

# Chasing Play Potentials: Towards an Increasingly Situated and Emergent Approach to Everyday Play Design

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## ABSTRACT

User involvement is well established in game and play design. But in a time when play design is becoming relevant in domains beyond pure entertainment, and play blends into everyday activity in diverse ways, we need to revisit old, and develop new, user involvement methods. Using a situated perspective and Research through Design, we present *Situated Play Design* (SPD), a novel approach for the design of playful interventions aimed at open-ended, everyday activities that are non-entertainment based. Like user-centered game and play design methods, our contribution leverages user engagement; like Participatory Design methods, our method acknowledges the co-creating role of end users. SPD extends those approaches by focusing on uncovering existing manifestations of contextual playful engagement and using them as design material. Through two case studies, we illustrate our approach and the design value of using existing and emergent playful interactions of users in context as inspirations for future designs. This allows us to provide actionable strategies to design for in-context playful engagement.

## Author Keywords

Situated Play Design; Play; Playfulness; Design Methods; User Involvement; Participatory Design; Design Process.

## CSS Concepts

• Human-centered computing~ HCI design and evaluation methods.

## INTRODUCTION

Play beyond entertainment has become increasingly popular, both in HCI research and industry. Play and playful technologies now transcend the scope of entertainment games, and are more present in our lives [[65]] featuring in a variety of domains such as education (e.g. [[60]]), health (e.g. [[71]]), and the workplace (e.g. [[50]]). As a consequence of this broadening—of the design space of play, its relevant application domains, and the ways it blends into everyday

activity—we see a need to revisit play design approaches.

Enhancing people's lives through play is a social good. Everyday play and playfulness can have a positive impact on the well-being of both individuals and groups [[19], [40]], provide us with agency to be creative, express ourselves and learn [[65],[67]], and create opportunities for meaningful social connection [[42]]. Importantly, everyday play and playfulness are often situated [[65]]—they emerge naturally in a variety of everyday situations [[19],[40], [65]], tightly tied to contextual contingencies and ongoing activities, and through the creative initiative of prospective players. For example, children act as play designers when they decide to skip the cracks on the road, imagining lava coming up through them, making the dull way home a far more interesting experience [[24]]. Here, play emerges through, and is sustained by, the physical properties of the asphalt and the ongoing activity of going home. But how can designers leverage this situated and highly contextual nature of play, and the capacity of users to reframe mundane situations into playful and meaningful ones? We suggest that drawing more on the context where play emerges and leveraging the creative capacity of users is a fruitful approach when designing for play and playfulness that integrate meaningfully in everyday situations.

There are general calls for well-formalized methods in design research [[75]] and for reimagining Participatory Design (PD) [[6],[14]]. Towards better supporting people's social and emotional needs, we add a call for new methods that support the design of playful interventions aimed at mundane, open-ended, everyday activities that are non-entertainment based. We propose *Situated Play Design* (SPD) as an extension to existing play design approaches that focuses on uncovering existing manifestations of contextual play as a starting point for designing for situated and emergent playful engagement. Arguably, the playful interactions that exist and emerge naturally as users engage in their everyday context and activities are likely meaningful to them. We propose to study and leverage those interesting play activities—and their underpinning play design elements—as they emerge naturally, when users playfully engage in a context similar to that designed for, and to use that knowledge as design material.

Our contribution transpired from a series of Research through Design (RtD) [[31],[36],[74],[75]] projects in the domain of play and playful design, sharing: (1) a focus on uncovering

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and leveraging existing manifestations of contextual playful engagement; (2) early involvement of users as creative partners; (3) in-context ideation activities, and (4) the usage of play and playfulness both as a design goal and design method. Here we illustrate SPD through two case studies in remarkably different domains: a playful gastronomic experience and a physical rehabilitative therapy for the elderly. We use these cases to illustrate a series of actionable strategies to support our approach. We conclude with a discussion of the design implications of SPD, including the opportunities and challenges it might present, and an account of how it draws from, and extends, other approaches. Our contribution can inspire interaction designers who want to design situated and emergent play interventions that work well in open-ended, everyday activities that are non-entertainment based.

## BACKGROUND

### Games, Play and Playfulness: Designing at the Intersection of Play and Everyday Life

The line between play and games is fine and blurry. A well-accepted distinction between them is captured by the concepts of *ludus* (a structured activity that is framed by imperative conventions) and *paidia* (a free, improvisational activity) [[5],[19]]. Games usually rely on a predefined, clear, and well-set structure, composed of goals, and game rules and challenges to overcome them [[59]]. Play engagement emerges typically within that structure, when players embrace the game rules to overcome challenges, finding their way towards a successful outcome [[5],[67]]. But play can also emerge outside of the realm of games [[59]]. Play does not necessarily require the presence of challenges or a clear outcome [[59]]. Play is diverse—it can be simultaneously liberty, invention, fantasy, and discipline [[19]]. Although less clear than in games, there is also structure to play [[5],[70]]. For example, when engaged in pretend play, children often come up with house rules, such as “you’re out if a bomb (balloon filled with water) explodes on you (and you get wet).”

Despite their differences, play and games share traits that are important from a design perspective: they are *autotelic* and *self-contained* activities. That is, they have a context of their own separated from other everyday activities, where playing is at focus and at stake [[19],[65]] and those other activities fade out. That notion of *separateness* is often referred to as the *magic circle* [[40],[59]]. Although some authors have argued that the notion of magic circle is obsolete, noting that play and games cannot be completely separate from the non-play world [[21]], we find this separation useful from a design point of view.

When designing an autotelic play activity, whether a game or another kind, designers create a new context and a set of meanings, which are maintained and continuously negotiated among players during the activity. In games, these are typically seen as exclusive to that play activity and separate from anything that is outside of the play domain [[65]]. Here

we argue that a good integration with the out-of-play world is essential when designing playful interventions in non-entertainment contexts, where the magic circle of play blends into real life.

Play and playfulness often emerge naturally in a variety of everyday situations [[19],[40],[65]]. Sicart’s notion of *playfulness* characterizes well that intersection between play and real life, “play outside of the context of play” [[65]]. It speaks about a specific type of play experience, “just what attracts us, [...] without the encapsulated singularity of play” [[65]]. As opposed to play and games, playfulness is often seen not an activity in itself, but an attitude with which other activities can be performed. As such, it can coexist with activities other than play. Playfulness affords the many benefits of play in situations in which playing is not the only thing at stake.

The differences between games, play and playfulness are relevant to situated and emergent play design—that is, the design space of playful interventions aimed at activities that are not entertainment-based. When designing a game or any other kind of autotelic play activity, designers create a quite self-contained world from scratch that the player gladly inhabits. In contrast, this is not the case when designing for playfulness and other forms of mundane play. Playfulness moves beyond, or extends, the magic circle of a pure game, instead weaving itself into everyday life and activity. Thus, while taking the context of play and the users into account is of course useful in game design, it is *essential* when designing for playfulness as situated and emergent within mundane everyday activities. How can we support that playfulness by design? How can we design a “porous” magic circle of play that at the same time supports autotelic action—that is, play that is worthwhile in and of itself—and that also embraces players’ contexts and lives? These are key design questions this paper addresses.

