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Jackie Marsh[a] ⓘD, Lydia Plowman[b] ⓘD, Dylan Yamada-Rice[a], Julia Bishop[a] and Fiona Scott[a]

[a]University of Sheffield, Sheffield, UK; [b]University of Edinburgh, UK

ABSTRACT

This paper draws on an ESRC-funded study of play and creativity in preschool-aged children's use of apps in the UK. The main objectives of the study were to collect information about access to and use of apps in the home, establish the most popular apps and identify the features of those apps that are successful in promoting play and creativity. A mixed-method approach was used to collect data, including video filming of children using the most popular apps. In identifying play types that emerged in the analysis of data, the team utilised an established taxonomy, which outlines sixteen play types. This taxonomy was reviewed and adapted to analyse data from the project relating to digital play. Through this process, an additional type of play, transgressive play, was identified and added to the taxonomy. The paper outlines the implications of the revised taxonomy for future studies of play.

Introduction

It is becoming increasingly clear that the nature of play in the digital age is changing in terms of the resources available for play and the ways in which those resources are deployed in different types of play (Bird and Edwards 2015; Herr-Stephenson et al. 2013; Marsh and Bishop 2014; Stephen and Plowman 2014). Given the changes that have taken place in this area, tools that have been used by researchers to categorise play in previous studies may need reconsideration. In this paper, we revisit a taxonomy of play developed by the play-worker Bob Hughes (2002) and revise the definitions of play offered in the light of technological transformations in the digital age. The revised taxonomy informed data analysis in a study of how far apps can foster young children's play and creativity (Marsh et al. 2015). In the first section of the paper, the key transformations that have taken place during the period since Hughes' taxonomy was developed are outlined, in order to provide a context for the study. The research design and methodology of the study in which Hughes' adapted tool was deployed are summarised and the nature of the classification of play in the digital age is considered in relation to the specific aims and objectives of the study. In the final section of the paper, the revised taxonomy is discussed, drawing attention to the addition of a category of 'transgressive' play and suggesting that it is not so much the *types* of play that have

changed as a result of new digital contexts as the *nature* of play. The paper focuses on the revision of the classifications of play and does not report on the full findings of the study. These are reported in Marsh et al. (2015).

The changing landscape of digital play

Hughes developed his taxonomy of play in the first decades of computer use by young children. At that time, there were few studies that considered the relation between technology and play and, therefore, it is of little surprise that Hughes' definitions did not consider this aspect of children's play. However, in the years since Hughes' original work, various changes have taken place which impact on this area of study.

First, contemporary children use technologies in different ways to children growing up in previous decades. There are few data that can throw light on preschool-aged children's access to technology in 2002, as the first large-scale study of this age group emerged in 2003, when Rideout, Vandewater, and Wartella (2003) detailed the findings from a telephone survey of 1065 families in the US. A few years later, a similar survey was conducted in the UK. Marsh et al. (2005) analysed the responses of 1852 parents who reported on their 0- to 6-year-olds' media use. These US and UK studies identified that young children were engaged in the use of a range of technologies, including TV, computers and laptops, electronic toys, radios and music players, console games and mobile telephones, and developed a range of skills and knowledge in this use. Usage differed in relation to social class, age and gender across different forms of media. The average screen use time was around two hours a day.

Children today have a wider range of technologies to use than previous generations, such as tablets and smartphones. However, it would seem that the time spent with screens for this young age group has not increased. Rideout (2013) identified that 0- to 8-year-old children in the US use screens for just less than two hours a day (1:55). Nonetheless, the type of screen use has changed. There is evidence, for example, that children are spending less time on console games as they play games on other platforms. In addition, more children are going online from home and are more likely to watch television on demand (Ofcom 2015). YouTube and other social media platforms have become a popular feature of young children's online practices in recent years (Chaudron et al. 2015; Marsh et al. 2015). Whilst there is still a paucity of studies of children aged under eight (but see Danby et al. 2013; Davidson et al. 2014; Verenikina and Kervin 2011), these data indicate that more children are accessing online content at an earlier age than was previously the case. This is particularly the case since the advent of the tablet, made popular through the launch of the iPad in 2010. The touch screen technology enables young children to engage with games, apps and websites in a relatively easy manner, although there needs to be caution expressed with regard to this assertion, given that not all children find touch screens easy to use and some apps are not intuitive (Merchant 2014).

