we refer to as *en leg* (a "play") or *et spil* (a game), which we explain later, first, we look at *at lege* (to be "playful").

### 5.2 *At lege* (to be "playful")

The Danish dictionary describes *at lege* ("being playful") as being engaged in or occupied by *en leg* [97]. This description indicates that the process is important; being occupied by the activity. Furthermore the origin of the word is *leika* – dancing, doing sports, being physically active.

When we *leger* (are "playful"), the process of the activity becomes the locus for interactions with a design. Kerr and Apter explains how a particular form of sense-making in playing transforms the means to reach a goal into being the "goal" itself [2,39]: for example in "catch", the process of catching each other or avoiding being caught becomes the locus of the activity rather than the catch itself as a measurable result. Another example is when players (often parents), in a game of hide and seek, pretend that they cannot find the other players (often children) in order to keep the "play" going and even out skill levels to include all players.

**Table 1: Examples of differences between English and Danish connotations of play and game as doings.**

English	Danish
<i>Play</i> the lottery	<i>Spille</i> lottery
<i>Play</i> (or make) music	<i>Spille</i> (eller lave) musik
<i>Play</i> a role (theatre)	<i>Spille</i> en rolle (teater)
<i>Play</i> "Family"	<i>Lege</i> "Familie"
<i>Play</i> "Doctor", "Police and Robbers" etc.	<i>Lege</i> "læge", "Politi og røvere", etc.

### 4.2.1 Bodily forms of *at lege* (to be "playful")

In our endeavors of investigating *at lege* ("being playful") from a bodily perspective, we turn to Caillois' *Paidia* [8]: "*the spontaneous manifestations of the play instinct*". *Paidia* is often referred to as the free and immediate form of playing [18,19,25–27,78] and to be "playful" [44]. We want to

emphasize that while we draw on Caillois' Ludus/Paidia dichotomy, Caillois' version is more of a mindset, in contrast, we describe this dichotomy as a doing (visible in our actions) in relation to configurations of two different structures.

Caillois further links his Ilinx game classification (see *En leg* section) as an extension of Paidia. Ilinx is the play form of bodily perceptual stimuli such as children's whirling but also adults' preference for speed resulting in bodily perceptual stimuli [8]. Play and bodily perceptual stimuli are further linked by Paasonen in her book *Many Splendored Things – Thinking Sex and Play: “For the quest for bodily pleasure – the enchantment of the activity itself - can be seen as the key purpose of, motivation and rationale for both sex and play”* [74]. She further links sex and play to bodily exploration and experimentation. While she is not the first to connect play and exploration (see also [8,19,27]), she is linking these notions to bodily stimuli. Thus, when we *leger* (“being playful”) in a bodily perspective, there might be a purpose or a goal but it is the process of the activity as a quest for enjoyable bodily perceptual stimuli that is the focus.

## 6 The Structures of *et spil* (a game) and *en leg* (a “play”)

The following descriptions of *et spil* (a game) and *en leg* (a “play”) describe how constitutional components form different structures. While the components are the same, we highlight that it is in the way designers configure these components that make up the structure of either *et spil* (a game) or *en leg* (a “play”).

### 6.1 *Et spil* (A Game)

The Danish expression *et spil* (a game) is explained as an entertaining activity performed from fixed rules with varying requisites (cards, dice, balls, ropes etc.) [98]. We present two configurations for the constitution of *et spil* (a game): Firstly, an irreversible and comparable outcome, and secondly, fixed rules.

#### 6.1.1 Irreversible and Comparable Outcome

In *et spil* (a game) the outcome has to be irreversible in the sense of either a winner/loser is determined, or an award or gain is achieved that is comparable across game rounds. An outcome is here understood as a focus on results achieved by the player. Both Juul [35] as well as Salen and Zimmerman [78] define the outcome of a game as a main feature of a game. If the results are not irreversible, it will be a different structure. This is constitutional for the doing of *at spille* (to be “gameful”). This configuration of irreversible and comparable results is imperative in sports [35] as the extreme version of bodily games [55,56]. Whether in sports or in *spil* (games), an irreversible outcome is closely linked to fixed (and unalterable) rules.

#### 6.1.2 Fixed Rules

The use of rules in *spil* (games) is different from that in *leg* (play) [3,8,8,35,35,78,86]. To be able to provide comparable results, rules of games need to be rigid [18]. Salen and Zimmerman explain that game rules cannot be altered and must be explicit, unambiguous and fixed. Rules are binding

and must be obeyed by all players involved [78]. If not, the results are not comparable or quantifiable across game rounds. However, game rules can be amended and agreed upon before a game session commences (if the technology allows), corresponding to Jesse Schell's notion of House Rules: Rules, which players negotiate beforehand [79]. An example of such amendments is the finishing scenario in Ludo: There are four spaces left for the player to get one of his pieces “home”, but the die shows five pips? Must the die's pips match the exact number missing for the player to get his piece “home”, or can there be excess pips? Nevertheless, once the game session starts, the agreements are bound, and the rules are not to be altered, once commonly established. In *en leg* (a “play”) they are not. The difference is that rules in *et spil* support an irreversible and comparable outcome, while rules in *en leg* support the activity's progression. The next section explains how these elements of outcome and rules are configured differently in *en leg* (a play).

### 6.2 *En leg* (A “Play”)

*En leg* is defined as a spontaneous, unhindered, and rule-based activity containing degrees of randomness and fantasy [99]. In line with this definition, Eichberg describes *en leg* (a “play”) to “*hint in many directions at the same time*” [19]. Building on these definitions, we will, similar to the above explanation of *et spil* (a game), present two constitutional configurations of *en leg* (a “play”). Following the same structure as in the previous section, these are firstly, no irreversible or comparable outcome, and secondly, undefined or negotiable rules resulting in an ambiguous structure.

#### 6.2.1 No Irreversible and Comparable Outcome

Møller emphasizes *en leg* (a “play”) as a process without a determinant goal [56], similarly to how other play scholars have described play [16,19,27,29,86,87]. This does not mean that there is no goal, rather, that the outcome or result of any goal is not important and constitutional for *legen* (the play). The process, then, becomes the locus for the constitution of *en leg* (a play) [54]. An example of this is Caillois' Ilinx game form. Ilinx is Caillois' classification of bodily play forms; play forms almost deprived of any external goal with the only purpose of exploring the bodily senses in various settings until exhaustion [8].

#### 6.2.2 Undefined and Negotiable Rules

Rules in *en leg* are flexible and depend on negotiation. Rules are made up as *legen* (play) progresses, and the purpose of the rules is not to accommodate a quantifiable outcome, but rather to form a common basis for the act of playing [55]: For example, we point to the illustrative phrase common among children when playing: “*Shouldn't we say that ...*” [37].