### The Design Space of Situated and Emergent Play

In this paper, we offer tools to support the design of situated and emergent play interventions targeted at everyday scenarios. We want to encourage and empower designers to craft compelling play experiences that are meaningful to users, and that integrate well into everyday activity. Here we discuss previous works in the design space of situated and emergent play, where SPD can add value.

The design space of play beyond entertainment games is diverse. It includes works that respond to diverging values and different understandings of play and its role in human life. However, they all share a common trait: regardless of their motivations, they focus on reframing mundane activities and situations to be more playful, compelling and/or fun. A noteworthy subset of non-entertainment play designs are those works that leverage the motivational power of play and games to support real-life productivity agendas. A well-known approach in this space is gamification [[18],[23],[25],[73]], i.e the strategy of using game elements (e.g. points, badges and leaderboards) to make non-game

activities more compelling. Gamification responds to the ultimate goal of motivating users to perform a specific set of tasks, which are necessary to achieve productive results in those activities but are not intrinsically motivating enough by nature. For example, *Classcraft* [[60]] is a digital app that motivates students to perform better at school by augmenting the learning process through game-inspired challenges and rewards.

Although popular in academia, and especially in the industry sector [[73]], gamification has received abundant criticism for embracing a narrow understanding of play [[51], [63]], for being too designer-centric [[53]], and for focusing more on supporting the productive outcomes of the activity rather than on the experience itself [[49]], which has raised ethical concerns [[16],[55]]. Play designers and scholars propose multiple and inspiring alternative concepts that embrace a more diverse idea of play and propose a more balanced focus between the quality of the play experience and the productive outcomes that are expected from it. Sicart makes a “call to playful arms, an invocation of play as a struggle against efficiency, seriousness, and technical determinism” [[65]]. Pearce advocates for the design of *productive play* [[56]] that is tied to a purpose beyond entertainment yet meaningful to users. Kim’s *gameful design* supports the design of meaningful user experiences that increase motivation and engagement through game thinking [[45]]. Nicholson’s *meaningful gamification* [[54]] affords space for player-generated content that emphasizes the intrinsic value of the play experience.

*Playification* [[48],[63]] is a rather new and blurry concept [[68]] that draws from many of those contributions to offer an alternative to the limitations of gamification. First, it embraces a broader idea of the diversity of play, supporting playful rather than gameful behavior [[48]]. Second, it focuses on the design of *meaningful* play and playful experiences that are intrinsically compelling to players. Instead of using generalized game elements that are likely to produce extrinsic motivation to perform not-so-compelling tasks (like in gamification), playification strives to make those tasks intrinsically fun through the emergence of meaningful situated play [[68]]. Our SPD approach can be very useful to achieve this: it provides mechanisms to find out what kinds of playful engagement are already meaningful to users in their everyday context and activities, and to respond to those playful cravings by design. Thus, within the scope of non-entertainment play interventions that support productive agendas, we align more with playification’s focus on supporting experiences that are intrinsically compelling than with gamification’s task-and-reward based approach.

While the idea of instrumenting play to support productive goals has an important traction in HCI, we also see works that embrace a less utilitarian understanding of the role of play and playfulness in human life. They focus on the design of playful interventions that respond to other values than productivity, e.g. promoting curiosity and exploration,

facilitating social connections or, more generally, supporting well-being. Gaver’s *ludic design* leverages technology to “pursue our lives, not just work” [[34]]. It advocates for the design of ambiguous, open-ended technology artifacts that elicit curiosity and encourage us to be explorative and playful in our everyday routines. The idea of using technology to help people enjoy experiences we long for, and not only help them “get the chores done” [[34]], is shared by other designers. For example, Bekker and colleagues have explored the design space of open-ended play and playful interventions that elicit curiosity [[69]] and support free-choice learning through exploration [[7]], promote physical play [[9]], or facilitate social interaction [[8]]. Our SPD approach is also relevant to those kinds of less utilitarian everyday play interventions, as they focus on augmenting everyday activities and situations through the lens of play and playfulness. Uncovering existing playful interactions that are already meaningful to users can help designers craft interventions that are more compelling and fun.

### Influential Methods and Approaches

A key aspect of designing for situated and emergent play is that the intervention supports the emergence of meaningful play and playful engagement. Therefore, engaging users is crucial to the design process, as they are the real experts on the contexts and practices the intervention will support and augment. We are inspired by existing user involvement approaches in the design space of play and games and, more broadly, in technology design. They offer interesting insights on how to engage users and context to design interventions that integrate better in mundane situations.

A plethora of User-Centered Design (UCD) [[1]] methods have taught us how to incorporate users in play and game design processes (e.g. [[10],[27],[32],[41]]). In game design, several of the lenses within Schell’s *Game Design Lenses* [[62]] are prompts to scrutinize games from the players’ perspective; various works from game UX (e.g. [[11],[27],[41]]) suggest strategies to take users’ desires into account to inform the design process; and Fullerton’s *playcentric* approach to game design [[32]] offers strategies to include users in the design process, mostly to test, refine and evaluate designs. In play design, Bekker et al.’s *Four Lenses of Play* [[10]] is a “toolkit for designing playful interactions” that offers a series of lenses to inform play design and support the designer’s choices throughout the design process through iteration with users. We are inspired by how those user-centered approaches iterate rapidly with users to refine and evaluate design outcomes, especially at the stages of prototyping and deployment.

Participatory Design (PD) [[30],[52]] methods extend UCD practices by including users earlier in the design process, before ideation starts, and giving them the role of *creative partners* [[28]]. We are inspired by PD’s longstanding tradition of leveraging multi-stakeholder engagement as the core driver of a design process [[37]], and by many of the strategies it employs to better understand users’ needs and



desires, and co-create democratic solutions that address their real concerns. Participatory Design literature offers numerous strategies to better understand how users act in their everyday, e.g. Druin's insights on children's participation in technology design [[28]]. Differently, instead of focusing on accessible, usable or democratic solutions, our Situated Play Design approach is primarily concerned with play and playfulness. Situated Play Design thus adds a nuance to traditional Participatory Design approaches by proposing strategies to surface existing manifestations of contextual play—what we call *play potentials*. The focus shifts from *what users do*, to *how they engage playfully* in their everyday. Further, Situated Play Design gravitates towards a more flexible approach to co-creation [[61]]: although users take a prominent design role, solutions do not necessarily reflect a completely transparent democratic design process at all times. The designer still takes a major responsibility when selecting the observed play experiences that will drive the rest of the design process and gives new form to them in subsequent designs through varying forms of user engagement.

In contrast with Participatory Design, Situated Play Design shares play and game design's explicit focus on play and playfulness. Yet, instead of focusing on users' play preferences per se, SPD extends those approaches by offering actionable tools to surface existing manifestations of contextual play. This is a novel approach to co-creation in play design: we propose to study and make design use of *play potentials*—existing playful dynamics that are already meaningful in context—as the cornerstone of a playful intervention. The novelty of SPD is the proposal of chasing play that naturally emerges in real-life activities—which is likely to be intrinsically meaningful to users—as the starting point of play design. The value of SPD is that it supports, rather than disrupts, real-life activities, enriching them through enhancing those observed *play potentials*. It facilitates the design of interventions that afford the emergence of playfulness: the attitude that allows us to *experience* meaningful play within activities that are not play [[65]], reframing of those activities to playful ones.

