Examining theory use in design research on fantasy play

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A B S T R A C T

Play is an essential activity in children’s lives. In the Child Computer Interaction (CCI) field, many authors refer to play and play theories when they describe their work. Play theories can come from many different disciplines, such as psychology, sociology and learning sciences. Theories from different disciplines can provide interpretations and inspiration sources when designing for play. In this study, we explore what theory clusters authors use and how they are used when design researchers report on design work for fantasy play. Based on 19 artefact-centred papers from the ACM digital library from the period 1999–2018, we analyse four components of reported theory use: design intention, design argumentation, design decisions and design evaluation. This paper provides a list of theory clusters that designers report on, showing that different clusters also indicate different conceptualisations of play. Furthermore, it describes three common strategies of theory cluster use: for contextualising the value of play, for highlighting the outcome of play and using design cases as ‘theory’ for supporting making design decisions. The paper concludes by providing reflective questions about how to report on the use of theory in designing for fantasy play. The questions can be used in order for future work in the Child Computer Interaction community to be precise and transparent about theory use in order to make it easier to build upon each other’s work.

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Contents

1. Introduction .................................................................................................................................................................................. 2
2. Related work .................................................................................................................................................................................... 2
2.1. Theory use in design ................................................................................................................................................................. 2
2.2. Coding theory use in designing artefacts .................................................................................................................................. 3
2.3. Play in the child computer interaction field .............................................................................................................................. 3
3. Research method ............................................................................................................................................................................. 3
3.1. Step 1: Search .................................................................................................................................................................................. 5
3.2. Step 2: Appraisal ........................................................................................................................................................................... 5
3.3. Step 3: Analysis of coding the use of theory in the papers ........................................................................................................... 5
3.3.1. What is coded, and what is seen as theory? .......................................................................................................................... 5
4. Results .............................................................................................................................................................................................. 6
4.1. What theory clusters are used? ...................................................................................................................................................... 6
4.2. How are theory clusters applied? .................................................................................................................................................. 6
4.2.1. Strategy 1: Using theory clusters to contextualise the value of play ..................................................................................... 6
4.2.2. Strategy 2: Using theory clusters to highlight the outcome of playing .................................................................................. 8
4.2.3. Strategy 3: Using previous design cases as play theory ........................................................................................................... 9
5. Discussion and conclusion .................................................................................................................................................................. 9
5.1. Conceptualisations of fantasy play ........................................................................................................................................... 9
5.2. Reflections about theory use ....................................................................................................................................................... 9
Declaration of competing interest ....................................................................................................................................................... 11

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1. Introduction

The paper aims to develop an understanding of how theory and knowledge are used to inform design for fantasy play. The present enquiry takes inspiration from the paper of Beck and Stolterman (2016). They examined how researchers in the design field use theory and how that use is described in their written texts (i.e. papers), as published in a single calendar year in the journal Design Studies. The emphasis of their work was not on which theories were used, but on how theories were used in reporting research. They identified six models using theory as objects across the different stages of research, such as questioning and examination of findings, serving various functions, such as contextualising, shaping and analysing. Inspired by Beck and Stolterman’s idea of “everyday practice” of theory use in design research, we aim to understand how theory functions in artefact-centred papers. Similar to Barendregt, Torgersson, Eriksson, and Börjesson (2017), we define artefact-centred papers as papers that present the design of an artefact, including information about background, the design process and often a form of evaluation. The work presented in this paper is expected to lead to more intentional theory use across the different stages of practitioner-based design research, with the aim for it to provide ‘us with the means to structure knowledge, to evaluate and assess it, to construct it, and to share it’ (Beck & Stolterman, 2016, p. 127). More specifically, it will support reflection on how theories from different disciplines can provide different perspectives for designing for fantasy play. The present paper focuses on how Child Computer Interaction (CCI) researchers use theory when designing for fantasy play. We chose to focus on fantasy play for several reasons: First, within the CCI field, fantasy play is a common interest of many researchers (Yarosh, Radu, Hunter, & Rosenbaum, 2011), and it is crucial for the CCI community to accumulate knowledge about fantasy play, which can share with each other. Second, fantasy play is a subject of interest across numerous disciplines, including psychology, sociology, learning science, cognitive science and Human Computer Interaction (HCI), as well as among play theorists. Due to the multi-disciplinary grounding of fantasy play, it makes it relevant and interesting as a way to understand theory use and theory cluster use, as understanding of fantasy play can be found in diverse theory clusters, including those related to creativity, imagination and child development studies. Furthermore, the multidisciplinary nature of play is illustrated by the fact that, in a course on play, Sutton-Smith asked his students to examine play in at least 10 different (sub-)disciplines, including psychology, sociology, folklore, anthropology, education, media studies, biology, leisure studies, psychiatry and sociolinguistics (Meckley, 2015).

In line with Hughes (2002) and Sutton-Smith (2001), we define fantasy play as consisting of several related types of play: pretend play, imaginative play and make-believe play. Lillard (1993) describes the salience of fantasy play as ‘the projecting of a supposed situation onto an actual one, in the spirit of fun rather than for survival’. Driven by a ‘what if...’ question, fantasy play has the following (play) properties (based on Hughes, 2002 and Ma, Veldhuis, Bekker, Hu, & Vos, 2019): (1) it involves playing with objects that can transform into all sorts of things (substituted or imaginary objects); (2) it involves role-playing a character, imagining situations and assigning roles to others; (3) it involves a storyline or narrative that connects the presumed functions and purposes. (4) the fantasy, pretend or imagination needs to be externalised through activity and/or social interaction and (5) lastly, fantasy play has an open-ended play form, with no predefined rules, procedures or goals. Designing for individual or social fantasy play thus is a complex challenge as well as an opportunity, as it often combines supporting creative and open-ended interaction with materials that support fantasy play with designing for the social processes of multiple users. The focus of the paper is on how theory clusters are used during design, as opposed to exactly which theories are used in various phases of designing for fantasy play. As such it will contribute to an understanding of how play theories are used in reporting on designing for fantasy play.