A further aspect of contemporary play is the relation between online and offline spaces. There have been various developments in relation to the way in which toys and other artefacts are digitally mediated (Burke and Marsh 2013; Manches et al. 2015). This leads to communication and play that moves across physical and virtual domains and integrates material and immaterial practices (Burnett et al. 2014; Marsh 2014).

There has been a range of concerns expressed that the rise of technology has led in some way to diminished play (for a discussion of these concerns, see Marsh and Bishop 2014).

However, it is possible to draw on well-established early childhood principles in order to identify ways in which this is not the case. For example, Edwards (2011) cites Vygotsky's (1978) theories of play as a leading activity in cognitive and imaginative development in her work on digital play, and argues that contemporary digital cultures provide rich opportunities for the promotion of play that is rooted in children's everyday experiences. This is not, she suggests, an inferior form of play; rather, it sits alongside more traditional play activities and is important for creative development, an argument developed in her later work. In a study of children's technology use in ten families in Australia, Edwards (2013) contends that there is a need to reconsider the relationship between traditional play (e.g. construction play, pretend play) and 'converged play' in post-industrial times. By converged play, she refers to play that is related to children's popular cultural artefacts and texts, including digital media. Rather than viewing the two types of play as oppositional, Edwards argues that they are interrelated and that it is no longer appropriate to view traditional play as the highest quality form, given that converged play can also lead to imaginative play.

It was in this context that the 'Exploring play and creativity in preschool children's use of apps' project was developed. The project was developed as a response to the lack of research outlining how tablets and apps could support play, but also to provide evidence that could offer a challenge to some of the moral panics expressed in relation to technology and play. A brief outline of the project itself is provided in the next section of the paper.

The project: exploring play and creativity in preschool children's use of apps

The aims of the project were to identify UK children's (aged 0–5) use of apps and to examine how far the apps they used promoted play and creativity. The project was co-constructed between academic, school and children's media industry partners, involving the Universities of Sheffield and Edinburgh, Monteney Primary School in Sheffield, CBeebies (BBC's channel for preschool children), Dubit, a media research and development company, and Foundling Bird, a children's television production company. All members of the team were jointly responsible for identifying the research questions, developing research tools and analysing data.

The project had four distinct stages. In the first stage, in early 2015, an online survey was completed by 2000 UK parents of 0- to 5-year-olds who had access to a tablet. The survey asked parents about children's access to and use of tablets and apps. In the second stage of the study, case studies were undertaken of six children aged 0–5. An ethnographic methodology was employed, as used in previous studies of children's technology use in the home (Plowman 2015). Over four to six visits to each family, each visit lasting approximately two hours, parents and children were interviewed and children were videoed and photographed using apps by both the researcher and parents. The researcher recorded field notes during each visit. In addition, play and creativity tours were undertaken in the home, in which the places, spaces and resources used for all manifestations of play, including technological, were identified by children and recorded by the researcher and families through notes, drawings and photographs. Finally, three children recorded their own play through the use of a 'GoPro' chestcam.

The third stage of the study involved an analysis of young children's top ten favourite apps, which had been identified in the stage one survey, in addition to a selection of augmented reality apps. Twelve children aged between 3 and 5 participated in this stage of the

study and were videoed using the apps, primarily on their own, in a school IT room, filmed by the researchers. Seventeen hours, 21 min and 48 s of video recording were analysed. In the final phase of the study, the apps themselves were scrutinised and a multimodal analysis undertaken of them.

As the project aimed to identify how far apps promoted play and creativity, a framework for analysis of the data was developed which related to the children's use of the apps, combined with both parental and child reports of their play. We needed to identify the types and range of play and creativity facilitated by the apps in order to describe the features that promoted these dimensions. Creativity was identified when children produced new and original content (such as drawings), in addition to the identification of creative thinking using Robson's (2014) classification. This uses observations as the basis of an 'Analysing Children's Creative Thinking' framework, providing three high-level categories of 'Exploration and Engagement', 'Involvement and Enjoyment' and 'Persistence', together with a further ten sub-categories. The video data were analysed using these two frameworks, aided by the use of the software package Scribd 4.2, which enables the labelling of events in recorded videos.