While some game and play design works may already be using similar strategies to shape their design processes, e.g. works in playification [[48]], a method articulating how this can be done has not yet been proposed. As a consequence, we see a lack of methodological discourse around the idea of using *play potentials* to design compelling playful interventions. In the next section, we propose an open methodological frame to think about and better articulate participatory practices to design for situated and emergent play. We hope that it will empower other designers to design mundane play interventions that support the emergence of play and playfulness that are meaningful to users, and that it will encourage them to share their practices so that they can be leveraged by the broader play design community.

## SITUATED PLAY DESIGN: CHASING, ENHANCING AND DEPLOYING PLAY

Here we articulate a series of user involvement practices that have guided our work over the last few years, namely the Situated Play Design (SPD) approach. They emerged from a series of iterative Research through Design projects in the domain of play and playful design, sharing: (1) a focus on uncovering and leveraging existing manifestations of contextual playful engagement; (2) early involvement of users as creative partners; (3) in-context ideation activities, and (4) the usage of play and playfulness both as a design goal and design method.

SPD supports designers in uncovering existing manifestations of contextual play, and using them as foundations of a design intervention, following three main steps: First, designers *chase* naturally existing or spontaneously emerging forms of play when interacting with users in (semi-) naturalistic settings. Second, a design intervention is created to support and *enhance* those forms of play. Third, this design intervention is *deployed* in the wild, where its impact can be evaluated. These steps can be iterated until a satisfactory design is achieved.

### Step 1: Chase the Play

Our interactions with others, with objects and with space are often—more or less explicitly—imbued with play [[65]]. We argue that this offers an invaluable opportunity for play designers, since playful experiences that exist and emerge through the creative initiative of users are likely meaningful to them. These existing and emerging experiences, that we call *play potentials*, could be used as foundations for our designs. *Chase the play* refers to interacting with users and their context in order to better understand these playful interactions that are intertwined with the targeted design activity and context, how they emerge and unfold, and what they mean to users. This inquiry can uncover opportunities for playful enhancements of a targeted design activity or situation.

To chase the play, different known methods in HCI can be employed, chosen to fit the design project, users, and context at hand. Strategies we have found useful range from active interventions in direct interaction with stakeholders (e.g. using co-creation methods like *embodied sketching* [[47]]) to more passive non-disruptive observations (e.g. doing *design ethnography* [[22]]), and interventions with diverse degrees of designer involvement in between (e.g. using *cultural probes* [[33],[35]], or interviewing with *tangible tools* [[20]]). At this stage, theory can provide lenses to understand the type of play engagement observed and the underpinning elements that support and sustain it.

### Step 2: Enhance the Play

Once one or more *play potentials* are identified in context, the designer can proceed to *enhance play and playfulness* within the observed context and activity. The goal is to leverage those observed *play potentials*, which can be used as design target or as inspiration for other new playful

experiences. They are reflected in a play design intervention, which may incorporate, or take as inspiration, observed play mechanics, play challenges, or rules of play that the users found meaningful in their context of use.

Here, the designer's expertise and repertoire of design tools, including play, game, and general design theory and practice becomes relevant to craft a coherent play experience [[43]] that incorporates and enhances those *play potentials*, taken as the core of the play intervention. Importantly, in SPD, play design is not theory-motivated—design expertise and theory are used to add to, take in, or augment already existing playful experiences. We have found play and game design frameworks to provide useful building blocks to craft coherent play experiences that incorporate inspirational play observations. Likewise, theories and concepts that articulate forms of play, as well as open-ended and semi-ambiguous play concepts (e.g. [[10],[46]]), can help materialize our inspirational play observations. At this stage, it is important to keep design interventions open-ended and semi-ambiguous, to afford user appropriation [[53],[54],[64]] in the following stage.

### Step 3: Deploy the Play

The third step of our approach, *deploy the play*, is performed when design solutions start to materialize. Drawing on the notion that a design project does not end with a product being produced [[72]], we encourage designers to deploy and iterate their designs in naturalistic settings, to assess their impact in context [[72]] and to envision future directions. In this step, SPD converges more with traditional game and play design methods, using strategies employed by those approaches. Similarly to rapid design loops to test and iterate designs in game design [[32],[43],[62]], SPD involves continuous iteration and exposure with users in the wild as a way of progressively bringing a play design intervention to

its final form.

Deployment, as well as the rest of the design phases, may lead to different outcomes besides an improved version of the tested design. It can also result in *design after design* [[13]], i.e. a different design that emerges when the artifact is put in the hands of users. Last, it can lead to the formation of intermediate-level knowledge, i.e. more abstract knowledge than that captured by the design, which springs from a RtD process. Examples are *strong concepts*, experiential qualities, methods, and guidelines [[38]]. To deploy the play, knowledge in play-testing or user studies are useful; as well as play and game design theories (e.g. [[4],[10],[62]] to analyze this deployment; they can provide lenses through which we understand the design's impact.

### CASE STUDIES

In this section we illustrate Situated Play Design through two case studies. They were selected to demonstrate the relevance of SPD for the design of different play interventions in different domains (see Table 1).

#### Playing with food

*Playing with food* [[3]] illustrates how SPD can facilitate the design of open-ended playful experiences by including stakeholders in early stages of a design process. The aim of the project was to discover strategies to enhance playfulness in gastronomy. In previous research, we found that the dominant idea of playful eating embraced by chefs is often narrow and does not necessarily resonate with the desires expressed by other stakeholders [2]. In the light of this, we decided to explore other perspectives, to inform the design of playful eating experiences—and technologies to support them—that are appealing to broader audiences. For the purpose of this paper, we describe one of our explorations: a co-creative engagement with two food enthusiasts. The exploration involved three main phases, in which designers

		Playing with food	PhySeEar
Overview	Design goal	A playful gastronomic experience.	A new playful design direction for a rehabilitative technology.
Chase	Methodology	Design ethnography, tangible conversation tools, in-activity interviews.	Design ethnography, Wizard of Oz, prototypes, interviews, interaction analysis, video analysis.
	Play potentials: What did we chase?	Core mechanic: participants had fun guessing the ingredients of a dish.	Existing social dynamics (chatting while training), and emerging playful dynamics (re-signification and role-playing).
Enhance	Methodology	Designer-driven, inspired by theory (PLEX framework).	In collaboration with one user (physiotherapist). Inspired by social robot research, and kinesiology.
	What did we design?	4 playful dishes based on the core mechanic, enhanced through different forms of play.	An interactive rehabilitative session featuring the NAO robot to model and assess movements.
Deploy	Methodology	Design ethnography, tangible conversation tools.	Design ethnography, Wizard of Oz, prototypes, interviews, interaction analysis, video analysis.
	What did we find?	Participants enjoyed all dishes and their playfulness, although they previously argued they did not like to play with food.	The intervention augmented desirable social dynamics, intensified physical engagement, reflection about performance, and playful competition “against” the robot.