Møller states an example of the alteration of rules in *en leg*: “In the simple *leg* (play) ‘*tagfat*’ [equivalent to the English ‘catch’], one person is the catcher, trying to catch the other players. In the instance where the catcher is the one all other players can outrun, *legen* (the play) would end. However, at this point *legen* enters another phase. If *legen* has to continue, the good runners will have to demonstrate a kind of solidarity that is not part of *et spil*'s nature, but extends it and belongs to the structure of *en leg*: The good runners will have to instate new rules (like run dangerously close, crawl on their knees, or

jump on one leg) for someone to end up being caught. It becomes their responsibility not to augment the pressure too much, but to ‘stop while everything is good’ in order to keep *legen* going” [55].

This enables *legen* (the “play”) to continuously adapt to the circumstances through alterations and additions of the rules [3,12,19,53,55–57,86]. This way, it does not adhere to any irreversible outcome as skill acquisition or other bodily measurements like being fastest or having most catches.

So far we have covered the Danish connotations of play and game as a doing and as design configurations. In the following, we describe an example for each of the four correlations.

## 7 Examples of the Four Correlations

We present four different examples, one for each combination and highlight how the configurations affect the doing and vice versa. The analyses of the examples are based on four different studies and as such are not meant as evidence but rather as empirically based explanations. The studies were originally conducted to investigate individual bodily play experiences and thus vary in methodology and approach.

### 7.1 *At spille et spil* (To be “gameful” in a game) – in Crazy Soccer Physics on Trampolines

To exemplify the correlation *at spille et spil* (to be “gameful” in a game), we present a study of the bodily play experience in Crazy Soccer Physics on Trampoline [73] (figure 2). Crazy Soccer Physics is a traditional computer game [35] created by Otto Ojala [73] with trampolines added as interface. The game is called Crazy Soccer Physics because the physics applied to the avatars are “crazy” in the sense that the avatars respond almost randomly to player interactions; jump high, fly through the air, do somersaults, fall on their heads (and stay in the position), move in the opposite direction and so on. Basically, it is difficult to fully control the avatars. In addition, the size of the goals varies randomly as well as the size and quality of the balls (huge balls, “inflated” balls, etc.). Despite the “randomness”, some control is possible. The trampoline jumps are divided into three categories based on weight and time length. The more intense the jump and the longer the time between jumps, the avatars fly higher and longer and start kicking. This allows the players to apply different jumping strategies; controlling their jumps in terms of light or heavy, fast or slow pace, or if they await the right moment to jump and make the avatars “do something” to save a goal and affect the outcome. In the following, we analyzed the empirical data using the extracted definitions above. We conducted 11 game sessions with 22 participants. The sessions were video recorded and complemented by structured individual interviews [76].

#### 7.1.1 Analysis of the Experience in Crazy Soccer Physics on Trampolines

We consider this game *at spille et spil* (to be “gameful” in a game) because the configurations for bodily perception and movement in the design almost exclusively encourage bodily achievements. This is also reflected in the players’ statements: in the interviews, players were all quite focused on achieving



**Figure 2: Crazy Soccer Physics. Left side: the set-up. Right side: the “crazy” physics of the avatars**

the goal of winning as the main motivation. There were even two players who asked to play the game many times to compete expressing desire to reach fiero and failure experiences. None of the participants sought to jump just for the bodily stimulus (considered as “childish”).

The trampolines were the only bodily interaction option. Therefore, the players' jumping anticipated by the onscreen part of the game constituted the *kinetic joy ride* (see section 4.1). While the game progressed, the jumps became more intense either in the sense of being calculated (to trigger the avatar to move at just the right time), jumping a lot (as a “fire at random” kind of strategy) or jumping intensely. The players’ readiness to jump grew as they were getting closer to a result of either fiero or failure. We continue our presentation of practical examples by presenting an example of *at lege en leg*.

### 7.2 *At lege en leg* (To be “playful” in a “play”) – in Inferno

We use the example of Inferno [13,52,92] (figure 3) to describe *at lege en leg* (to be “playful” in a “play”). Inferno is an interactive performance with exoskeletons created by Demers [13] and Vorn [92]. We consider Inferno *en leg* (a “play”) because there are few rules and no irreversible outcome. In Inferno, the participants wore an exoskeleton on the upper body, which was controlled by a choreographer in real-time. The participants were able to twist their upper body and generally free to move their lower body around the room as far as the cables allowed. The event included a dystopian



**Figure 3: “Inferno” participants’ upper bodies being controlled by exoskeletons.**

atmosphere of loud electronic music, changing light settings and theatre smoke. Inspired by ethnographic methodology [22], we investigated the bodily play experience in Inferno in the form of self-reporting observation (as an audience), complemented by semi-structured, informal interviews [40] with 10 participants after the event asking about their bodily experience and motivation for participation. Just as with the Crazy Soccer Physics on Trampoline example, we here analyze the empirical data anew using the extracted definitions above. We do so to get an understanding of the bodily play experience in Inferno.

### 7.2.1 Analysis of the Experience in Inferno

The general reason for participation expressed by all participants was a curiosity of the unknown bodily experience. They wanted to feel what it was like to be controlled by another person through an exoskeleton. They all expressed exploration as the main driver. They said that it was fun to be thrown around and the tumultuous feeling from being partially controlled by external forces. Some found it both scary and fun at the same time. Furthermore, participants started experimenting with different bodily possibilities (twisting, bending, etc.) once they had overcome the initial adaptation to the new bodily situation.

In Inferno, the *kinetic joy rides* (see section 4.1) were formed by the imposed movements controlled by the exoskeleton, as was also expressed by the interviewees. The movements that were imposed on the participants from the exoskeleton together with the participants own movements created a sequence of movements that the participants experienced as almost “ridiculous”, “really surreal”, and “fun to lose control” with one participant even feeling dizzy at times. The (almost random) sequences of movements imposed by the exoskeleton stimulated the bodily perception with exploration to follow.



Figure 4: Move Maker elements: Proximity controlled mobile robot, laser lines, light cubes, music cubes and bodily precondition cards.

Thereby the participants’ readiness to move around and do movements that they would not otherwise do, grew. Thus, we explain *at lege en leg* - to be “playful” in a “play” – pursuing bodily perceptual stimulation and exploration in a structure with few rules and no irreversible outcome (see section 5.2).

In the following section, we introduce how we interpret switching the verbs and nouns into *at lege et spil* (to be “playful” in a game) and *at spille en leg* (to be “gameful” in a “play”).