Ethical issues were addressed throughout the study, in line with the BERA Ethical Guidelines (2011). The notion of informed consent underpinned the approach to the research, with an understanding that for young children, assent must be judged through ongoing assessments of the child's body language in addition to other potential markers of discomfort (Dockett and Perry 2011). If children appeared to be tired, then the interviews/video recording schedules were adjusted accordingly. Each family was given £100 of vouchers and the tablets purchased for the study were given to the school in order to acknowledge the commitments made to the project.

Classifications of play

There have been many classifications of play that have emerged from a range of disciplines. Given the way in which play is differently defined across disciplines (Sutton-Smith 1997), it seemed important to consider typologies developed in a number of them. One of the most established classifications was developed by Hutt (1979), a British psychologist. She identified three broad categories of play: (i) epistemic play, which is exploratory play in which knowledge of things is acquired; (ii) ludic play, which is play that draws on past experiences and includes symbolic and fantasy play; and (iii) games with rules, including games of skill and chance. This is a very useful framework for considering play in its broadest terms but, for the purpose of the study outlined in this paper, it is not sufficiently finely grained. Instead, there was a need to use a classification framework that enabled the identification of different types of epistemic play, ludic play and games with rules.

In sociology, other categories have been developed. Caillois defined four types of play: (i) agon – games of competition; (ii) alea – games of chance; (iii) mimicry – play as simulation, role play; and (iv) ilinx – play as vertigo (a state of dizziness and disorder, as when children spin in a circle on the spot) (Caillois 2001, 12). He proposed that these four types of games or play may be placed on a continuum, at one end of which is spontaneous improvisation (Paidia) and, at the other, contrived rules (Ludus). This can be related back to Hutt's (1979) model, as she suggested a distinction between exploratory and imaginative play, and games with rules. Whilst this classification of play is of interest as it includes attention to improvised

play in addition to play bound by rules, both of which can be applied to young children's digital play, it was also too broad for the purposes of this study.

The team considered typologies of play that had been developed in educational projects in order to identify those that might be relevant for this study. Broadhead (2003) developed a framework for analysing play known as the 'Social Play Continuum'. This outlines observable behaviours in four domains: associative, social, highly social and co-operative. The framework enables the analysis of play in social situations, with the associative domain relating to contexts in which children play alongside each other. As Broadhead (2006, 193) suggests, 'The Social Play Continuum offers insights into the physical manifestation of learning processes through related language, action and interaction and to progression as represented in the four domains of the Continuum'. It was not felt to be relevant to this study because Broadhead's framework is largely focused on social interaction and learning, which was not the focus for this study.

Moving beyond psychology, sociology and education, a framework that had been developed in an interdisciplinary project that included attention to technology was considered. Two of the members of the project team involved in the study discussed in this paper had been engaged in a previous project on playground play, in which Bishop and Curtis's (2001) taxonomy of play was adapted to provide a more detailed model than the framework offered by Hutt (1979) (see Willett et al. 2013). That classification of play was, in turn, based on the work of Opie and Opie (1959, 1969, 1985, 1997). The adoption of that tool was considered to be too broad, as it specified play with high verbal content, high verbal and/or musical content, high physical and high verbal and/or musical content, high physical content and high imaginative content. This, again, would not have provided a sufficiently fine-grained framework to analyse the data produced in this project.

The final taxonomy considered was Bird and Edward's (2015) 'Digital Play Framework', which appeared relevant to this study, given that it focuses on the impact of digital technologies on play. The 'Digital Play Framework' sets out behaviours in relation to epistemic (exploration, problem solving, skill acquisition) and ludic (symbolic, innovation) play. However, Bird and Edwards (2015, 1153) emphasise that this framework 'provides a summarised description of children learning to use technologies through play that teachers can use to observe and assess children's learning'. Given its focus on learning, it was not felt suitable to be applied in this study.

As we were not able to identify a suitable classification of play that took account of the digital, it was decided to adapt an already established framework. Hughes' (2002) taxonomy of play was originally devised in order to enable playworkers to identify the various types of play in which children were engaged. It was adopted for our project because it enables detailed categories of play to emerge but, as none of the definitions referred to technology, the team adapted the framework so that it could be applied to the data emerging from a study of play using tablets.