Table 1. Summary of the case studies, including: the design goal and the methodology and outcomes for all three phases of SPD (*chase*, *enhance*, and *deploy* the play).

took different roles. To *chase the play*, we actively observed stakeholders' everyday eating practices in context. That allowed us to identify a *play potential* that we then used as core mechanic for our design. We designed an eating experience based on that play potential, *enhancing* it through play theory. Finally, we *deployed* the design and critically reflected on it with stakeholders.

To *chase the play*, we started by interviewing the food enthusiasts over a meal while focusing on identifying existing playful interactions in their everyday eating, which would inform our design. To *chase the play*, we combined two design methods: *design ethnography* [[22]] to study the participants' behavior during a meal; and *tangible conversation tools* [[20]] to facilitate a post-meal conversation about play and gastronomy. Interestingly, the food enthusiasts said, repeatedly, that they thought including any kind of play would be disruptive to the gastronomic experience. Their actions, however, conveyed quite the opposite. Combining interviews with observation of their behavior while eating, we were able to identify a playful interaction that kept emerging and engaging our stakeholders: challenging and teasing each other. They did this in different ways, and one particular challenge seemed to work well to playfully engage them while enjoying their food: guessing the ingredients of the dishes.

Hence, to *enhance the play*, we designed a playful eating experience building from the observed play potential of "guessing the ingredients of a dish" (described in detail in [[2]]). We decided not to include the food enthusiasts in this part of the process, to maintain a surprise factor that we previously found key to gastronomy [[3]]. We designed a 4-course meal, where each dish built on the observed playful interaction in a slightly different way, supporting different forms of play inspired by play theory (e.g. *PLEX* [[4]]): discovery, creative expression, collaboration, and competition. Discovery, for example, took the form of bread and olive oil (Figure 1). We gave each diner 6 small plates and poured some oil in one of them. The oils were infused with certain ingredients. Individually, diners had to guess the ingredients in order to be served a new type of oil. Importantly, the intervention was semi-ambiguous to allow diners to find their own way to participate, e.g. they could choose whether to share their findings, or to compete over who guessed more oils.



Figure 1. Discovery-inspired dish. Left: a plate with samples to help the diners guess the ingredients used to infuse the oils. Right: a participant tasting one of the oils.

To *deploy the play*, we invited the food enthusiasts to another meal, and served the playful dishes. Following the meal, we conducted a reflection, again using *tangible conversation tools* [[20]]. To facilitate the conversation, we gave participants a food-based questionnaire (Figure 2) that allowed them to choose the most liked and disliked dishes by eating small sweets. We found that the participants enjoyed all of the dishes, as well as the play experiences they supported. They engaged with all of the forms of play while enjoying their food, which was surprising considering that in the interview they stated playing would negatively disrupt their eating experience. In the reflection, they explained that the dishes supported them to behave the way they like to behave around food. Far from being disruptive, playfulness integrated smoothly into their eating expectations, offering them chances to be casually playful with one another, and therefore enhancing their experience.

Arguably, a key success factor in this case study was that the play we chased strongly inspired our design. While we used play theory to inform some of our design decisions (i.e. enhancing existing playfulness through theory-motivated forms of play), the core mechanic was a result of the observation of existing eating interactions. We believe it was essential to conduct the first interview in context—that is, while eating. By conversing while experiencing the activity on spot, we were able to observe interactions that our participants did not necessarily express verbally, or that even contradicted their words. Had we limited our research to a de-contextualized conversation, we might not have been able to know about these food enthusiasts' playful interactions around food, and we would have missed the *play potential* that resulted in a successful design.

To summarize, in this case study we enhanced a playful interaction these food enthusiasts often engaged in, and therefore felt comfortable with. Our work, augmenting that activity through play theory, simply made playfulness easier to access and more compelling. While we did not include users in some parts of the design process, the design was a



Figure 2. Petit-four-based questionnaire. Questions around the perimeter of the plate: *What did you like? What was fun? What felt uncomfortable?* In the centre, 16 emotions drawn from play theory.



result of, and extended, our participants' play practices. Play theory, in combination with our own design expertise, helped us craft an experience that enhanced those practices. *Playing with food* illustrates how existing forms of playful interpersonal engagement can be leveraged in the design for play, and why that might be desirable.

### PhySeEar

*PhySeEar* shows how emerging playful interactions during early explorations in the domain of physical rehabilitative therapy offered new design directions that worked for, and added to, the original goals of the project. These revolved around improving physical training sessions in an assisted living facility by means of increasing motivation, focus, and engagement of the elderly attending to sessions offered by the onsite physiotherapist. Design challenges were: First, inpatients hardly found the targeted exercises intrinsically motivating. Although necessary, they were repetitive, tedious, and physically challenging for many individuals. Second, many inpatients could not expect to see an apparent physical improvement from their exercises, which is often a powerful extrinsic incentive of rehabilitative therapy [[17],[39]]. For many, the therapy's goal was to slow down the worsening of their physical condition and skills, rather than to increase capability per se. The project explored how technology could help improve the training sessions, and involved two main design cycles, where five different prototypes were tested. For the purpose of this paper, here we focus on two subsequent prototypes: The first one belongs to a first exploratory design phase, where interesting play engagement and social play dynamics emerged. These *play potentials* were leveraged and materialized in a following design prototype.

To better understand and *chase* what worked for the inpatients, we conducted interviews, on-site observations, and analysis of regular training sessions. Socializing with the therapist was found to be an important extrinsic incentive for the elderly. Although valued by the physiotherapist, it was unfortunately detracting too much focus from the physical exercises. Our first prototype (Figure 3), designed as a *provotype* [[15]] to provoke new and unexpected situations, built on inpatients' desire to socialize with therapists to focus the inpatients' attention during the training session. It consisted of a set of LEDs, one mounted in a stand in front of



Figure 3. Chasing the play with *PhySeEar*. The physiotherapist roleplaying a supportive role while using the remote control to provide more strict feedback on performance through the LEDs.

the inpatient, and others attached to the body part they were training. They were remotely controlled by the physiotherapist following a Wizard of Oz technique [[26]]: green lights indicated correct performance; orange, minor movement flaws; and red, incorrect performance. This intervention showed potential in terms of the inpatients' focus and provided them with a common vocabulary to discuss their skills, issues, and progress. Yet the most striking insight was the *emergence of playful engagement*, which the inpatients enjoyed and the therapist considered a key motivator.

Playful engagement was hence *chased* in a subsequent video analysis of the sessions, resulting in two key insights around the themes of re-signification and role-playing: The physiotherapist spontaneously started using the lights as a strict external judge, while roleplaying a supportive and friendly role. For example, whenever the inpatients were slipping, he would start vocalizing a warning, interrupting it half way through as he changed the lights (to orange or red), which he would play act empathically, surprised, or jokingly annoyed or frustrated, e.g. "Watch your... [lights change to orange] Oh, yeah... elbow. It was slightly bent." This type of siding against the technology was enjoyed by the inpatients. Many started to make jokes about the strictness of the technology, teasing it, and coming up with funny names for it, like the "tattletale," "know-it-all," "snitch," and "smarty pants." We called this type of play engagement "good cop/bad cop."