### 7.3 At lege et spil (To be “playful” in a game) – in The Undie Game

This bears resemblance with the English “gaming the system”. Besides that gaming, in general, entails an achievement, which *at lege* (to be “playful”) does not, the English phrase is more about testing the system than bodily exploration and perceptual stimulation. In this perspective of *at lege et spil* (to be “playful” in a game), we describe the “Undie Game”, a game in which the designers configured the controller to hint at bodily sense stimulation in, what we consider, a classical computer game. Because the game has a structure of “et spil” (a game), it already encourages *at spille* (to be “gameful”) in the sense of achieving an irreversible outcome, while *at lege* in such a structure will entail focusing on bodily perceptual stimulation and exploration. We here describe how the designers reconfigured the controller to hint at bodily *at lege* (to be “playful”) as a diversion of the game’s core objective.

#### 7.3.1 Analysis of the Experience in The Undie Game

The Undie Game [10,23] is a traditional computer game created by the Copenhagen Game Collective [10] using a traditional screen as visual feedback and a mouse as controller but with one significant modification: The mouse is built into the front of a pair of modified underpants, which the players wear (on top of their clothes) during the game (figure 5). It is a two-player game where the players feed a gigantic mouth with an unnaturally long tongue with food falling from above. We consider it *et spil* (a game) because it has fixed rules and an irreversible outcome; the player, who feeds the mouth the most within a given time frame, wins. However, maneuvering the dislocated mouse mimics sexual interaction with the vulva (the designers call this “queering” the mouse [23]). Referring to Loke and Robertson’s “Moving and Making Strange” methodology [43] as covered in section 2, we argue that



Figure 5: The dislocated mice mimicking interaction with the vulva in The Undie Game. Picture by Simon Nielsen.

because the mouse is dislocated onto the body to resemble, but not perform, a sexual act, players are presented with a new way of (bodily) interacting with the computer, which in turn encourages bodily awareness as a precursor to bodily exploration, e.g., men can explore the sexual act from a female perspective, and women can explore their genitals differently than during a sexual act. This way, the designers reconfigured the mouse to be a resource allocated from an instrumental activity to an autotelic activity [86].

While the gameplay is simply about feeding the mouth, the *kinetic joy ride* (see section 4.1) stems from stimulating bodily perception through the actions mimicking sexual interaction (as a sequence of movements) – and emphasized further by the long tongue onscreen. What enables the players (and audience) to perceive these actions as sexual is the macroperceptual (see section 4.2) dimension; besides perceiving the hint to bodily perceptual stimuli, we also perceive these actions to be of the specific social act, sex [74], and the culture thereof. This hint to experimentation with bodily perceptual stimuli made the audience respond with loud noise and great laughter at the presentation of the game at the conference [23]. While the structure of the game remains a game (*et spil*), the doing of *at lege* (to be “playful”) is encouraged through the hints to bodily perceptual stimulation.

#### 7.4 *At spille en leg* (To be “gameful” in a “play”) - in The Move Maker

To demonstrate the perspective of *at spille en leg* (to be “gameful” in a “play”), we describe The Move Maker [48] (figure 6), a movement-based hybrid game system created by Matjeka [48]. While we consider The Move Maker *en leg* (a “play”) – a structure of few rules and no irreversible outcome, the perspective of *at spille en leg* (to be “gameful” in a “play”) is to focus on bodily achievements and skills in *en leg* (a “play”). In this example, participants will have to either determine an objective or goals or choose to follow suggested objectives and goals in a structure that is basically *en leg* (a “play”).



Figure 6: *At spille en leg* (to be “gameful” in a “play”) in Move Maker

#### 7.4.1 Analysis of the Experience in Move Maker

The Move Maker is a system that players can play with as it is or they can use the included rulesets. The system consists of a set of elements (figure 4) containing sensors promoting bodily perception and exploration; light cubes, music cubes (with a fixed period of playing time) controlled by proximity sensors, laser lines (“lines” made from laser pointers connected to a brightness sensor), a mobile robot controlled by proximity sensors and a set of cards determining a bodily precondition as a temporary handicap (e.g. “your left foot cannot touch the ground” or “your right arm is glued to your back”). As such, there is no initial irreversible outcome and no rules to obey, but bodily perceptual stimulation – and room for exploration. To start an activity, players can choose to use any of the included rulesets: “get the robot through a maze of light cubes”, in which the players collaborate to steer the robot around a self-created maze of light cubes, while adhering to a bodily precondition, or “get through the laser field” in which players have to climb and crawl to avoid the laser fields. Players can also choose to define the activity as they wish. Either way, they will have to create or follow objectives and possible outcomes. Hence, we consider Move Maker to be *at spille en leg* (to be “gameful” in a “play”) because players are encouraged to create their own goals from a setting that initially is about bodily perceptual stimulation and exploration.

Players experience *kinetic joy rides* (see section 4.1) in Move Maker from movement sequences created by the applied bodily preconditions, a chosen objective, and how the players chose to allocate the different elements. In figure 5, the man and the boy are trying to get the robot through a maze of light cubes while avoiding the laser lines while the man’s right foot cannot touch the ground, and the boy has the knee glued to the ground. This way, they test their bodily skills, and the design encourages achievements in a structure of *en leg* (a “play”). The open structure with no pre-defined outcome containing various sensory elements, invites players to define objectives and achievements. Whether the players *leger* (are “playful”) or *spiller* (are “gameful”) is up to the players. However, designers can apply strategies to design for each of these perspectives.

## 8 Strategies to Design for either of the Four Perspectives

In the following, we transfer our previous analyses of the four perspectives into design knowledge in the form of strategies for designers to apply in their design work. While the players individually apply their “doing” of *at lege* (to be “playful”) or *at spille* (to be “gameful”), designers can support these or move a design in the desired direction through the design’s structure and form elements. We explain these strategies by focusing on how the design’s *structure* (objective and rules) and *elements* encourage bodily movement; as a way for *achievements and skills acquisition or testing*, or for *bodily perceptual stimulation and exploration*. These are addressed below for each correlation. While we draw on the examples described previously, we will, in this section, include other examples to underline our arguments.

## 8.1 Designing for *at lege en leg* (to be "playful" in a "play")

When designing for *at lege en leg* (to be "playful" in a "play"), the focus is on creating an open structure with objectives and design elements to stimulate bodily perception and exploration. In the following, we address such strategy.