Based on the above-mentioned the following research questions will be addressed in this paper:

1. To what theory clusters (of play) do authors refer in writing about their work on designing for fantasy play? To what properties (or concepts) of play do they refer?
2. How do authors use theory clusters in writing about their design work for fantasy play?
3. How do they use theory to frame fantasy?
4. How do they explore and apply the concepts during the design process, for example, in arguing about the design decisions and describing the evaluation of the design?

The main contributions of the paper are as follows:

- Developing an overview of what (types of) theory clusters have been used and in what manner they have been applied in reporting on design research on fantasy play.
- Developing an understanding of how design researchers use theory clusters in reporting about their designs for fantasy play.

In the following section, we describe related work in the field. Hereafter, we introduce the selection of literature and how we analysed the theories and concepts used in the various parts of the research papers. In the analysis section, we present three strategies of theory use. Finally, we conclude with a discussion on how CCI researchers might consider reporting on theory use in the future.

2. Related work

In this section, we will position our work and contribution. We will cover the following topics: examining theory-use in reporting about design, examining the bridges between theory and design practice and developing intermediate level knowledge. Furthermore, we will describe coding strategies in theory use and the role of designing for play in the CCI community.

2.1. Theory use in design

We have a link to work that examines theory use in research about design as a process, without a specific interest in theory use in the design of artefacts, such as the work by Beck and Stolterman (2016). We have an overlap with their interests, in the sense that we examine theory use in reported design research papers, in our case focusing on artefact-centred papers. Beck and Stolterman include a wide range of interpretation when examining theory use (Beck & Stolterman, 2016), such as theory, model, perspective, rationale and phenomenon: ‘We see theory as ‘an abstracted
knowledge [object] that tells us something about fundamental
entities at the core of a discipline” (Beck & Stolterman, 2016,
p.127). Their focus was on how theories are used as objects
related to common elements in research as opposed to examining
theory as a process (i.e. theorising).

Furthermore, our work is linked to a general interest within
HCI to examine the relationship between abstract theory and
the design of artefacts. Work done by Law, Hassenzahl, , Karapanos,
Obrist, and Roto (2014) focuses on understanding the bridges
between theories and practices, with the intention to trace the
bridges between theory and practice (see Fig. 1).

In the space between the abstract theories (top) and the con-
crete design artefacts (bottom), various types of design knowl-
edge exist, also called Intermediate Level Knowledge (ILK) (Dals-
gaard & Dindler, 2014). Friedman (2003) states that the ability
to theorise design enables the designer to move from an endless
succession of unique cases to broad explanatory principles that
can help solve many kinds of problems. These guiding princi-
pies become useful intermediate knowledge, resulting from the
interaction between theory and practice in design.

Different approaches have been suggested for developing forms
of ILK, for example, examining how design practices or instances
can be grounded in theories (bottom-up approach) (Höök & Löwgren,
2012), examining how theories can be operationalised
through concepts (top-down approach) or a combination of the
two approaches (Dalsgaard & Dindler, 2014). Examples of inter-
mediate level knowledge include: patterns, guidelines, heuristics
and strong concepts (design elements abstracted beyond particu-
lar instances) (Höök & Löwgren, 2012). Law et al. (2014) studied
how abstract user experience (UX) frameworks inspired design
practice and, in turn, how design practice informed the devel-
opment of these theoretical frameworks. For two specific frame-
works, Law et al. examined the links between theories, frame-
works, intermediate level knowledge and design practice (Law
et al., 2014) (see Fig. 2). They found that authors who mention
the framework in the early sections of their papers do not always
describe how the framework is used for design and evaluation
work. Law et al. referred to this issue as fading traceability (Law
et al., 2014).

Similar to Law et al. (2014), we examine how authors report
the use of theories when describing their design and evaluation
work. They focused on two specific UX frameworks, while we will
be focusing on designing for fantasy play.

Within The Child Computer Interaction (CCI) field there is also
an interest in the relationship between theory, various forms of
ILK and design. The importance of developing intermediate
level knowledge (ILK) in the CCI community has been argued in
several recent papers (e.g. Barendregt et al., 2017; Torgersson,
Bekker, Barendregt, Eriksson, & Frauenberger, 2019). For exam-
ple, Barendregt et al. (2017) examined whether ILK could be
generated by analysing artefact-centred papers published in the
Interaction Design and Children Conference. Subsequently, they
illustrated that by analysing artefact-centred papers, intermediate
level knowledge could be generated, by looking for potentially
promising strong concepts, and linking these concepts through
horizontal (e.g. linking to similar concepts) and vertical grounding
(e.g. linking to other theories, and to other designs).

In a literature study on designing for physical activity for
children, Ma et al. (2019) examined how theory was used for
reporting about different types of design activities. They exam-
ined for a specific purpose of (designing interventions to motivate
physical activity of teenagers) how authors describe the design
process (design intention, requirements, design decisions and
evaluation of designs). As part of their analysis, they describe
what theories and frameworks have informed requirements. They
also examine how the concepts or framings of the design require-
ments phase are related to the arguments for design decisions,
and what is evaluated.