The following design iteration focused on *enhancing the play*, i.e. supporting these playful antagonistic dynamics with the technology and social dynamics with the therapist. Drawing from social robot research, our own knowledge in kinesiology, and in consultation with the physiotherapist, we decided to use the NAO robot [[66]]. In addition to physiotherapy reasons, this technology was interesting from a playful stance. Robots can be seen as social agents and playthings [[44]], and the NAO's anthropomorphic form could support the antagonistic and contender playful behaviors towards the technology. With the help of the physiotherapist, we pre-programmed a set of exercises for the NAO to model before and during the inpatients' performance, and the most common errors they used to make, which the NAO would exaggerate. The robot's eyes used the same color system to the previous prototype. When an error happened, the NAO interrupted its "ideal" performance, switched eye color (to orange or red), and performed the exaggerated movement flaw.

To *deploy the play*, we used a Wizard of Oz setup with the physiotherapist triggering the different NAO responses, which would allow him to keep roleplaying and taking sides with the patients (Figure 4). This deployment had a positive therapeutic and playful value: the NAO contributed taking over the physiotherapist's tasks of movement assessment (similarly to the earlier deployment), and also provided the patients with a continuous movement. As anticipated, similar



**Figure 4. Deploying the play with PhySeEar. Left: the NAO Robot. Right: the inpatient and the physiotherapist performing a rehabilitation exercise.**

siding and contending dynamics were observed. Additionally, the physiotherapist used the NAO to “take the blame” for the flaws in the patients’ movements, to which he would point and refer when explaining movement issues. The patients were readily able to grasp these second order movement flaw references, and made relevant posture and movement corrections, while joking about the NAO’s mistakes. Patients still called the NAO the earlier funny names, adding “the doll”, and “the boss” to the repertoire. They also teased the robot when it was too slow or clumsy, and some would follow up on the difference between their and the NAO’s performance, asking performance questions, or bragging about their own. The movement limitations of the robot were also picked on by the physiotherapist, who used them as baselines to set up playful competitive challenges for the patients, e.g. performing some movements faster than the NAO, or with a bigger movement range. The patients found this amusing, and many intensified their physical engagement.

Arguably, a key success factor of the *PhySeEar* project was that many of the supported play dynamics resonated well with playful and social behaviors the patients enjoyed prior to our interventions, namely socializing with the physiotherapist, often seen as a confidant, somebody to tell jokes to, and occasionally tease. These *play potentials* emerged in the first explorative deployment as well, when the physiotherapist role-played a “good cop” role (the technology featuring the “bad cop”). Yet, this socialization and teasing were enhanced by our design, since they were now directed at the technology and in continuous reference to movement performance aspects, contributing with therapeutic, emotional, and entertaining value. These were picked up on (*chased*) early in the design process and used to drive the rest of the design process.

To summarize, *PhySeEar* was not conceived of as a play-oriented project from the onset but play emerged as an important motivator for patients along the way and was leveraged in successive design iterations. This makes this case particularly interesting from the perspective of *stumbling on*—rather than purposefully chasing—interesting play dynamics that not only aligned well with the original

goals of the project, but that also made the training activity more compelling to the patients.

## DISCUSSION

The two case studies we examined illustrate the value of Situated Play Design in different situations, to design a variety of systems, and at different phases of a design process. Despite the differences in the two projects, we followed a similar three-step approach by *chasing* existing manifestations of play in the interaction with users, which led to the discovery of *play potentials*—that is, existing and emergent playful experiences, interactions, attitudes and situations that are meaningful to users in the context of their ongoing activity and setting. Then, these *play potentials* were used to design novel playful experiences, and were lastly tested in their targeted design context, proving to be compelling to users. Here we argue these *play potentials* could have been easily missed without a *chasing-the-play* observational lens. For example, during an early interview in *Playing with food*, participants insisted that play would negatively disrupt their eating experience, only to show with actions that they actually enjoyed eating playfully.

In the *PhySeEar* project, given the success of the first prototype regarding motivation, focus, and engagement, a more traditional technology-focused approach would have likely focused on polishing this prototype, e.g. achieving autonomy, improving or extending movement feedback, and improving form factor, attachment, and location of the lights. While we will not argue against the potential value of such second prototype, it would not have been driven by those observations of playfulness and interesting social dynamics, which both we and the physiotherapist believed to be a key aspect underpinning the elderly patients’ motivation and engagement. As the *PhySeEar* case shows, this play lens may not necessarily be used from the onset of the project, but once play and playfulness emerges. We strongly encourage design researchers to keep an eye out for situations where this happens, as well to seek out conditions and elements that allow play and playfulness to emerge. Play and playfulness are strong indicators of whether an activity is meaningful and worth doing for users, and hence we argue it only makes sense using them to inspire design.

## Novelty and Relevance of SPD

The main contribution of Situated Play Design is that it empowers designers to identify and understand emergent playful dynamics that already exist in context—and are thus likely to be meaningful to users—and to support and enhance them by design. Importantly, SPD does not exclude, but rather builds on, complements, and extends many design strategies often employed in User-Centered Design, Participatory Design or game and play design. We build on UCD by including users in the design process but consider them active contributors rather than inspirations or evaluators. We see users as *creative partners* [[28]], while in UCD their role is to indirectly influence the designer’s work. Instead of limiting user input to playtest sessions or the



refinement of existing prototypes, Situated Play Design encourages designers to leverage users' tacit knowledge of their own realities from the moment a design process starts.

SPD is thus inspired by Participatory Design [[30], [52]], a longstanding tradition of leveraging multi-stakeholder engagement as the core driver of a design process [[37]]. Yet, instead of focusing on accessible, usable or democratic solutions, Situated Play Design is primarily concerned with play and playfulness. Participatory Design literature offers strategies to better understand how users act in their everyday, e.g. Druin's insights on children participation in technology design [[28]]. Following a recent call to reimagine Participatory Design [[6], [14]], Situated Play Design adds a nuance to traditional PD approaches by proposing co-creative strategies to surface existing manifestations of contextual play—what we call *play potentials*. The focus shifts from *what users do*, to *how they engage playfully* in their everyday—that move responds to a contemporary need to design technology that responds to people's social and emotional needs, and not only to support productive agendas. Further, in SPD, although users take a prominent design role, solutions do not necessarily reflect a completely transparent democratic design process at all times.

SPD shares play and game design's focus on play and playfulness. Yet, instead of focusing on users' play preferences *per se*, SPD extends those approaches by offering actionable tools to surface existing manifestations of contextual play. This is a novel approach to participation in play design: we propose to study and make design use of *play potentials*—existing playful dynamics that are already meaningful in context—as the cornerstone of a playful intervention. The novelty of SPD is the proposal of chasing play that naturally emerges in real-life activities as the starting point of play design. The value of SPD is that it supports, rather than disrupts, real-life activities, enriching them through enhancing those observed *play potentials*. It facilitates the design of interventions that afford the emergence of playfulness: the attitude that allows us to *experience* play within activities that are not play [[65]], reframing of those activities to playful ones.

While some game and play design works may already be using similar strategies to shape their design processes, e.g. works in playification [[48]], a method articulating how this can be done has not yet been proposed. As a consequence, we see a lack of methodological discourse around the idea of using *play potentials* to design for situated and emergent play. Our paper addresses this by visualizing the need for methodology contributions in this space and offering an open frame where participatory play design practices can be shared, combined and critically reflected upon.