### 8.1.1 Create Objectives Stimulating Bodily Perception and Exploration

A strategy to create *at lege en leg* (to be "playful" in a "play") is to center the design's objective around sequences of bodily movements that require no or little skills but stimulates perception and exploration. The objective of the Inferno event was to be partially controlled by an exoskeleton, an objective that required few skills but was highly stimulating. Furthermore, there was no goal to achieve, and there were few rules to follow; the participants could leave whenever they wanted to. Bodily perceptual stimulation and exploration was further stimulated through the loud dystopian music, light show, and theatre smoke: Rhythmic music can function not only to stimulate the aesthetic and hearing sense, but also bodily movement [4,93]. The lightshow and theatre smoke helped facilitate the dystopian atmosphere through the visual and olfactory senses. Lastly, the exoskeleton was stimulating the kinesthetic and tactile senses and thus, encouraging *at lege* (to be "playful").

## 8.2 Designing for *at spille et spil* (to be "gameful" in a game)

In the following section, we describe our strategy to design for *at spille et spil* (to be "gameful" in a game), in which the focus is on creating a structure with a clear objective to encourage bodily achievements and skill testing.

### 8.2.1 Create Objectives Based on Skills; Sequences of Movements for the Players to Master

Designers can design for this kind of experience by centering the design's structure around an objective with a skill as a specific sequence of bodily movement to master. We demonstrated how players in the Crazy Soccer on Trampolines example were focused on winning as the irreversible outcome and applied different jumping strategies to achieve this. The skill to master was the trampoline jumping by applying the "right" strategy to control the avatars, and the irreversible outcome was winning – despite the avatars' random feedback on their efforts.

However, the achievements as winning conditions in *at spille et spil* (to be "gameful" in a game) are adjusted to the individual player. An example of this is "Zombies, Run" (first edition) [1], a running game in which the players collect resources on their route based on different measurements related to their athletic performance. The players later use the resources to maintain their basecamp in the accompanying strategy game. The resources work as different kinds of feedback on achievements in the form of individual rewards instead of comparable results (to determine a winner). While running is the objective in *Zombies, Run!*, the resources

support this objective in the form of elements providing feedback on achievements.

Another example of using technology to implement objectives for bodily mastery and skill acquisition is the WEARPG [6]. For this tabletop role-playing experience, wearables are used to implement bodily movement in the form of different minigames, with each corresponding to basic actions in the game such as swinging a sword or shooting an arrow. To play the minigames, the players use the Elemental Gauntlet, an arm-worn device to test their skills. This way of using physical movement to interact with a narrative-based tabletop role-playing game implements possibilities of bodily mastery and skill acquisition in an otherwise less movement-based game experience.

In the following, we describe the perspectives when switching the verbs and nouns opposite to the ones above.

## 8.3 Designing for *at lege et spil* (to be "playful" in a game)

In *at lege et spil* (to be "playful"), the structure is that of *et spil* (a game), which basically encourages *at spille* (to be "gameful"). *At lege* (to be "playful") in *et spil* (a game) is then a kind of "going against" the structure. This bears resemblance with the English "gaming the system". Besides that, gaming, in general, entails an achievement, which *at lege* (to be "playful") does not. The English phrase is more about testing the system than bodily exploration and perceptual stimulation. In the following, we discuss how to design for this and argue that designers can facilitate this in the configuration of the elements in a design.

### 8.3.1 Implement Hints to Bodily Perceptual Stimulation and Exploration

Designers can use hints to different forms of bodily perceptual stimulation and exploration as we saw it in the Indie game to facilitate this bodily play perspective. In *The Indie Game*, the designers used the positioning of the computer mouse to the forefront of the underpants as a way to create different bodily perceptual stimulation in comparison to what regular usage would have done. In other words, they allocated the mouse from an instrumental activity to an autotelic activity. In this way, designers can use already implemented (or traditional) elements by either dislocating these or, in other ways, change their configuration to hint at perceptual stimulation.

The game *Fortnite* [85], which is a traditional computer game played using traditional controllers, also hints at bodily stimuli. The game does so in the dances that players achieve in the game. The players act these dances out in their physical lives as a way to communicate with other *Fortnite* players. We consider casual dancing to be *at lege* (to be "playful") because the specific sequence in movements can facilitate *kinetic joy rides* (see section 4.1)[81], besides being stimulated kinesthetically by music [4,93]. Furthermore, in this case of *Fortnite* players' dancing, the dancing functions as the "third" that socially and culturally connects the players [41,91].

Though the players do not physically exert the dance movements while playing *Fortnite* [85], we argue that when bodily exerting the dance moves outside the game, the players *leger* (being playful) *Fortnite* as a way of reproducing the avatar's movements. Calleja explains this phenomenon as

kinesthetic involvement [9]; players start to incorporate the game avatar's bodily movements as a consequence of their engagement in the game.

Another example of *at lege et spil* (to be playful in a game) is Beat Saber [28], a VR rhythm game where players slice boxes rhythmically to the music and get scores accordingly. While this game encourages bodily play by using music and rhythm to stimulate bodily perception, we consider it a game because of the fixed rules and the irreversible outcome of a final score. However, there is a twist incorporated in the score calculation: To score max points, the players must not only slice the boxes timely in rhythm, but must also exert excess body movements; they must continue the swing of the saber after slicing the box [24]. Because this feature is only perceivable through bodily exploration, this part of the game encourages *at lege* (being playful) once the players realize that there is more to the game than merely being timely. When players *leger et spil*, they perform actions in and from the game without any regard to the game's (*et spil*) irreversible and comparable outcome.

#### 8.4 Designing for *at spille en leg* (to be "gameful" in a "play")

To design for *at spille* (to be "gameful") in *en leg* (a "play") is to leave room for the players to achieve goals and test or acquire skills. As there are no predefined goals in *en leg* (a "play"), it thus encourages *at lege* (to be "playful"). Therefore, designers should leave room for the players to instate goals and possibilities to test or acquire bodily skills.

The structure in designing for *at spille en leg* (to be "gameful" in a "play") is an open structure leaving room for player definition of goals supporting that of *en leg* (a "play"). In this structure, the elements of the "design" support or encourage forms of bodily achievements or skills to test.

##### 8.4.1 Include Possibilities for Bodily Achievements through Rulesets and Elements with Measuring Qualities

Designers can implement possibilities for bodily achievements and skills in a structure of *en leg* (a "play") by either implementing various rulesets or elements containing qualities to measure time, distance, height etc.. In the Move Maker example, the included elements stimulated bodily perception; however, the system also contained several accompanying rulesets with irreversible outcomes. Also, players are encouraged to make rulesets of their own. In this way, the players choose how they want to experience Move Maker; as a straight *leg* ("play") or for bodily skill testing and achievements. This perspective of *at spille* (to be "gameful") can be further encouraged through elements with measuring qualities: In the Move Maker example, the music cube can function, for examples, as a kind of time measurement by only playing for a certain period, the laser lines can function as a boundary giving feedback when "broken," the color of the light cubes can function as a collectible resource, e.g. collect all red cubes or turn a minimum five cubes blue.