The focus of our work is examining descriptions of theory use
in artefact-centred papers. We have overlapping interest with
Law et al. (2014) that we want to trace theory use between
theory and specific designs. While they focused on two specific
frameworks used in HCI, we focus on examining how play the-
ories are used in designing for fantasy play in CCI. In contrast
with Barendregt et al. (2017) our interest is not in developing
strong concepts; however, we have similar interests in tracing
relationships between theory, intermediate level knowledge and
designs.

2.2. Coding theory use in designing artefacts

Beck and Stolterman (2016) developed a list of four core
elements of research papers: question, examination, findings and
tory. They developed their list of core elements of a research
publication based on two widely used reference texts on research
and academic writing. In MacLaren and Olson (1993) the core
elements for coding were based on the components used in the
prototypical design and research processes, seen in descriptions
of design research as framing design intentions, developing design
requirements, providing design arguments for design decisions and
evaluating the design.

We will be combining strategies from Beck and Stolterman
(2016) and Ma et al. (2019) while constructing our coding scheme
for the analysis of play theory (cluster) use regarding fantasy play.
Similar to Beck and Stolterman, our focus is on understanding
theory use, in relation to phases of the design process, without
examining what specific theories are used.

2.3. Play in the child computer interaction field

Designing for play and the use of theory when designing for
fantasy play is a topic of interest within the CCI community.
Yarosh et al. studied values expressed in the CCI field over nine
years of Interaction Design and Children (IDC) research and found
that 10% of the 137 coded IDC papers explicitly aspired to sup-
port children’s play and the quality of playfulness in children,
along with other behaviours, including learning and social inter-
action (Yarosh et al., 2011), whereas 15% of these were especially
concerned with imagination. The authors further explained that
only 15% of the papers about play mentioned developmental
psychology theory. Hence, they stated that there might be an
opportunity for IDC authors to be more explicit about the theories
that inform their research. Designing for fantasy play presents a
unique context in which to examine the use of theory (Skovbjerg
& Bekker, 2018).

3. Research method

A full systematic literature review is not appropriate for a
topic that has been conceptualised differently by different re-
searchers (Snyder, 2019; Templier & Paré, 2015). The topic of
our work, play as fantasy play, has been conceptualised in many dif-
cerent ways, such as pretend play (Law et al., 2014), as imaginary
and improvisational play (Sutton-Smith, 2001), and as dramatic,
imaginative and fantasy play (Hughes, 2002). Examining how
theory has been applied in designing for fantasy play, requires
us to develop an understanding of different interpretations of
play in designing for fantasy play. In our analysis we want to be
open to discovering and discussing the framing of fantasy play.
A narrative or descriptive approach is suitable for a topic that
has been conceptualised differently by different researchers, as is
Fig. 1. The space between theories (at the top) and instances, or design artefacts at the bottom, populated by different forms of Intermediate Level Knowledge in the middle. Source: Adapted from Höök and Löwgren (2012).

Fig. 2. Relations between theories, frameworks, intermediate-level knowledge, and practical work. Source: Adapted from Law et al. (2014).

the case in the context of fantasy play (Snyder, 2019). Therefore, a combination of a narrative and critical literature review was conducted. For these types of reviews, the aim was not to systematically review all relevant literature but to select a representative selection of papers (Paré & Kitsiou, 2017).

The aim of the search strategy was to identify a representative number of works on a particular topic. We followed the global procedure for conducting literature reviews described by Sutton-Smith, Mechling, Johnson, and McMahon (1999): (1) formulating the research question(s) and objective(s), (2) searching the extant
literature, (3) screening for inclusion, (4) assessing the quality of the studies, (5) extracting data and (6) analysing data. According to Paré and Kitsiou (2017), this process is often done in an iterative manner, where activities planned in the initial phase can be refined in later phases of the process.

To answer the research questions, we performed an analysis of papers from peer-reviewed journals and conference papers published in the ACM digital library. The ACM library was selected due to its extended coverage of design-related conferences and journals.

The overall process involved first selecting an initial set of papers from the ACM digital library and secondly checking whether they were artefact-centred papers that included a description of designing for fantasy play. Finally, the papers were coded based on the theories they used.

3.1. Step 1: Search

An initial query using various combinations of the words children, design, play, fantasy pretend and storytelling (AND children OR kids OR child) AND design AND play AND (fantasy OR pretend OR storytelling) in the abstract of the papers published in proceedings was performed in the ACM digital library with a timescale between 1999 and 2018, resulting in 73 papers. We selected a time span of 20 years (similar to the time span of the literature review in Börjesson, Barendregt, Eriksson, & Torgersson, 2015) that was also close to the number of years that the conference on Interaction Design and Children existed at the point of time when we selected the papers (in 2018). In our initial query, we focused on conferences because we expected those venues to have the largest number of artefact-centred papers.

3.2. Step 2: Appraisal

Two authors screened all the abstracts, and if that led to uncertainty, the papers were screened, to get an understanding of the various important concepts related to our research questions, such as the concepts of play and fantasy and the artefact’s design process. Similar to the approach of Barendregt et al. (2017), we selected artefact-centred papers in which the main objective was to describe the development of a concrete product, whether it was a design for children and intended for fantasy play.

The selection process was iterative, with discussions occurring between the two coders concerning the inclusion and exclusion criteria after approximately every six papers until every paper was coded. This process allowed the independent coders to obtain a more detailed understanding of the inclusion and exclusion criteria. The independent coders were often in agreement regarding the selection, and in the event of a disagreement, a discussion followed to refine the inclusion and exclusion criteria.