SPD is thus an open methodological frame aimed at supporting emergent playful design practices. Inspired by previous calls for well-formalized methods in design research [93], it formalizes play design to afford actionable strategies

to design for non-entertainment play, but in an open way. Rather than enforcing a unique set of practices, SPD gives pointers to a diverse set of flexible tools that can help designers design for situated and emergent play. SPD is thus aligned with a generative understanding of RtD [[36]]—it structures design *just enough* to make it approachable. It does not attempt at simplifying design or eliminating uncertainty. Instead, it empowers designers to navigate—and leverage—that uncertainty. We present SPD as an inclusive and evolving framework that encourages designers to share best practices and thus diversify the set of tools available to the community. Our case studies demonstrate that: while part of a same SPD umbrella, they use different methods. Critically, reflecting on those cases through the lens of SPD allowed us to unpack our strategies so that they can be used by others hereafter.

### Challenges and Limitations

User engagement in play design presents challenges. First, many game designers have noted that it is often difficult for people to tell what they will find fun before they try it out (e.g. [[57]]). While that might be a barrier in the design of entertainment games, we argue it is less problematic in the design of situated and emergent play interventions. Games are often closed systems that are separated from—and significantly more abstract than—the player's everyday context and routines. In situated and emergent play interventions, playfulness intersects with—and often builds on top of—those routines. Importantly, users are the ultimate experts on their own routines. With co-creative methods like those described in our case studies, designers can help users describe what they think is fun, and what might be, and discuss this in interplay with their playful engagement with their context and routines.

Another common source of skepticism towards co-creative approaches to play design is the effort they require. [[57]] explains that participatory approaches to game design are limited by how costly it is to prototype a videogame. In game design, while early low-fi prototypes are often used by design teams to facilitate rapid iteration cycles [[32],[62]], playtesting with real audiences usually happen at an advanced stage of the process [[32]] and employ hi-fi prototypes that resemble the “final experience” [[57]]. Developing hi-fi prototypes requires remarkable time and specialized skills. Once that time has been spent in development, it is hard to take several steps back and rethink structural design decisions. Here, we argue the problem is less present in the design for situated play. While in videogames a *new world* is built from scratch, in situated and emergent play designs the *world of play* is the users' context. The core design materials already exist: the users, their space, the objects in that space, and the situations that emerge in the interplay between all of those. Using those materials as a starting point, and leveraging co-creative methods such as *mock-ups* [[29]], *embodied sketching* [[47]], *object theatre* [[58]], *tangible tools* [[61]], or *Wizard of Oz* [[26]], designers can co-design low-fidelity prototypes in-situ with

stakeholders in a lightweight way. In fact, those explorations can even be useful once the core mechanics of a system have already been determined. While such methods are already used by many in game and play design (e.g. [[32]]), we suggest using them earlier in the process and involving real audiences.

Another challenge to co-creative processes in play design, and in particular in our SPD approach, is the same reason that makes them powerful: the situated nature of their outcomes. SPD produces context-dependent knowledge that might not be applicable beyond the situations explored. Importantly, the aim of SPD is not to inform the design of playful systems that work in all possible scenarios. Rather, it supports the design of situated artefacts that genuinely address the idiosyncrasies of specific scenarios. As noted by [[12]], there is value in designing for the particular as it “can enable us to capture the richer and more complex nuances of a particular situation or user, hence also directly challenging the assumptions we make as researchers”. That being said, the outcomes of different SPD explorations can be combined to produce intermediate-level knowledge [[38]] that responds to a variety of scenarios, thereby broadening the space of applicability of a design. That, in combination with user-generated content strategies such as [[54]], might help designers create interventions that are applicable beyond one single domain.

Finally, while in this paper we outlined a series of design and research methods we found useful, we acknowledge that there might, should and will be many more. We stress the need for further research on methods that support user involvement in the idiosyncratic design space of play and playfulness. Thus, we are committed to continue exploring how user involvement methods that have been deemed useful in other areas of design can be extended as to be valuable in the design of playful systems. We also encourage other researchers to share their own—we have seen a number of play design works that involved extensive engagement with users, and we are positive that they could be a source of invaluable methodological insights to the rest of the play design community.

## CONCLUSION

In this paper, we proposed Situated Play Design (SPD) as an approach that extends current play design frameworks by empowering designers to identify and understand meaningful playful dynamics that exist naturally in context, and to support and enhance them by design. It supports the design of playful interventions addressed at mundane, open-ended, everyday activities that are non-entertainment based, where the line between real-world activity and the magic circle of play fades away. Our approach focuses on capturing the emergence of play in semi-naturalistic settings and using those observations to inform the design of the key aspects of playful interventions that work well alongside such activities. SPD supports, studies, and makes design use of play and playful engagement: (1) that emerges naturally as users

interact; (2) that is deeply grounded in a context similar to that designed for; and (3) early in the design process.

Playfulness is latent in many everyday situations, ready to emerge—SPD can help support and enhance it, and that can help technology designers better respond to people’s social and emotional needs. We propose to *chase* play that already exists in context, *enhance* it through developing a playful artifact or activity, and finally *deploy* the artifact or activity in the wild to test for success and subsequent iterations. If we can identify, study and unpack those *play potentials*, we might be better positioned to respond to them by design. They can be used as a starting point for ideation and augmented by designers through their own expertise. By providing actionable strategies for early and sustained user involvement, SPD gives designers invaluable material to work with, empowering us to build on premises that are likely to respond to the users’ desires and contextual needs. SPD can be the through-line that allows us to make sure the users’ play desires are always at the core of the designed system, uncovering missed opportunities to encourage play.

To make our approach accessible to other designers, we unpacked SPD as a three-phase iterative process—including *chasing*, *enhancing* and *deploying* play—and provided actionable mechanisms for each of those steps. To illustrate our approach, we described how SPD might unfold in two case studies of our own work in different areas within the design space of play. We then offered a discussion on the novelty of our approach, as well as on the challenges and opportunities it might pose. Finally, we stressed the need for further research on methods to support multi-stakeholder situated participation in play design processes.

To conclude, SPD builds on existing contextual *play potentials* to create playful interventions that resonate with these experiences and respond to contextual idiosyncrasies. It thus responds to a need to design for everyday play and playful engagement beyond entertainment games, which can have an impact on individual and collective well-being and is therefore a desirable social good. In this paper, we make accessible a series of situated and emergent user involvement mechanisms we found useful when designing for situated play. We hope that it will also encourage the play design community to expand the—currently limited—set of methods that support the design of playful interventions addressed at mundane, open-ended, everyday activities that are non-entertainment based, with the aim of supporting people’s social and emotional needs.