Another example of using technology to encourage *at spille en leg* (to be "gameful" in a "play") is Just Dance [90]. We consider the basic structure of casual dance to be *en leg* (a "play") as there are few rules (except the socially and culturally defined) and no irreversible outcome, only the

sequence of moving rhythmically to music. The game Just Dance [90] uses the interface of the console (specifications differ for each console) to measure the quality of each player's movements against predefined dance movements. Thereby the game implements bodily achievements by focusing on dancing as a skill to master with feedback on the outcome.

## 9 Discussion: Transitioning Between the Different Experiences

Before concluding on this paper, we want to briefly discuss how players can transition between the experiences. We have explained how the two Danish versions of *at lege* (to be playful) and *at spille* (to be "gameful"), relate to the two different structures of "a game", *et spil* (a game) and *en leg* (a "play"), resulting in four versions of "playing a game". Regardless of the structure, players can revert between *at lege* (to be playful) and *at spille* (to be "gameful"): some players *leger* (being playful) in the same game as other players *spiller* (being "gameful"), or players can revert between the two during a game. In Beat Saber [28] (section 8.3.1), players might start with a focus on bodily mastery wanting to achieve the highest score (*at spille* to be "gameful") but end up being caught in bodily exploration of different rhythmic movements or only just moving to the music not caring about the outcome (*at lege* - to be playful). Likewise, participants in the Inferno event [13,92] (section 7.2) can start focusing on their bodily movements as a performance, which can be a measurable outcome (e.g. best performer), and compare these to the other participants' movements and thereby start to *at spille* (be "gameful").

Contrary, the mere use of technology might encourage bodily exploration. In the example of WEARPG [6] (section 8.2.1), the use of technology combined with bodily movement can bring an awareness of the players' bodily skills and abilities. This bodily awareness can temporarily lead to a new bodily perceptual stimulation and focus on bodily exploration when the players acquire the skills needed to gain mastery to win the minigames.

Finally, players can experience *at lege* (to be playful) and *at spille* (to be "gameful") at different immersion levels: We exemplify this through Brown and Cairns' Game Immersion model [5]; how players transition through three stages of immersion during gameplay (engagement, engrossment, total immersion). Regardless of whether the players *spiller* (being "gameful") or *leger* (being playful), they can do so at each of the different levels. An athlete can be totally immersed and have no awareness of anything else when attempting to set a world record (*at spille*- focus on bodily skills and mastery). A player in Inferno is probably "only" at the engagement stage, being curious about what is going to happen when putting on the exoskeleton (*at lege* - focus on bodily exploration and stimulation) and then gets totally immersed once being moved to the loud music by the exoskeleton.

## 10 Limitations

The presented definitions of play and game in the form of the Danish connotations do not serve as exhaustive or mutually exclusive definitions but as guiding principles as we have interpreted these in the Danish language. As such, we have

only dealt with a part of the differences in the Danish connotation. Therefore, the four perspectives are a first step towards understanding the relationship between bodily game and play experiences in terms of design construction and player “doing”. Likewise, the presented design strategies represent a starting point for design and should be used in conjunction with other design tools. Lastly, many other aspects are not covered here. To name a few; other phenomenological perspectives such as computer game culture [38], or bodily perspectives; how body cultures affect bodily gameplay in different ways [17,18], as well as other linguistic connotations [19,29]. Nevertheless, we believe that our work contributes as a generative resource for future work of bodily play and game design within HCI.

## 11 Conclusion

In this paper, we investigated the Danish linguistic connotations of bodily “playing a game”, because this phenomenon, differently from the English language, exists in Danish as two verbs and nouns, making up four different correlations. Through these investigations, we introduced the following four perspectives of bodily play and game experiences:

- *At lege en leg* (to be “playful” in a “play”): Pursuing bodily perceptual stimulation and exploration supported by a structure with no irreversible outcome and few rules.
- *At spille et spil* (to be “gameful” in a game): Pursuing bodily achievements and skills supported by a structure of fixed rules accompanied by an irreversible outcome.
- *At lege et spil* (to be “playful” in a game): To “go against” a structure of fixed rules and an irreversible outcome and pursue bodily perceptual stimulation and exploration.
- *At spille en leg* (to be “gameful” in a “play”): To pursue bodily achievements and skills in an open structure with few rules and no pre-defined outcome.

From these definitions, we extracted a set of design strategies for designers to apply in their design work:

- *At lege en leg* (to be “playful” in a “play”): Create objectives stimulating bodily perception and exploration.
- *At spille et spil* (to be “gameful” in a game): Create objectives based on skills – sequences of movements for the players to master.
- *At lege et spil* (to be “playful” in a game): Implement hints to bodily perceptual stimulation.
- *At spille en leg* (to be “gameful” in a “play”): Include possibilities for achievements and skill testing through rulesets and elements with measuring qualities.

To arrive at these perspectives on bodily play and game experiences and subsequent design strategies, we examined the Danish connotations of the verbs; *at lege* (to be “playful”) and *at spille* (to be “gameful”) and their corresponding nouns; *en leg* (a “play”) and *et spil* (a game). We did so by

bridging the phenomenological and postphenomenological theories of bodily meaning-making as *kinetic joy rides* formed by *sequences of movements* that we are *ready to do* in *en leg* (a “play”) and *et spil* (a game) as *objects for perception*, the something that connects us socially and culturally.

This paper is intended for researchers and designers with an interest in bodily play and game experiences. The descriptions and analysis presented in this paper serve as a step toward the understanding of the experiential dynamics in bodily play and game experiences and how to design for these in a design process. With this work, we hope we are able to expand the range of diverse bodily play and game experiences within HCI.