Assuming longer papers had the opportunity to describe the theory in further depth than shorter papers, only papers with a page length of six or more pages were coded (28 papers). Of the papers in the initial query, 45 papers were less than 7 pages. Further, in multiple instances, the same authors had written short and long papers about the same design research project, where the longer papers provided more details about the design research process.

Papers were excluded for various reasons: for example, no artefact was mentioned (2 papers), the focus was on designing a game without really exploring a play perspective or the concept of play was not included in how the design was created (8 papers).

Originally, we started with a review of the papers in all conference proceedings. After obtaining a better understanding of the inclusion and exclusion criteria, we ran a follow-up query in the ACM digital library, which also included journals. Interestingly, this only resulted in one extra journal paper that met the criteria (plus 1 journal paper).

To verify whether we had a representative set of papers, we decided on the following criteria as being indicative of covering diversity in designing for fantasy play: diversity of the conceptualisation of fantasy play, technology and research teams/labs (in terms of paper authors).

Conceptualisations of fantasy play included storytelling, pretend play, social pretend play, imagination and creative play; technologies included interactive tabletops, augmented reality games, video communication tools, interactive cuddly toys and more; many different research teams/labs were included, assuming to increase more diversity in how fantasy play was interpreted.

This resulted in the final selection of 19 papers, which are referred to hereafter using capital letters (e.g. A, B, and C) and which are listed at the end of the paper (Appendix: List of Papers). The papers cover a wide range of designs for fantasy play, including interactive tabletop games that support fantasy play in terms of e.g. variety of story themes and object substitution [H], an augmented reality puppet game to promote reasoning about emotional states and shared pretence [A], an e-book storytelling tool that supports children’s exploration of emotional expressions in pretend play narratives [K], a location-based storytelling app that supports combining fictional and realistic components in creating a narrative [D] and interactive cuddly toys that support pretending that inanimate objects are sentient [P]. The final set of papers came from leading design-oriented conferences that are covered in the ACM digital library (see Table 1) as well as from one journal.

3.3. Step 3: Analysis of coding the use of theory in the papers

3.3.1. What is coded, and what is seen as theory?

We marked ‘segments of text’ that included descriptions or references to theory (Sutton-Smith et al., 1999).

Furthermore, we coded to what elements of design and research process the segments of text were related. This coding scheme was inspired by the work of Beck and Stolterman (2016) and by Ma et al. (2019). The coding scheme consists of 4 codes that cover whether theories related to play are used in: (1) framing the design intention, (2) developing design requirements, (3) providing design argumentations for detailed design decisions and (4) evaluating the created design in terms of play-related concepts. A paper can refer to a developmental play theory to argue for why fantasy play is essential for children (framing design intention), provide a list of requirements for the design with links to the fact that being able to try out different strategies is essential from a creative play theory perspective (requirements or argumentation), explain in detail how the design supports the process of testing strategies (design decisions) and finally explain that the design was evaluated by assessing whether the design supported the testing of procedures in a suitable manner (evaluation).

Also a scheme of theory clusters was created iteratively through discussion with all of the researchers. After marking segments of text that referred to play in general or to fantasy play, we examined how these might be clustered.

We ran into numerous challenges in the analysis and coding process. For describing intention: papers regularly do not mention fantasy play as the main intention, but play for a higher purpose, such as learning. For describing requirements, many papers referred to design cases as argumentation. Therefore, we added this cluster category as a separate cluster. In creating the clusters, we decided to re-code references in the initial large cluster of ‘developmental theory’ into more nuanced clusters; such as
play theory and learning theory clusters. Occasionally, in design decisions authors do not refer (back) to theory and references, making it difficult to determine whether decisions were made intuitively, or whether having mentioned theoretical concepts in previous sections, authors did not make the theoretical reference explicit. We decided to only include explicit mentions of theory in our coding.

Furthermore, we developed several clusters for categorising the theories used in each paper, according to how the authors used it in their framed design intention, requirements or argumentation, design decisions or evaluation.

This resulted in the following selection criteria:

After we coded the clusters, we made an analysis of both what theory clusters designers use and how they are using it. To do so we applied a hermeneutic, thematic analysis (Zeck, Paterson, & Pentland, 2008) aiming at interpretation in the formation of knowledge. Hermeneutic analysis consists of the hermeneutic circle as a method where you go back and forth between what we know and the material that we have. In this paper, hermeneutics was used to get an understanding of what theories and also how those theories were used.

4. Results

The results section is structured as follows: The first subsection will answer the first research question concerning what theory clusters designers use. The second subsection will answer the second research question concerning how theory clusters are used. Then we explain how theory clusters are used for the four elements of design papers: design intention, requirements, design argumentation, design decision and design evaluation. Finally, we describe three common strategies, which we have identified in our analysis of how authors describe the way in which they have applied theory.

4.1. What theory clusters are used?

The coding of the papers resulted in several main theory clusters when examining how designers report on their design work for fantasy play (see Table 2). Table 3 shows which papers refer to which theory clusters.

- The theories used in the papers come from a broad spectrum of disciplines (design research, psychology, play studies, game studies, educational studies, literature and innovation).
- The theories could be placed in 9 clusters, which are explained in Table 2.
- Most papers refer to multiple clusters, ranging from two [Q] to seven clusters [A, F].
- Four of these clusters are referred to more prominently, including design cases, HCI theories, developmental theories and play theories.

4.2. How are theory clusters applied?

In the following, we will present results of how theory clusters are used. We will show how theory clusters are used both within each coding dimension and across the four coding dimensions. Subsequently, we will show three strategies that designers use when they are applying theory clusters when designing for fantasy play.