## REFERENCES

- [1] Chadia Abras, Diane Maloney-Krichmar, and Jenny Preece. 2004. User-centered design. Bainbridge, W. *Encyclopedia of Human-Computer Interaction*. Thousand Oaks: Sage Publications, 37(4), 445-456.
- [2] Ferran Altarriba Bertran. 2017. *Playing with food: enriching and diversifying the gastronomic experience*

- through play. MSc thesis. University of Southern Denmark.
- [3] Ferran Altarriba Bertran and Danielle Wilde. 2018. Playing with food: reconfiguring the gastronomic experience through play. In *Proceedings of the 1st International Conference on Food Design and Food Studies* (EFOOD 2017), October 19-21, 2017, Lisbon, Portugal.
  - [4] Juha Arrasvuori, Marion Boberg, Jussi Holopainen, Hannu Korhonen, Andrés Lucero, and Markus Montola. 2011. Applying the PLEX framework in designing for playfulness. In *Proceedings of the 2011 Conference on Designing Pleasurable Products and Interfaces* (DPPI '11). ACM, New York, NY, USA, Article 24, 8 pages.
  - [5] Jon Back, Elena Márquez Segura, and Annika Waern. 2017. Designing for Transformative Play. *ACM Trans. Comput.-Hum. Interact.* 24, 3, Article 18 (April 2017), 28 pages.
  - [6] Liam Bannon, Jeffrey Bardzell, and Susanne Bødker. 2018. Reimagining participatory design. *Interactions* 26, 1 (December 2018), 26-32. DOI: <https://doi.org/10.1145/3292015>
  - [7] Tilde M. Bekker and Berry H. Eggen. 2008. Designing for children's physical play. In *CHI '08 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '08). ACM, New York, NY, USA, 2871-2876. DOI: <https://doi.org/10.1145/1358628.1358776>
  - [8] Tilde Bekker, Janienke Sturm, Rik Wesselink, Bas Groenendaal, and Berry Eggen. 2008. Interactive play objects and the effects of open-ended play on social interaction and fun. In *Proceedings of the 2008 International Conference on Advances in Computer Entertainment Technology* (ACE '08). ACM, New York, NY, USA, 389-392. DOI: <https://doi.org/10.1145/1501750.1501841>
  - [9] Tilde Bekker, Janienke Sturm, and Berry Eggen. 2010. Designing playful interactions for social interaction and physical play. *Personal Ubiquitous Comput.* 14, 5 (July 2010), 385-396. DOI=<http://dx.doi.org/10.1007/s00779-009-0264-1>
  - [10] Tilde Bekker, Ben Schouten and de Mark de Graaf. 2014. Designing Interactive Tangible Games for Diverse Forms of Play. In *Handbook of Digital Games* (eds M. C. Angelides and H. Agius).
  - [11] Regina Bernhaupt (Ed.). 2010. *Evaluating user experience in games: Concepts and methods*. Springer Science & Business Media.
  - [12] Olav W. Bertelsen, Susanne Bødker, Eva Eriksson, Eve Hoggan, and Jo Vermeulen. 2018. Beyond generalization: research for the very particular. *Interactions* 26, 1 (December 2018), 34-38. DOI: <https://doi.org/10.1145/3289425>
  - [13] Erling Björgvinsson, Pelle Ehn, and Per-Anders Hillgren. 2012. Design things and design thinking: Contemporary participatory design challenges. *Design Issues*, 28(3), 101-116.
  - [14] Susanne Bødker and Morten Kyng. 2018. Participatory Design that Matters—Facing the Big Issues. *ACM Trans. Comput.-Hum. Interact.* 25, 1, Article 4 (February 2018), 31 pages. DOI: <https://doi.org/10.1145/3152421>
  - [15] Laurens Boer and Jared Donovan. 2012. Provotypes for participatory innovation. In *Proceedings of the Designing Interactive Systems Conference* (DIS '12). ACM, New York, NY, USA, 388-397. DOI: <https://doi.org/10.1145/2317956.2318014>
  - [16] Ian Bogost. 2011. Persuasive Games: Exploitationware. *Gamasutra.com*. [https://www.gamasutra.com/view/feature/134735/persuasive\\_games\\_exploitationware.php](https://www.gamasutra.com/view/feature/134735/persuasive_games_exploitationware.php).
  - [17] Cynthia J. Brown and Claire Peel. 2009. Rehabilitation. In *Hazzard's Geriatric Medicine and Gerontology* (6 edition), Jeffrey B. Halter, Joseph G. Ouslander, Mary E. Tinetti, Stephanie Studenski, Kevin P. High and Sanjay Asthana (eds.). The McGraw-Hill Companies, New York, NY, USA. Retrieved December 11, 2015 from <http://mhmedical.com/content.aspx?aid=5113374>
  - [18] Brian Burke. 2016. *Gamify: How gamification motivates people to do extraordinary things*. Routledge.
  - [19] Roger Caillois. 2001. *Man, play, and games*. University of Illinois Press.
  - [20] Simon Clatworthy, Robin Oorschot and Berit Lindquister. 2014, June. How to Get a Leader to Talk: Tangible Objects for Strategic Conversations in Service Design. In *ServDes. 2014 Service Future; Proceedings of the fourth Service Design and Service Innovation Conference*; Lancaster University; United Kingdom; 9-11 April 2014 (No. 099, pp. 270-280). Linköping University Electronic Press.
  - [21] Mia Consalvo. 2009. There is no magic circle. *Games and culture*, 4(4), 408-417.
  - [22] Andrew Crabtree, Mark Rouncefield and Peter Tolmie. 2012. *Doing design ethnography*. Springer Science & Business Media.
  - [23] Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke. 2011. From game design elements to gamefulness: defining "gamification". In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (MindTrek '11). ACM, New York, NY, USA, 9-15.
  - [24] Sebastian Deterding. 2011. Meaningful Play. Getting »Gamification« Right. Retrieved December 18,