The revised framework

Table 1 outlines Hughes' taxonomy and provides revised descriptions for each type of play, although it is noteworthy that the adaptations for our project retain many of the same characteristics as the original definitions. These adaptations were developed following reflections by team members, based on findings from their extensive projects on young children's

Table 1. Play types: adapted from Hughes (2002).

Play Type	Hughes' definition	Adapted for this project
1. Symbolic play	Occurs when children use an object to stand for another object, e.g. a stick becomes a horse	Occurs when children use a virtual object to stand for another object, e.g. an avatar's shoe becomes a wand
2. Rough and tumble play	When children are in physical contact during play, but there is no violence. Energetic play	Virtual rough and tumble play occurs when avatars that represent users in a digital environment touch each other playfully, e.g. bumping each other
3. Socio-dramatic play	The enactment of real-life scenarios that are based on personal experiences, e.g. playing house, going shopping	The enactment of real-life scenarios in a digital environment that are based on personal experiences, e.g. playing house, going shopping. This could take place through play with avatars, or by imagining that an on-screen virtual character is involved in such play off-screen
4. Social play	Play during which rules for social interaction are constructed and employed	Play in a digital context during which rules for social interaction are constructed and employed
5. Creative play	Play that enables children to explore, develop ideas and make things	Play that enables children to explore, develop ideas and make things in a digital context
6. Communication play	Play using words, songs, rhymes, poetry, etc.	Play using words, songs, rhymes, poetry, etc. in a digital context. Can include text messages, multimodal communication and so on
7. Dramatic play	Play that dramatises events in which children have not directly participated, e.g. TV shows	Play in a digital context that dramatises events in which children have not directly participated, e.g. TV shows. This could take place through play with avatars, or in chat rooms, etc.
8. Locomotor play	Play which involves movement, e.g. chase, hide and seek	Virtual locomotor play involves movement in a digital context, e.g. child may play hide and seek with others in a virtual world
9. Deep play	Play in which children encounter risky experiences, or feel as though they have to fight for survival	Play in digital contexts in which children encounter risky experiences, or feel as though they have to fight for survival
10. Exploratory play	Play in which children explore objects, spaces, etc. through the senses in order to find out information, or explore possibilities	Play in a digital context in which children explore objects, spaces, etc. through the senses in order to find out information, or explore possibilities
11. Fantasy play	Play in which children can take on roles that would not occur in real life, e.g. be a superhero	Play in a digital context in which children can take on roles that would not occur in real life, e.g. be a superhero. This could be through the use of an avatar, but may also include taking on a character off-screen whilst they engage in on-screen activities in the fantasy scenario
12. Imaginative play	Play in which children pretend that things are otherwise	Play in a digital context in which children pretend that things are otherwise
13. Mastery play	Play in which children attempt to gain control of environments, e.g. building dens	Play in digital contexts in which children attempt to gain control of environments, e.g. creating a virtual world
14. Object play	Play in which children explore objects through touch and vision. They may play with the objects	Play in which children explore virtual objects through vision and touch through the screen or mouse. They may play with the virtual objects
15. Role play	Play in which children might take on a role beyond the personal or domestic roles associated with socio-dramatic play	Play in a digital context in which children might take on a role beyond the personal or domestic roles associated with socio-dramatic play. This could be through the use of an avatar, or they could take on a role themselves as they engage in on-screen activities
16. Recapitulative play	Play in which children might explore history, rituals and myths and play in ways that resonate with the activities of our human ancestors (lighting fires, building shelters and so on)	Play in a digital context in which children might explore history, rituals and myths and play in ways that resonate with the activities of our human ancestors (lighting fires, building shelters and so on)

Table 2. Simon plays 'Minecraft' App[a].