Table 4 shows the following:

- Theories coming from human computer interaction theory [6: F, H, I, N, P, S] and design cases clusters [10: A, B, E, F, H, I, L, O, R, S] are and often used for design decisions. Papers refer to other designs; for example, to illustrate how others have designed for fantasy play or what is still lacking in designing for fantasy play.

The analysis also showed:

- There is a significant overlap in the theories and design cases, which the papers use in their argumentation. It means that when papers use design cases, they often use it in combination with the clusters HCI, developmental and/or play theory clusters [for example, B, G, I, O].
- Theories used in design intention are often then related to argumentation; for example, if developmental theories are used for intention, they will often also be used for argumentation [H, K, M].
- Theories used in design decisions are often then related to evaluation; for example, if design cases are used for design decisions, then they will often also be used for evaluation [A, S].

In summary, papers covered in the review use theories from multiple clusters, but the overview seems to indicate that the theories used in one element are not necessarily used when switching to another element in the paper. We will explore that point further by pointing to three strategies of theory use.

4.2.1. Strategy 1: Using theory clusters to contextualise the value of play

With inspiration from Beck and Stolterman’s concept of contextualise, the first strategy we identified was using theory to

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Table 1
The distribution of the selected papers by year of publication and venue. The papers included in the review are referred to by capital letters (e.g. A, B and C) in a list in the paper's appendix.

<table>
<thead>
<tr>
<th>Year/publication</th>
<th>CHI</th>
<th>IDC</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>E</td>
<td>B (Hypertext ’06)</td>
</tr>
<tr>
<td>2011</td>
<td>G, L</td>
<td>I (IoCHI ’12)</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>M</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>R</td>
<td>A</td>
<td>S (SA ’15)</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>O</td>
<td></td>
<td>N (HRI ’16), J (DSAI ’16), K (CHI Play ’16), Q (CHIplay ’16)</td>
</tr>
</tbody>
</table>

Total number of papers per venue 5 4 10
Table 2
An overview of the theory clusters and knowledge used and a short explanation of the clusters.

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Selection criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play Theory</td>
<td>The authors of the selected papers refer to this theory as describing the detailed play components and giving concrete suggestions on how to design for play, such as theories by Piaget (1945), Vygotsky (1978) and Singer (1998).</td>
</tr>
<tr>
<td>Developmental Theory</td>
<td>The authors of the selected papers refer to this theory describing a general statement/rationale regarding the added value of play for the development of children or why play is vital for the development of children. Play is mentioned as a part of the development of children. Still, the authors do not elaborate on details of play in this theory that could be used for design, such as a reference to a child development handbook (Bergen, 2002) or papers on child development and play (Bergen, 2002; Whitebread, Neale, Jensen, Liu, Solis, Hopkins, Hirsh-Pasek, &amp; Zosh, 2017).</td>
</tr>
<tr>
<td>Human–Computer Interaction Theory</td>
<td>The authors of the selected papers refer to this theory describing a general statement/rationale concerning the added value of properties of electronic/digital/interactive toys or systems; e.g. on technologies for storytelling Cassell and Ryokai (2001) or on an embodied interaction (Dourish, 2001).</td>
</tr>
<tr>
<td>Learning Theory</td>
<td>The authors of the selected papers refer to this theory describing general statements/rationale regarding the added value of play for learning for children. The statements could be related to an educational context, subject, discipline or competence the children would develop through said play element, for example, playful learning theory (Robert et al., 2006) or fostering positive emotions through pretend play-supported learning (McGhee, 1988).</td>
</tr>
<tr>
<td>Creativity Theory</td>
<td>The authors of the selected papers refer to this theory describing general statements/rationale regarding the added value of creativity for children’s play, e.g. a theory regarding imagination and creativity [37; 27] and how free expression with some constraints can support creativity (Boden, 2004; Runco, 2004).</td>
</tr>
<tr>
<td>Game Theory</td>
<td>The authors of the selected papers refer to this theory describing general statements/rationale regarding the added value of game elements for play. Alternately, the authors refer to this theory by mentioning specific game theory components that can be translated into a playful artefact (e.g. HCI papers on how to design for the quality of play); for example, the entertainment value of storytelling and games (Shell, 2005) and a book on game design (Rouse III, 2005).</td>
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<td>Psychology Theory</td>
<td>The authors of the selected papers refer to this theory describing general statements/rationale regarding topics such as emotional psychology, social interaction or pedagogical aspects of children concerning play (e.g. about children’s understanding of emotions and surprise (MacLaren &amp; Olson, 1993).</td>
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<tr>
<td>Design Cases</td>
<td>The authors of the selected papers refer to this knowledge as a reference for how other research or designs use play (concepts). For example, Decortis and Rizzo (2002) used POGO as an example of a design that allows users to be flexible in capturing objects to incorporate in storytelling activities, and/or the PUPPET (Marshall, Rogers, &amp; Scaife, 2002) system supports children’s development through storytelling.</td>
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<tr>
<td>Narrative Theories</td>
<td>The authors of the selected papers refer to this theory describing statements/rationale regarding the added value of narrative properties for play. This includes theories that provide information about narrative structures (Propp, 1968) and storytelling patterns (Bordwell, 1985).</td>
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Table 3
Theory clusters (horizontal axis) mentioned in the papers (on the vertical axis).