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## REFERENCES

- [1] Naomi Alderman and Rebecca Levene. *Zombies, run!* Six to Start Limited.
- [2] Michael John Apter. 2009. Reversal Theory. In *Encyclopedia of Play in Today’s Society*. SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks California 91320 United States. DOI:https://doi.org/10.4135/9781412971935.n335
- [3] E. M. Avedon and B. Sutton-Smith. 1971. *The Study of Games*. Wiley & Sons, New York.
- [4] P. Brattico, E. Brattico, and P. Vuust. 2017. Global Sensory Qualities and Aesthetic Experience in Music. *Front Neurosci* 11, (2017), 159. DOI:https://doi.org/10.3389/fnins.2017.00159
- [5] Emily Brown and Paul Cairns. 2004. A grounded investigation of game immersion. In *Extended abstracts of the 2004 conference on Human factors and computing systems - CHI ’04*, ACM Press, Vienna, Austria, 1297. DOI:https://doi.org/10.1145/985921.986048
- [6] Oğuz Turan Buruk and Oğuzhan Özcan. 2018. Extracting Design Guidelines for Wearables and Movement in Tabletop Role-Playing Games via a Research Through Design Process. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI ’18*, ACM Press, Montreal QC, Canada, 1–13. DOI:https://doi.org/10.1145/3173574.3174087
- [7] Richard Byrne. 2015. Vertigo as a Design Resource for Bodily Play. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play - CHI PLAY ’15*.
- [8] Roger Caillois. 2001. *Man, Play, and Games*. University of Illinois Press.
- [9] Gordon Calleja. 2011. *In-game: from immersion to incorporation*. MIT Press, Cambridge, Mass.
- [10] Copenhagen Game Collective. 2018. *The Undie Game*. Copenhagen Game Collective, Copenhagen, DK. Retrieved May 8, 2019 from <http://www.copenhagengamecollective.org/projects/the-undie-game/>
- [11] Peter Dalsgaard and Christian Dindler. 2014. Between theory and practice: bridging concepts in HCI research. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI ’14*, ACM Press, Toronto, Ontario, Canada, 1635–1644. DOI:https://doi.org/10.1145/2556288.2557342
- [12] Bernie DeKoven. 2013. *The well-played game: a player&#039;s philosophy*. MIT Press, Cambridge, Mass.
- [13] Louis-Philippe Demers. 2015. *Inferno*. vimeo.com. Retrieved January 24, 2018 from <https://vimeo.com/130670526>
- [14] Sebastian Deterding. 2014. Eudaimonic Design, or: Six Invitations to Rethink Gamification. In *Rethinking Gamification*, Mathias Fuchs, Sonia Fizek, Paolo Ruffino and Niklas Schrape (eds.). Meson Press.
- [15] Christoph Durt (Ed.). *Embodiment, enaction, and culture: investigating the constitution of the shared world*. MIT Press, [2017], Cambridge, Massachusetts.