Number of turn	Vocalisation/ Speech	Action	Gaze	Gesture/facial expression	Posture, proxemics/ haptics
1.	N/A	Simon is creating a building in Minecraft. He continually taps the screen and with each tap, a paving slab appears. His avatar stands at the front of the 'patio' area	Simon looks at screen	Not possible to see because of camera angle	Simon is half-stand-ing, half-kneeling on a stool as he bends over the iPad, which is placed on a table top
2.	N/A	Simon taps the bar at the bottom of the screen. This takes him to a menu of building objects	As above	As above	Simon pushes closer to the screen
3.	Simon says 'See'.		As above	As above	As above
4.	Simon says, 'I know what I can use. I can use …'	Simon scrolls through the choice of building materials available	As above	Concentrated look	Simon sits up as he speaks
		He taps on a picture of a brick and goes back to his land, where he can use his chosen brick on his construction			He bends down again to press the screen

play using digital technologies (e.g. Marsh 2010; Marsh and Bishop 2014; Plowman, Stephen, and McPake 2010) and then refined through initial analysis of the data.

The revised definitions were then tested against the video data of children engaging with tablet apps. They were found to be highly relevant to the data, as they enabled the various types of play to be identified in ways which would not have been possible using the original framework. This can be illustrated by the following examples from the data. The videos were transcribed multimodally using the framework developed by Taylor (2014), which enables the notation of vocalisation/speech, gaze, facial expression, haptics (touch) and proximity (spatial positions) in any communicative turn. This was considered an appropriate approach, given the multimodal nature of children's practices when using technology (Kress 2010). All three examples were filmed in the school IT classroom, and the children used the tablets individually. The researchers filmed children using 'over the shoulder' shots, which enabled the children's actions to be discerned. The only other person in the room during the video recording was the IT teacher.

Hughes defined mastery play as relating to occasions when children attempt to gain control of physical environments, such as building dens. However, there were numerous occasions on which children could be seen attempting to control a virtual environment. This was particularly the case when children used the 'Minecraft' app, as this allowed them to create a virtual world using blocks, as illustrated by 4-year-old Simon (see Table 2).

The play continued as Simon built his environment. Once his building was complete, he manipulated his avatar so that it ran over the terrain of the surrounding environment. In this play episode, Simon could be identified as attempting to gain mastery over his virtual envi-ronment in a similar way to play in a physical environment in that what is at stake is the appropriate and effective deployment of the resources to hand.

Imaginative play, in which children pretend that things are otherwise, was a common feature of digital play with apps. For example, 4-year-old Jennifer played with an augmented reality app, 'AR Flashcards'. This enabled children to hold a tablet over a physical card on

Table 3. Jennifer plays 'AR Flashcards' App[a].

Number of turn	Vocalisation/Speech	Action	Gaze	Gesture/facial expression	Posture, proxemics/haptics
1.	Jennifer says, 'Iguana'	Jennifer holds the tablet over the picture of the letter 'I' and the iguana. When the 3D picture of the iguana appears, she presses it and the narrator says the letter and the animal's name	Looks at screen	Not possible to see because of camera angle	Sits on a stool and holds the tablet over the top of a paper with the pictures on it
2.	Jennifer says, 'Oh-oh, oh-oh, oh-oh, back' Jennifer says. 'Oh no, it's run away!'	Jennifer holds the tablet and waves her hand just above the paper	As above	As above	As above

Table 4. April plays 'Temple Run' App[a].

Number of turn	Vocalisation/Speech	Action	Gaze	Gesture/facial expression	Posture, proxemics/haptics
1.		April moves the avatar by flicking it with her finger repeatedly, so that it runs along a path. The avatar is chased by monkeys making threatening sounds. There is a fast-paced soundtrack, adding to the tension	April looks at the screen	Not possible to see because of camera angle	April is kneeling on the floor, with the tablet placed on a stool in front of her
2.	April says, 'Uh!', with an expression of surprise/shock	The avatar falls down a crack in the road			April moves back a little as she says this

which a letter of the alphabet and related animal were depicted and then a 3D representation of the animal would appear (see Table 3).

In this instance, Jennifer pretends the iguana has run away from the screen, thus imaginatively extending the limits of this app. There were many instances of imaginative play, such as when children treated digital pets as 'real' animals and pretended to care for them when using the 'Talking Tom' app.

Hughes identified deep play as play in which children encounter risky experiences, or feel as though they have to fight for survival. He offered examples that were based on children's interaction with the outdoor environment, but this type of play can also occur in a digital environment, as when 3-year-old April played the app 'Temple Run' (see Table 4).