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<tr>
<th>Papers</th>
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<th>HCI Theories</th>
<th>Developmental Theories</th>
<th>Play Theories</th>
<th>Game Theories</th>
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<th>Psychology Theories</th>
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contextualise the value of play. Beck and Stolterman define contextualisation as follows: ‘Theory is used as a tool for contextualising or situating the research question within a particular discourse’ (Beck & Stolterman, 2016, p.131). Applied to our coding system, the theory is primarily used in relation to design intention and argumentation as a way of contextualising the study. A theory is presented at the beginning of a paper as a part of the purpose and argumentation of the study. However, when describing design decisions and evaluation, there are either no or limited links to that same theory. It is the case with [A, D, L, R].

It occurs that 16 of the 19 papers justify their design intentions related to fantasy play based on the value of play. That is, they point out that play is central to children’s lives, and hence good conditions for play should be provided. Good conditions for play can be created by designing for play; Cao et al. emphasise this further by pointing out that the designs available for play often stand in the way of play experiences [B].
The designs primarily turn children into consumers and thus do not support imagination and creative power. Nowadays, there is a risk that playing with virtual toys is driven by the toys instead of the other way around, and they elaborate by asking ‘how to support creativity, fantasy play and imagination with electronic toys and tools’ [B; E]. Freed et al. point to the richness of play when describing their aim: ‘We were interested in exploring the trade-offs these approaches in terms of richness of play based on the idea that while realistic toys promote fewer object transformations, they elicit greater amounts of play in which the objects are used within a pretend context’ [E]. The design thus contains a large number of experiences for children that have value for communication opportunities. Lu et al. [G] also point to the value of play providing important experiences for children. In addition to the richness of play, several papers emphasise that the value of play is linked to ‘natural ability’. For example, Ryokai, Kowalski and Raffle state, ‘Our goal is to create a tool to support children’s natural ability to engage in storytelling and explore emotional expressions in their storytelling play’ [L]. Theory related to the value of play is thus used to contextualise the necessity of the study by pointing to how play is natural for all children.

If we look at how they provide contextualisation, 16 out of 19 papers highlight the value of play, but the papers do not discuss play theoretically — e.g. they do not discuss Vygotski’s point about the need for tools in play (Vygotsky, 1978) or Piaget’s point about the connection between imitation and play (Propp, 1968). Instead, they point to why play has value, and in explaining why play has value, they primarily refer to the name and year of a publication, without further elaboration. Piaget and Vygotsky are used seven times [F, E, I, H, O, M, K] as a way to contextualise the why of play value. In contrast, the different properties of play are not discussed in detail, nor are the play theories challenged or explored. Contextualisation through play value thus primarily becomes a way of using clusters of theory to position the studies (i.e. why these studies are conducted and, primarily, how). As a consequence of this strategy, the use of play theory is primarily used for papers in relation to design intention and argumentation, whereas it often disappears in the sections about design decisions and evaluation. An example of this use of play theory clusters is the paper by Freed et al. [E]. In the introduction about play, the authors state that they are aware of the in-depth characteristics of play. They explain the development of play competencies, referring to Piaget and pointing to children’s internalisation of imagination when they are around seven years old, describing and using the theories on a general level. However, after that section, they talk more about the specific interaction and usability in the design as a part of the evaluation, and the description in the paper does not include the specific play details. When the authors begin to present their design decisions, they refer to several design cases related to doll–computer interfaces, but the decisions are not related to or explicitly supported by the theory presented in the introduction. They do provide fantasy play-type observations, but they are not related to the introduction and focus more on interaction evaluation and usability. In this sense, the first strategy indicates that, when designers write about how they apply play theory when designing for fantasy play, the theory is mainly used for initial positioning and does not directly determine and drive the design intention or argumentation (Beck & Stolterman, 2016).

### 4.2.2. Strategy 2: Using theory clusters to highlight the outcome of playing

The next strategy for applying theory when designing for fantasy play is using clusters of theory to highlight the outcome of play (e.g., contributing to an overall development or learning outcome). In the papers, this strategy is used in combination with the first strategy, and it can be seen as another variation of Beck and Stolterman’s (2016) contextualisation. When the authors have stated in the introduction that play has value, the next step is to relate the value of play to its outcome. They use theory to point to that outcome, which is particularly related to the cluster of theories within development and learning but also to those related to creativity.

Mansor, De Angel and de Bruijn [H] refer to developmental play theories of Piaget (1945) and Vygotsky (1978), stating,
'However, numerous scholars have agreed that fantasy play is important in children's lives, which via these kinds of activities, the children could explore, act out and share their understanding of the world'. They further point out that play 'supports and stimulates children's imagination'. Lu et al. argue that 'play supports creativity' [G], while Bai, Blackwell and Couloris [A] argue that play supports 'complex cognitive skills', which is also reflected in the description of their designed outcome as 'FingAR Puppet helps children associate expressive interpretations with immediate reality and promotes reasoning about emotional states, communication and divergent thinking during social pretend play for children 4–6 years old' [A, p.1035].

Additionally, Cao [B] points out that play 'supports their creative development'. According to Mispa [K], play supports 'the need for social elements', and Strommen & Alexander [P] emphasise play as something 'can engage the emotions of the users'. Ryokai et al. [L] discuss the value of play in terms of 'supporting children's emotional growth', whereas Wood, Vines, Balazam, Taylor et al. [R] describe play as a core attribute of learning storytelling.