- 2015 from <http://www.slideshare.net/dings/meaningful-play-getting-gamification-right>
- [25] Sebastian Deterding, Staffan L. Björk, Lennart E. Nacke, Dan Dixon, and Elizabeth Lawley. 2013. Designing gamification: creating gameful and playful experiences. In *CHI '13 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '13). ACM, New York, NY, USA, 3263–3266.
- [26] Steven Dow, Blair MacIntyre, Jaemin Lee, Christopher Oezbek, Jay David Bolter, and Maribeth Gandy. 2005. Wizard of Oz support throughout an iterative design process. *IEEE Pervasive Computing*, 4(4), 18–26.
- [27] Anders Drachen, Pejman Mirza-Babaei and Lennart E. Nacke. 2018. *Games User Research*. Oxford University Press.
- [28] Allison Druin. 1999. The Role of Children in the Design of New Technology.
- [29] Pelle Ehn and Morten Kyng. 1992, January. Cardboard Computers: Mocking-it-up or Hands-on the Future. In *Design at work* (pp. 169–196). L. Erlbaum Associates Inc..
- [30] Pelle Ehn. 1993. Scandinavian design: On participation and skill. *Participatory design: Principles and practices*, 41–77.
- [31] Lois Frankel and Martin Racine. 2010, June. The complex field of research: For design, through design, and about design. In *Proceedings of the Design Research Society (DRS) International Conference* (No. 043).
- [32] Tracy Fullerton. 2014. *Game design workshop: a playcentric approach to creating innovative games*. CRC press.
- [33] Bill Gaver, Tony Dunne and Elena Pacenti. 1999. Design: cultural probes. *interactions*, 6(1), 21–29.
- [34] Bill Gaver. 2002. Designing for Homo Ludens. *I3 Magazine* 12. Retrieved from <https://www.gold.ac.uk/media/documents-by-section/departments/research-centres-and-units/research-units/interaction-research-studio/27gaver.ludens.02.pdf>
- [35] William W. Gaver, Andrew Boucher, Sarah Pennington, and Brendan Walker. 2004. Cultural probes and the value of uncertainty. *interactions* 11, 5 (September 2004), 53–56.
- [36] William Gaver. 2012. What should we expect from research through design?. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 937–946). ACM.
- [37] Kim Halskov and Nicolai Brodersen Hansen. 2015. The diversity of participatory design research practice at PDC 2002–2012. *International Journal of Human-Computer Studies*, 74, 81–92.
- [38] Kristina Höök and Jonas Löwgren. 2012. Strong concepts: Intermediate-level knowledge in interaction design research. *ACM Trans. Comput.-Hum. Interact.* 19, 3, Article 23 (October 2012), 18 pages.
- [39] Michael A. Horan and John E. Clague. 1999. Injury in the aging: recovery and rehabilitation. *British Medical Bulletin* 55, 4: 895–909.
- [40] Johan Huizinga. 1950. *Homo Ludens: A Study of the Play Element in Culture*. Beacon Press.
- [41] Katherine Isbister and Noah Schaffer. 2008. *Game usability: Advancing the player experience*. CRC Press.
- [42] Katherine Isbister. 2016. *How games move us: Emotion by design*. MIT Press.
- [43] Katherine Isbister, Elena Márquez Segura, and Edward F. Melcer. 2018. Social Affordances at Play: Game Design Toward Socio-Technical Innovation. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (CHI '18). ACM, New York, NY, USA, Paper 372, 10 pages.
- [44] Mattias Jacobsson. 2009. Play, belief and stories about robots: A case study of a pleo blogging community. *RO-MAN 2009, 18th International Symposium on Robot and Human Interactive Communication*, IEEE Computer Society.
- [45] Amy Jo Kim. 2018. *Game Thinking: Innovate smarter & drive deep engagement with design techniques from hit games*.
- [46] Andrés Lucero, Evangelos Karapanos, Juha Arrasvuori, and Hannu Korhonen. 2014. Playful or Gameful?: creating delightful user experiences. *interactions* 21, 3 (May 2014), 34–39.
- [47] Elena Márquez Segura, Laia Turmo Vidal, Asreen Rostami, and Annika Waern. 2016. Embodied Sketching. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). ACM, New York, NY, USA, 6014–6027.
- [48] Elena Márquez Segura, Annika Waern, Luis Márquez Segura, and David López Recio. 2016, October. Playification: The PhySeEar case. In *Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play* (pp. 376–388). ACM.
- [49] Joe Marshall and Conor Linehan. 2017. Misrepresentation of Health Research in Exertion Games Literature. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (CHI '17). ACM, New York, NY, USA, 4899–4910. DOI: <https://doi.org/10.1145/3025453.3025691>
- [50] Sherif Mekky and Andrés Lucero. 2016. An Exploration of Designing for Playfulness in a Business Context. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (CHI EA '16). ACM, New York, NY, USA, 3136–3143.

- [51] Jane McGonigal. 2011. *Reality is broken: Why games make us better and how they can change the world*. Penguin.
- [52] Michael J. Muller. 2003. Participatory design: the third space in HCI. *Human-computer interaction: Development process*, 4235, 165-185.
- [53] Scott Nicholson. 2012. A user-centered theoretical framework for meaningful gamification. *Games+Learning+ Society*, 8(1), 223-230
- [54] Scott Nicholson. 2015. A recipe for meaningful gamification. In *Gamification in education and business* (pp. 1-20). Springer International Publishing.
- [55] Casey O'Donnell. 2014. Getting played: Gamification, bullshit, and the rise of algorithmic surveillance. *Surveillance & Society*, 12(3), 349.
- [56] Celia Pearce. 2006. Productive play: Game culture from the bottom up. *Games and Culture*, 1(1), 17-24.
- [57] Doris C. Rusch. 2017. *Making Deep Games: Designing Games with Meaning and Purpose*. CRC Press.
- [58] Merja Ryöppy, Patricia Lima, and Jacob Buur. 2015. Design Participation as Postdramatic Theatre. In *4th Participatory Innovation Conference 2015* (p. 47).
- [59] Katie Salen and Eric Zimmerman. 2004. *Rules of play: Game design fundamentals*. MIT press.
- [60] Eric Sanchez, Shawn Young and Caroline Jouneau-Sion. 2017. Classcraft: from gamification to ludicization of classroom management. *Education and Information Technologies*, 22(2), 497-513.
- [61] Elizabeth B. N. Sanders and Pieter Jan Stappers. 2008. Co-creation and the new landscapes of design, *CoDesign*, 4:1, 5-18.
- [62] Jesse Schell. 2008. *The Art of Game Design: A book of lenses*. CRC Press.
- [63] Aaron Scott. (2014). *Meaningful play*.
- [64] Phoebe Sengers, and Bill Gaver. 2006, June. Staying open to interpretation: engaging multiple meanings in design and evaluation. In *Proceedings of the 6th conference on Designing Interactive systems* (pp. 99-108). ACM.
- [65] Miguel Sicart. 2014. *Play matters*. MIT Press.
- [66] Softbank Robotics. 2018. Who is NAO?. *SoftBank Robotics*, 2018.  
<https://www.softbankrobotics.com/emea/en/robots/nao>.
- [67] Henrik Sproedt. 2012. *Play. Learn. Innovate*. BoD–Books on Demand.
- [68] Mattia Thibault. 2017. Play as a Modelling System – a Semiotic Analysis of the Overreaching Prestige of Games. In *GamiFIN Conference 2017*, Pori, Finland, May 9-10, 2017.
- [69] Rob Tieben, Tilde Bekker, and Ben Schouten. 2011. Curiosity and interaction: making people curious through interactive systems. In *Proceedings of the 25th BCS Conference on Human-Computer Interaction (BCS-HCI '11)*. British Computer Society, Swinton, UK, 361-370.
- [70] Douglas Thomas and John Seely Brown. 2011. *A new culture of learning: Cultivating the imagination for a world of constant change* (Vol. 219). Lexington, KY: CreateSpace.
- [71] Debbie Thompson, Tom Baranowski, Richard Buday Janice Baranowski, Victoria Thompson, Russell Jago and Melissa Juliano Griffith. 2010. Serious video games for health: How behavioral science guided the development of a serious video game. *Simulation & gaming*, 41(4), 587-606.
- [72] Annika Waern and Jon Back. 2017. Activity as the Ultimate Particular of Interaction Design. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*. ACM, New York, NY, USA, 3390-3402.
- [73] Kevin Werbach and Dan Hunter. 2012. *For the win: How game thinking can revolutionize your business*. Wharton Digital Press.
- [74] John Zimmerman, Jodi Forlizzi, and Shelley Evenson. 2007. Research through design as a method for interaction design research in HCI. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07)*. ACM, New York, NY, USA, 493-502.
- [75] John Zimmerman, Erik Stolterman, and Jodi Forlizzi. 2010. An analysis and critique of Research through Design: towards a formalization of a research approach. In *Proceedings of the 8th ACM Conference on Designing Interactive Systems (DIS '10)*. ACM, New York, NY, USA, 310-319.