- [16] Scott G. Eberle. 2014. Elements of Play - Toward a Philosophy and a Definition of Play. *Journal of Play* 6, 2 (2014), 214–234.
- [17] Henning Eichberg. 2010. Body, soma - and nothing else? Diversity of body semantics. In *Bodily Democracy: Towards a Philosophy of Sport for All*, MIKE McNamee and Jim Parry (eds.). Routledge, Abingdon, Oxon, England, 257–282.
- [18] Henning Eichberg. 2015. Play as Production - Production as Game?: Towards a critical phenomenology of productivity. *East Asian Sport thoughts* 4, (2015), 25–44.
- [19] Henning Eichberg. 2016. *Questioning Play: What Play Can Tell Us About Social Life*. Routledge, London.
- [20] Endomondo LLC Under Armour. 2009. *Endomondo*. Game [IOS, Android] (2007) Endomondo LLC Under Armour, Denmark, USA. Last played June 2020 *Endomondo*.
- [21] Shaun Gallagher and Dan Zahavi. 2012. *The phenomenological mind* (2nd ed ed.). Routledge, London; New York.
- [22] Jaber F. Gubrium. 1997. *The new language of qualitative method*. Oxford University Press, New York.
- [23] Sabine Harrer, Simon Nielsen, and Patrick Jarnfelt. 2019. Of Mice and Pants: Queering the Conventional Gamer Mouse for Cooperative Play. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems - CHI EA '19*, ACM Press, Glasgow, Scotland Uk, 1–11. DOI:https://doi.org/10.1145/3290607.3310431
- [24] Scott Hayden. 2019. 'Beat Saber' Scoring Explained - It's All in the Technique. *roadtovr.com*. Retrieved June 22, 2020 from https://www.roadtovr.com/beat-saber-studio-shows-get-highest-score-new-video/
- [25] Thomas Henricks. 2011. Play as a Pathway of Behavior. *American Journal of Play* (2011).
- [26] Thomas S. Henricks. 2010. Caillois' Man, Play, and Games: An Appreciation and Evaluation. *American Journal of Play* 3, 2 (2010), 157–185.
- [27] Thomas S. Henricks. 2015. *Play and the Human Condition*. URBANA; CHICAGO; SPRINGFIELD: University of Illinois Press.
- [28] Vladimir Hrinčar, Jan Ilavský, and Jaroslav Beck. 2018. *Beat Saber*. Game [HTC VR] (1 May 2018) Beat Games, Beat Games s.r.o. Retrieved May 23, 2018 from https://beatsaber.com Last played June 2018.
- [29] Johan Huizinga. 2016. *Homo Ludens, a Study of the Play-Element in Culture*. Angelico Press, Kettering, OH.
- [30] E. Husserl. 1982. *Ideas pertaining to a pure phenomenology and to a phenomenological philosophy (Edmund Husserl collected works; 3)*. Dordrecht: Kluwer.
- [31] Don Ihde. 1990. *Technology and the lifeworld: from garden to earth*. Indiana University Press, Bloomington.
- [32] Don Ihde. 1995. *Postphenomenology: essays in the postmodern context* (Paperback ed.). Northwestern University Press, Evanston, Ill.
- [33] K. Isbister. 2016. *How Western Move Us: Emotion by Design*. MIT Press, Cambridge, Massachusetts.
- [34] Elizabeth Jochum, Louis-Philippe Demers, and Evgenios Vlachos. 2018. Becoming Cyborg: Interdisciplinary Approaches for Exoskeleton Research. 1–9. DOI:https://doi.org/10.14236/ewic/EVAC18.40
- [35] Jesper Juul. 2005. *Half-real: video games between real rules and fictional worlds*. MIT Press, Cambridge, Mass.
- [36] Jesper Juul. 2013. *The art of failure: an essay on the pain of playing video games*. MIT Press, Cambridge, Mass.
- [37] J. Kampmann. 2010. Legeskab. *Legeskab.dk*. Retrieved from http://www.legeskab.dk/Jan-Kampmann-718.aspx
- [38] Brendan Keogh. 2018. *A play of bodies: how we perceive videogames*. MIT Press, Cambridge, MA.
- [39] J. H. Kerr and Michael J. Apter. 1991. *Adult play: a reversal theory approach*. Swets & Zeitlinger, Amsterdam.
- [40] Steinar Kvale. 2007. *Doing interviews*. SAGE, Los Angeles, Calif. London.
- [41] Suzanne Condie Lambert. 2018. My son caught the Fortnite dance bug, but there's at least one upside to it. *USA Today*. Retrieved from https://www.usatoday.com/story/life/allthemoms/2018/08/15/fortnite-dances-annoying-but-least-my-kid-active/942499002/
- [42] Nicole Lazarou. 2008. The Four Fun Keys. In *Game Usability* (1st ed.), Katherine Isbister and Noah Schaffer (eds.).
- [43] Lian Loke and Toni Robertson. 2013. Moving and Making Strange: An Embodied Approach to Movement-Based Interaction Design. *ACM Transactions on Computer-Human Interaction* 20, 1 (2013). DOI:http://dx.doi.org/10.1145/2442106.2442113
- [44] Andrés Lucero, Evangelos Karapanos, Juha Arrasvuori, and Hannu Korhonen. 2014. Playful or Gameful?: creating delightful user experiences. *interactions* 21, 3 (May 2014), 34–39. DOI:https://doi.org/10.1145/2590973
- [45] E. J. Lyons. 2015. Cultivating Engagement and Enjoyment in Exergames Using Feedback, Challenge, and Rewards. *Games for Health Journal: Research, Development, and Clinical Applications* 4, 1 (2015).
- [46] E. Márquez Segura. 2013. The Design Space of Body games: Technological, Physical, and Social Design. In (On the Move), ACM.
- [47] Louise Petersen Matjeka and M. P. Matjeka. In press. This is not an Exergame - Designing with Bodily Movement and Sound as Core Mechanics in Digital Play. In *Gamescope: The potential for gamification in digital and analogue places*, O. E. Hansen, T. Jensen and C. Rosenstand (eds.). Aalborg Universitetsforlag.
- [48] Louise Petersen Matjeka. 2020. The Move Maker – Exploring Bodily Preconditions and Surrounding Conditions for Bodily Interactive Play. In *Proceedings of the 2020 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, ACM Press, Honolulu, Hawai'i. DOI:https://doi.org/DOI: https://doi.org/10.1145/3334480.3381652
- [49] Louise Petersen Matjeka and Dag Svanas. 2018. Gamifying an Exergame Co-DesignWorkshop – Playful involvement of experts in the design process o balance training exergames. In *2018 IEEE 6th International Conference on Serious Games and Applications for Health (SeGAH)*, IEEE, Vienna, 1–8. DOI:https://doi.org/10.1109/SeGAH.2018.8401343
- [50] Maurice Merleau-Ponty. 2006. *Kroppens fenomenologi*. Det lille Forlag, Frederiksberg.
- [51] Maurice Merleau-Ponty. 2012. *Phenomenology of perception*. Routledge, Abingdon England; New York.
- [52] metamorf. 2017. *Inferno. meta.morf*. Retrieved from http://metamorf.no/2018/project/inferno-louis-philippe-demers-bill-vorn/index.html
- [53] Jørn Møller. 2000. *Euroleg, 121 gamle lege og spil fra Idrætshistorisk Vaerksteds internationale legepark*. Bavnbanke, Idrætshistorisk Vaerksted, Denmark, Slagelse.
- [54] Jørn Møller. 2010. *Med leg skal land bygges*. Bavnbanke, Slagelse.
- [55] Jørn Møller. 2010. Sportificering af leg – overvågning eller ej. In *Med Leg skal Land Bygges*, K. L. Kirchoff and H. Eichberg (eds.). Bavnbanke, Gerlev Idrætshøjskole, Denmark, Slagelse, 173–187.
- [56] Jørn Møller. 2010. Legen I Idrætspædagogikken – et historisk rids. In *Med Leg skal Land Bygges*, K. L. Kirchoff and H. Eichberg (eds.). Bavnbanke, Gerlev Idrætshøjskole, Denmark, Slagelse, 43–62.
- [57] Jørn Møller. 2010. Leg I Landsbyen. In *Med Leg Skal Land Bygges*, K. L. Kirchoff and H. Eichberg (eds.). Bavnbanke, Gerlev Idrætshøjskole, Denmark, Slagelse, 130–135.
- [58] Dermot Moran. Intercorporeality and Intersubjectivity: A Phenomenological Exploration of Embodiment. In *Embodiment, enaction, and culture: investigating the constitution of the shared world*, Christoph Durt (ed.). MIT Press, [2017], Cambridge, Massachusetts, 25–46.
- [59] Florian 'Floyd' Mueller, D. Altimira, and R. A. Khot. 2015. Reflections on the Design of Exertion Games. *Games Health J* 4, 1 (February 2015), 3–7. DOI:https://doi.org/10.1089/g4h.2014.0088
- [60] Florian 'Floyd' Mueller and D. Edge. 2011. Designing Sports: A Framework for Exertion Games. In (CHI 11 - Session: Cats, Dogs, Sports, Games, and Books), ACM, 2651–2660.
- [61] Florian 'Floyd' Mueller, Stefan Agamanolis, and Rosalind Picard. 2003. Exertion interfaces: sports over a distance for social bonding and fun. In *Proceedings of the conference on Human factors in computing systems - CHI '03*, ACM Press, Ft. Lauderdale, Florida, USA, 561. DOI:https://doi.org/10.1145/642611.642709
- [62] Florian 'Floyd' Mueller, Richard Byrne, Josh Andres, and Rakesh Patibanda. 2018. Experiencing the Body as Play. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems - CHI '18*, ACM Press, Montreal QC, Canada, 1–13. DOI:https://doi.org/10.1145/3173574.3173784
- [63] Florian 'Floyd' Mueller, Martin R. Gibbs, Frank Vetere, and Darren Edge. 2017. Designing for Bodily Interplay in Social Exertion Games. *ACM Trans. Comput.-Hum. Interact.* 24, 3 (July 2017), 1–41. DOI:https://doi.org/10.1145/3064938
- [64] Florian 'Floyd' Mueller, Tuomas Kari, Zhuying Li, Yan Wang, Yash Dhanpal Mehta, Josh Andres, Jonathan Marquez, and Rakesh Patibanda. 2020. Towards Designing Bodily Integrated Play. In *Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction*, ACM, Sydney NSW Australia, 207–218. DOI:https://doi.org/10.1145/3374920.3374931
- [65] Florian 'Floyd' Mueller, Zhuying Li, Richard Byrne, Yash Dhanpal Mehta, Peter Arnold, and Tuomas Kari. 2019. A 2nd Person Social Perspective on Bodily Play. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*, ACM Press, Glasgow, Scotland Uk, 1–14. DOI:https://doi.org/10.1145/3290605.3300868
- [66] Florian 'Floyd' Mueller, Louise Matjeka, Yan Wang, Josh Andres, Zhuying Li, Jonathan Marquez, Bob Jarvis, Sebastiaan Pijnappel, Rakesh Patibanda, and Rohit Ashok Khot. 2020. "Erfahrung & Erlebnis": Understanding the Bodily Play Experience through German Lexicon. In *Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction*, ACM, Sydney NSW Australia, 337–347. DOI:https://doi.org/10.1145/3374920.3374926
- [67] Florian 'Floyd' Mueller and D. Young. 2018. 10 Lenses to Design Sports-HCI. *Foundations and Trends® Human-Computer Interaction* 12, 3 (2018), 172–237.
- [68] Florian 'Floyd' Mueller and Damon Young. 2017. Five Lenses for Designing Exertion Experiences. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*, ACM Press, Denver, Colorado, USA, 2473–2487. DOI:https://doi.org/10.1145/3025453.3025746
- [69] Florian 'Floyd' Mueller and Katherine Isbister. 2014. Movement-based game guidelines. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14*, ACM Press, Toronto, Ontario, Canada, 2191–2200. DOI:https://doi.org/10.1145/2556288.2557163
- [70] Florian 'Floyd' Mueller, Rohit Ashok Khot, Kathrin Gerling, and Regan Mandryk. 2016. Exertion Games. *FNT in Human-Computer Interaction* 10, 1 (2016), 1–86. DOI:https://doi.org/10.1561/1100000041