When using clusters of theory to point to the outcome of play, designers are not necessarily designing for fantasy play but rather for an outcome (e.g. when Strommen & Alexander [P] would design for 'intellectual growth'). It seems that strategy one and strategy two, as presented, might lead to this consequence. If we look at theory use in relation to design decisions, the (explicit) use of theory is often left out, and intuitive decisions — or non-theory-based decisions — are made instead [B, Q]. Garzotto and Forfori [F] mostly rely on field observations conducted using the first version of their design. They do incorporate some notions of game theory and learning. However, they do not provide a more elaborate understanding of fantasy play. If we look at design evaluation in relation to strategy one and two, the dominant tendency is exemplified by Ryokai, Raffle and Kowalski [L, M]. They state that play and storytelling objects focusing on technology can leverage children's literacy. However, they make no explicit reference to theories about the properties of play in their design decisions when describing their concept.

### 4.2.3. Strategy 3: Using previous design cases as play theory

The last strategy that designers use when writing about their fantasy play design studies is related to how previous design cases are used as a form of play theory. Specifically, previous designs are often mentioned in the design decisions and are used as play theory or design knowledge.

As stated in strategy one and two, the use of contextualisation often indicates that a theory is not applied to the specific design issue but rather used as a justification for the design decisions. In our coding, we found that previous design cases are often used as theoretical argumentation for a specific design decision. For example, Mansor et al. [H] position their work in relation to development theory and play theory; they mention the designs of StoryMat, Rosebud, Pets, Pagecraft, Storyroom, Pogo, Picture this!, Vuela, Jabberstomp, Kidpad and StoryTable when justifying the conceptualisation and play theory, primarily highlighting the limitations of the designs and only going into a few of them in more depth. Freed, Burleson, Raffle, Ballagias and Newman [E] also mention several design cases — StoryMat, Rosebud, Video Puppetry, Pogo, TellTable, StoryTable — but they do not explore the specific play properties they want to build on in more detail. In the initial section of the paper investigating children's play, almost nothing is related to the cases presented; both the observations and reasoning in the design evaluation are unrelated to similar cases. Beck and Stolterman also mention this type of theory use, when they state: 'With this type of theory use, researchers often reference frameworks and models instead of referencing theory per se' (Beck & Stolterman, 2016, p. 128). According to Beck and Stolterman, researchers use what other people have used instead of presenting concrete concepts of theory and elaborating on what they specifically mean in a specific case. In other words, uses of design knowledge as theory are described in a very general manner, and it becomes difficult to understand to what extent specific theories or clusters of theories have influenced specific design decisions.

### 5. Discussion and conclusion

This review of the literature on theory use in designing for fantasy play is based on 19 papers from the ACM library and focuses on what theory clusters designers use when they write papers on designing for play and how those theories are used.

#### 5.1. Conceptualisations of fantasy play

A narrative literature review approach was adopted to explore the conceptualisations of fantasy play in design. A common reason for applying a narrative literature review is when the conceptualisation of the concept under examination, such as fantasy play in this context, is unclear. In relation to developing an understanding of tracing links between theory and designing for fantasy play, we uncovered different operationalisations of fantasy play. This might be seen as a form of horizontal grounding for designing for fantasy play.

The words that were initially included in the search query were fantasy, pretend and storytelling. The set of papers could be extended to include a broader interpretation of fantasy play. Another conceptualisation mentioned in the papers was imagination. Having this keyword in the initial query might have led to the inclusion of a wider range of papers and thus a wider set of theories that researchers use in designing for fantasy play.

Another manner in which the conceptualisation of fantasy play can be further developed, can be by examining how other disciplines and in relation to this, theory clusters, might extend our present understanding. Viewing the diverse disciplines mentioned by Meckley (Paré & Kitsiou, 2017) as providing important perspectives on play, we can reflect on whether one of these disciplines is missing from our sample of papers. The disciplines of mass media, folklore and anthropological theories could potentially also provide inspiration for designing for fantasy play. To illustrate this point, we can look at children's folklore as a discipline. Folklore includes beliefs, customs and stories orally performed or passed down through generations. Children's folklore as a discipline can include examining children's dances, poems, stories and games (Sutton-Smith et al., 1999). Folk tale analysis that examines how play is described and depicted by children of different ages might give inspiration to themes and story elements interesting for children. These in turn can inform how the designs support fantasy play.

#### 5.2. Reflections about theory use

We have presented a number of theory clusters (see Table 2) which studies of fantasy play draw upon. The different theory clusters that inform the design of artefacts, can be seen as different possibilities for both horizontal and vertical grounding when designing for fantasy play. These clusters include more fundamental theories, and forms of knowledge that are embedded in specific design cases.

Furthermore, we have presented three strategies that can be identified in the application of theory.

One important finding related to the first research question is that, when writing studies about fantasy play, designers often
use learning theory, developmental theory and play theory clusters in framing their intentions and argumentation, whereas the design decisions and evaluation are primarily linked to theory clusters coming from human–computer interaction theory and design cases. When looking at the theory clusters that studies of fantasy play draw upon, there seems to be potential in drawing on theories of play from a more specific level. By a more specific level, we mean that aiming at concrete properties of play would be useful for designers (Hughes, 2002).

Furthermore, it is interesting that the two clusters applied most often are HCI theories and knowledge embedded in design cases. This shows that authors refer extensively to previous work; however, as mentioned above, the authors could be more explicit in how they re-use or build on previous works in which theory has been used.