April had previously played this game and stated that she found it scary, so it is of interest that she wanted to play it again. As numerous scholars have attested, humans are attracted to fearful, imaginary experiences (Clasen 2012; Tudor 1997). In this kind of digital play, children experience tension and fear as they do in risky offline play, but they have more control over the outcomes; it is relatively easy to switch a digital game off if it is causing too much emotional stress, whereas this is not always possible with deep play in a physical environment.

One aspect of play that could not be accounted for by Hughes' framework was transgressive play. This can occur in both digital and non-digital environments. In the study outlined

in this paper, transgressive play occurred when children used features of the apps that were not part of the design, thus transgressing the app producers' intentions. This was the case in 3-year-old Arjun's play, when he was observed playing 'Alphablocks' on the CBeebies Playtime app. Rather than adhering to the game's rules by placing the alphabet blocks on the line underneath the depiction of a word he was supposed to spell, he raised the block up to the top of the screen and made it disappear, then released the block to bounce back on the screen as he said, 'Peek-a-boo!'. This example, in addition to other instances in the data from the study, suggests that 'transgressive play' needs to be added to the framework, with the following definition:

> Play in which children contest, resist and/or transgress expected norms, rules and perceived restrictions in both digital and non-digital contexts.

In the examples offered above, it can be seen that Hughes' framework could be applied to play within a digital context. With the revised definitions, the framework enabled a comprehensive analysis of the types of play which emerged from young children's play using apps on tablets.[1] All but two of Hughes' (2002) 16 play types were identified in children's play with apps across the school and homes. The two types of play not observed were 'Recapitulative play' and 'Rough and tumble' play. Rough and tumble play relates to physical contact, and whilst there are virtual replications of this in online play (see Marsh 2010), this was not observed in this study. Recapitulative play is a category of play that is difficult to discern as it often overlaps with other play types, and Hughes (2002) felt that it occurs primarily when children have access to nature, although it could be argued that recapitulative play did occur in this study when children were using the *Minecraft* app, as they built dens and created civilisations.

Conclusion

This study has indicated that Hughes' taxonomy can be applied in a digital context, albeit with appropriate adaptations. It has demonstrated that what changes in digital contexts is not so much the types of play possible, but the nature of that play. Contemporary play draws on both the digital and non-digital properties of things and in doing so moves fluidly across boundaries of space and time in ways that were not possible in the pre-digital era. The findings of this study provide a counterpoint to those who seek to dichotomise digital and non-digital play, suggesting that play with digital technologies is not 'real play' (Palmer 2016).

There are a number of implications of the findings of this project for future studies of play. First, the adaptation of Hughes' taxonomy provides a useful framework for analysing other instances of young children's play in digital contexts. With the proviso that Hughes' original framework should be extended with the addition of 'transgressive play', it can be viewed as a robust tool for this kind of analysis given that the adapted framework was extensively tested on over 17 h of video data.

Second, Hughes' revised taxonomy can be applied to the digital play of older children, young people and adults. This study was focused on children aged under five, but similar types of play can be found in studies with older children (Kafai and Giang 2008). It would be possible, and even desirable, to engage young people in critical reflections on their own play across digital and non-digital spaces in order that the definitions could be refined further and be built on participatory approaches to the development of analytical tools. This process of adaptation can be a two-way process of adaptation. Using the taxonomy in a digital

context may highlight an additional form of play that has not been identified originally and is equally applicable in digital and non-digital contexts and vice versa.

Finally, it is contended that this study makes a significant contribution to the field of play studies, as it points to the way in which future analyses of play should pay attention to the way in which the dichotomies of online/offline, physical/virtual and material/shape the activities, and it provides a means of classifying play types in this context. Whilst we would suggest that the research on young children's digital play is very much work in progress, this paper offers a robust tool that can inform studies in the area in the years ahead, and can be refined and adapted further as the possibilities for additional changes in the play landscape grow in the light of technological changes in society.

Note

1. For further discussion of the findings from the study, see Marsh et al. (2015).

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ORCID

Jackie Marsh http://orcid.org/0000-0001-6192-6198
Lydia Plowman http://orcid.org/0000-0003-2068-6428

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