- [71] Alva Noë. 2006. *Action in perception* (1. MIT Press paperback ed.). MIT Press, Cambridge, Mass.
- [72] Juliet Norton, Chadwick A. Wingrave, and Joseph J. LaViola. 2010. Exploring strategies and guidelines for developing full body video game interfaces. In *Proceedings of the Fifth International Conference on the Foundations of Digital Games - FDG '10*, ACM Press, Monterey, California, 155–162. DOI:<https://doi.org/10.1145/1822348.1822369>
- [73] Otto Ojala. 2013. *Crazy Soccer Physics*. Game [PC, IOS] (8 December 2014), Otto Ojala. Last played June 2018.
- [74] Susanna Paasonen. 2018. *Many splendored things: thinking sex and play*. Goldsmiths Press, London.
- [75] Martin Pichlmair, Lena Mech, and Miguel Sicart. 2017. Designing for immediate play. In *Proceedings of the International Conference on the Foundations of Digital Games - FDG '17*, ACM Press, Hyannis, Massachusetts, 1–8. DOI:<https://doi.org/10.1145/3102071.3102075>
- [76] Catherine Kohler Riessman. 2008. *Narrative methods for the human sciences*. Sage Publications, Los Angeles.
- [77] Robert Rosenberger and Peter-Paul Verbeek (Eds.). 2015. *Postphenomenological investigations: essays on human-technology relations*. Lexington Books, Lanham.
- [78] Katie Salen and Eric Zimmerman. 2004. *Rules of play: game design fundamentals*. MIT Press, Cambridge, Mass.
- [79] Jesse Schell. 2019. *The art of game design: a book of lenses* (Third edition ed.). Taylor & Francis, a CRC title, part of the Taylor & Francis imprint, a member of the Taylor & Francis Group, the academic division of T&F Informa, plc, Boca Raton.
- [80] M. Sheets-Johnstone. 2003. Thinking in Movement. *Journal of Aesthetics and Art Criticism* 39, 4 (2003), 399–407.
- [81] M. Sheets-Johnstone. 2013. Movement as a Way of Knowing. *Scholarpedia* 8, (2013), 30375. DOI:<https://doi.org/doi:10.4249/scholarpedia.30375>
- [82] M. Sheets-Johnstone. 2014. *Putting Movement Into Your Life: a beyond fitness primer*. CreateSpace Independent Publishing Platform.
- [83] Miguel Sicart. 2014. *Play Matters*. Cambridge, Massachusetts; London, England: The MIT Press.
- [84] Miguel Sicart. 2015. Loops and Metagames: Understanding Game Design Structures. In *Proceedings of Foundations of Digital Games FDG '15*.
- [85] Darren Sugg. *Fortnite*. Gaame [SNES, PC, Playstation, XBOX, IOS, Android] (25 July 2017) Epic Games, People Can Ily. Last played 21 May 2020.
- [86] Bernard Suits. 1978. *The Grasshopper: Games, Life and Utopia*. Broadview Press, Canada.
- [87] Brian Sutton-Smith. 1997. *The ambiguity of play*. Harvard University Press, Cambridge, Mass.
- [88] Dag Svanæs. 2013. Interaction Design For and With the Lived Body. *ACM Transactions on Computer-Human Interaction* 20, 1 (2013), 1–30. DOI:<https://doi.org/10.1145/2442106.2442114>
- [89] Evan Thomson. 2010. Chapter 1: The enactive approach. In *Mind in life: Biology, phenomenology, and the sciences of mind*. Harvard University Press.
- [90] Ubisoft. 2019. *Just Dance 2019*. Game [SNES, IOS, Android] (17 November 2009) Ubisoft, Massive Entertainment, Ubisoft Milan. Last played April 2020.
- [91] u/IAMMADEOFEVERYTHING. 2018. These kids don't know each other (Fortnite Dance Off). *reddit.com*. Retrieved February 4, 2019 from [https://www.reddit.com/r/FortniteBR/comments/9v4rmw/these\\_kids\\_dont\\_know\\_each\\_other\\_fortnite\\_dance\\_off/](https://www.reddit.com/r/FortniteBR/comments/9v4rmw/these_kids_dont_know_each_other_fortnite_dance_off/)
- [92] Bill Vorn. Inferno. <http://billvorn.concordia.ca>. Retrieved from <http://billvorn.concordia.ca/robography/Inferno.html>
- [93] M. A. G. Witek, T. Popescu, E. F. Clarke, M. Hansen, I. Konvalinka, M. L. Kringelbach, and P. Vuust. 2017. Syncopation affects free body-movement in musical groove. *Exp Brain Res* 235, 4 (April 2017), 995–1005. DOI:<https://doi.org/10.1007/s00221-016-4855-6>
- [94] Dan Zahavi. 2011. *Husserls fænomenologi*. Samfundslitteratur, Frederiksberg.
- [95] Dan Zahavi. 2014. *Self and other: exploring subjectivity, empathy, and shame* (First edition ed.). Oxford University Press, Oxford.
- [96] 2018. at spille. *Den Danske Ordbog - Moderne Dansk sprog*. Retrieved June 24, 2019 from <https://ordnet.dk/ddo/ordbog?select=spille,2&query=spille>
- [97] 2019. At lege. *Den Danske Ordbog - Moderne Dansk sprog*. Retrieved June 24, 2019 from <https://ordnet.dk/ddo/ordbog?query=lege>
- [98] 2019. Spil. *Den Danske Ordbog - Moderne Dansk sprog*. Retrieved September 9, 2019 from <https://ordnet.dk/ddo/ordbog?query=spil>
- [99] 2019. Leg. *Den Danske Ordbog - Moderne Dansk sprog*. Retrieved June 24, 2019 from <https://ordnet.dk/ddo/ordbog?query=leg>