While in strategy one theory is used to contextualise the value of play, in strategy three previous design cases are used as play theory to contextualise the value of the design. For both strategies, and for strategy two, we might have to assess the value to the CCI community of applying these strategies when designing for fantasy play. We have asserted that there is a potential in cumulative knowledge production for the CCI community, with the aim of applying theory in a more valuable way for qualities of play and for producing design knowledge. First, it is interesting to examine the extent to which the papers are coherent in how the authors argue about play, moving from intention, to argumentation, to decisions and ultimately to evaluation. We already touched upon this relationship when presenting our results, and a part of our conclusion is that studies about design for play are often split into two parts: one about intention and argumentation and another about decisions and evaluation. This insight extends the more global statement about fading traceability made by Law et al. (2014), in a more detailed examination of strategies of theory use linked to four elements of design research papers. Furthermore, as mentioned in Law et al. (2014, p. 193) a possible reason for authors being less explicit about theory use in describing design decisions might be that they have internalised the theoretical knowledge and thus do not mention it explicitly in their papers. Since specific theory clusters are used within these two parts, we argue that the specific qualities of play, which the designers initially state that they are designing for, might get lost.

Consequently, the sensitivity toward the phenomenon of play as a human phenomenon — in this case, fantasy play — could be lost (Skovbjerg & Bekker, 2018). As Sutton-Smith (2001) states in his book, The Ambiguity of Play, care is needed, when considering the epistemological and ontological levels of play. Specifically, we need to make sure that our general and abstract ideas about play (ontological level) are closely related to how we obtain knowledge about play and view play as an empirical phenomenon (epistemological level). If not, we may lose the ability to understand all the qualities of play. For example, when designing for imagination, if we limit exploration to the more abstract stages of children’s development through play and imagination (Sutton-Smith, 2001) without linking it to a concrete action(s) that we design for, we might end up designing for something completely else, and/or losing the qualities of play in a specific play action out of sight. Besides qualities of play we might also end up losing knowledge potential because of the distance in play theory use between our ideas about play and the actual play action that we are designing for (Skovbjerg & Bekker, 2018).

In addition to precision, reporting on fantasy play design requires transparency. We must be as transparent as possible about how we get from intention to argumentation to decisions and ultimately to evaluation. This would also support traceability of theory use. Beck and Stolterman bring the idea of ‘talking back’ from contextualisation to discussion (Beck & Stolterman, 2016, p. 132) as a strategy that might be useful. By ‘talking back’, they refer to the importance of theories used in the evaluation, related in a reflective way to the design intention. For example, if we were designing for fantasy play and presented a definition of fantasy play in the introduction, the evaluation could also provide insights on that definition because of the design study. According to Beck and Stolterman, ‘talking back’ is a way to ensure that designs generate knowledge.

However, we must further examine whether a more traceable use of particular theories is necessarily required for good theory use. What can designers do when they are writing about their studies in order to realise the potential in specific (play) qualities and develop design knowledge?

Based on our literature review, the theory clusters we have presented and our identification of strategies, we suggest asking the following reflective questions during the design process:

- Do you reflect on or address specific playful properties?
- Do you address specific playful properties while making design decisions?
- Do you evaluate the claim(s) made in the design intention?
- Does the theory presented in the evaluation ‘talk back’ (Beck & Stolterman, 2016) to the design intention?
- How are you using different types of knowledge – ranging more theoretical knowledge to more applied knowledge (related to the vertical dimension in Fig. 2) in your design process, and have you reported on the vertical grounding of the knowledge used?
- How are you applying different theory clusters (related to the horizontal and vertical dimension in Fig. 2) and how might the selection and/or combination of clusters influence the direction and decisions in your design process?

Based on this literature review, we can give some directions for future research on the reporting of design for fantasy play:

- There is a need for an increased focus on how to incorporate and adopt theories from a wide variety of domains relevant to designing for fantasy play, in order to develop design knowledge for fantasy play. More specifically, there is a need to examine how these theories are used in the various parts of the paper, and the relationship between the different parts of the paper and the design process.
- There is a need to investigate approaches that can combine ontological (e.g. general and abstract conceptualisations) and epistemological (e.g. observable and empirical actions) aspects of design for fantasy play in order to develop design knowledge for fantasy play.
- Future studies could examine whether traceable use of play qualities throughout the various phases of the design research process led to better designs and better papers.
- A more detailed analysis of how play theories and conceptualisations of fantasy are used to argue for specific design decisions can give a better understanding of how including certain theory clusters and conceptualisations open up the design space: e.g. whether fantasy-play related design considerations are linked to emotions, expression, identity, story elements on the one hand and design implementation decisions about tangibility, embodiment, input and output modality selection on the other hand.

The insights presented here are a first step in developing knowledge about how to report theory use in different phases of design research in artefact-centred papers, and more specifically theory related to fantasy play design. As play is such a core activity within a child’s life, developing such knowledge is crucial for the CCI community. Future work will examine in more detail how the
concept of play, coming from diverse disciplines, can inform the development of designs for children.

The review has several limitations that need to be mentioned. First, we only used the ACM library for our literature search; however, the diversity of papers provides a good starting point for examining the various ways in which theory is used in reporting work on design for fantasy play. Furthermore, this is a first attempt at analysing theory use when writing about work in CCI. More detailed examination of the consistency of theory use in different elements of papers on designing for fantasy play specifically, but also other artefact-centred papers, could lead to a better understanding of the consequences of coherence — it is not necessarily the case that more coherence leads to better papers.

Overall, CCI researchers, working on designing for fantasy play, but also those working on artefact-centred design papers, can use our findings to reflect on (1) how they conceptualise the selected design qualities, such as fantasy play and how the theory clusters selected influence the conceptualisation and vice versa, (2) how they link ontological and epistemological aspects of the design, and (3) their approach to play (or other) theory use (such as the strategies described above) in the various elements of design research and how this is presented in their papers.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Selection and participation

There were no participants involved

Appendix. List of papers


Hughes, B. (2002).


References


