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## **Let's splash: Children's active and passive water play in constructed and natural water features in urban green spaces in Sheffield.**

### **Children's water play in urban green spaces**

The value of open spaces to people's lives in cities are many and may relate to the space in its entirety or specific elements within a space. Within urban green and open spaces vegetation and water are elements that are a great attraction for people (Zube, et al., 1983). This is especially the case for water, which children (Yamashita, 2002) consider to have a higher design value than adults (Francis, 1988). Yet, despite water being identified as one of children's five favourite elements of childhood play in an outdoor environment (Brunelle et al., 2016); acknowledged as a natural element by children (Collado et al., 2016; Freeman et al., 2015; Gulgonen and Corona, 2015; Donnell and Rinkoff, 2015); positively correlated with the use of open spaces for boys aged 4-6 (Aarts, et al., 2010) and supporting an increase in the active recreation of girls (Hume et al., n.d.) little research has been undertaken that explicitly seeks to understand children and their interaction with water in urban green spaces. This paper seeks to add to that limited research by providing insights into children's play associated with different types of water features in one *civic* green space and two *neighbourhood* green spaces in the City of Sheffield, in the north of England, UK. This paper builds upon (Bozkurt, Woolley and Dempsey, 2019) which developed an observational tool (TOWEC), to observe children's water play

### **Constructed and natural water features**

In urban green spaces water can be understood to exist in two main forms: constructed and natural. Constructed spaces are those understood to be built for a specific purpose and are sometimes understood in opposition to 'found' (incidental) spaces and for children this might be the difference between playing in the constructed space of a playground or the found space of some steps or other element within an urban landscape (Woolley, 2015). Similarly *constructed water features* can be considered to be those which are built for a specific purpose and include fountains, usually provided for aesthetic and sometimes auditory purposes, and lakes or ponds for activities such as boating and fishing. *Natural water features* have been suggested to include features such as rivers (Tapsell, et. al. 2001; Tunstall, et. al. 2004). We contest that some natural water features may be more constructed than is obvious at first sight, for example a river may have been partially re-aligned or had weirs and dams introduced to alter flow rates. Yet to the untrained eye such water features retain a 'natural character' and thus we retain the classification of 'natural' here.

Many different types of green and open spaces exist in a city and often differ according to their location such as in a city centre or a (housing) neighbourhood. The attraction to children of water in these different locations is exemplified by the fact that in city centres, where many civic open spaces exist, children prefer water features to statues or sculptures (Woolley, et al., 1999), while in neighbourhood parks children consider them to be good if they include a fountain in which they can run and splash (Gulgonen and Corona, 2015). The importance of different forms of water is evidenced in that constructed forms of water such as fountains can provide seasonal opportunities for water play for children (Derr and Lance, 2012) which can be enhanced for both boys and girls by the use of playthings such as water guns and water balloons (Ferre, et al., 2006). Natural forms of water such as rivers also provide attraction for children who might visit with friends and family (Tapsell, 1997). Although children understand rivers to be natural features and find them interesting (Tunstall, et al., 2004) it has been

reported that children do not always interact with the water in rivers in their outdoor play (Tapsell, et al., 2001). However, more recently landscape elements such as ditches, shallow lakes or running water were valued for the challenge they provided while supporting the growing competence of younger children through pouring, mixing, splashing, or playing with bridges over ditches in the more informal setting of a forest school (Lerstrup and Refshauge, 2016; Lerstrup and Moller, 2016). Thus one of our research questions is whether the type of water feature, constructed or natural, in an urban green space influences the type of activity or play that a child might engage in.

### **Characteristics to consider in understanding children playing with water**

A range of characteristics can influence children's use of urban green spaces, whether they contain water features or not, and these include proximity to a green space, age, gender and ethnicity. Proximity is important because children have been shown to visit more frequently urban green spaces that are closer to their homes than spaces further from where they live (Giles-Corti and Donovan, 2002; Roovers et al., 2002). Age can influence children's independent mobility in a city with 10/11 being the age at which they have more freedom within a city in most countries (Johnston, 2008; Shaw et al., 2015) and even to the city centre (Woolley et al., 1997). Gender has also been shown to influence children's mobility in a city with females being reported as more restricted than males in various contexts (Hart 1979; Spilsbury 2005; Villanueva et al., 2012 ). These characteristics provide additional research questions with respect to children's play with water in constructed and natural water features.

### **Affordance as a framework for understanding children playing with water**

In seeking to understand children's experiences with water in urban green spaces the theory of *affordance*, which suggests that people interact with their environment using it in ways they perceive as possible (Gibson, 1979), provides a suitable framework. This is evidenced in previous research where children have used the environmental quality of water by 'playing with water', rather than swimming or fishing in water (Kytta, 2002, p112). By doing so the children are, or become, *attuned* to the environment of the water and their environs and use the information about that environment to respond, in play (Gibson, 1979; Kytta, 2002).

For affordance to exist, an environment must include an element or elements that someone can perceive as offering the potential for an activity. It has been suggested that this perception relates to different characteristics of an individual and how these are matched with elements within an environment (Greeno, 1994; Kytta, 2004). Such affordances may be potential or actualised within an environment. Potential affordances relate to an individual and an activity which the individual perceives might be available in an environment and might be infinite in number (Kytta, 2004). Actualised affordances (Heft, 1989) result when someone perceives an activity and acts or reports on that perception (Kytta, 2002; Kytta, 2004). This leads us to a third set of research questions as to whether children perceive and actualise affordances for play with water in the different types of constructed and natural water features in urban green spaces.

## **Methodology**

### *Study site selection and characteristics*

Four sites were identified and purposively chosen because they were known to have either constructed or natural water features, or both, and are commonly known to be where

children play with water. This has been the case for nearly 20 years in one location and for more years, even generations, at the other sites. Unfortunately, one site had to be eliminated from the research because of major maintenance work being undertaken during the time of the planned field work. The remaining three sites included one civic green space, The Peace Gardens in the centre of the city, Endcliffe Park and Millhouses Park, to the south-west and south of the city. Typical images of the three urban green spaces are shown in Figure 1.



**Figure 1: The three study sites: The Peace Gardens (left), Millhouses Park water play area (centre), Endcliffe Park stepping stones (right)**

The Peace Gardens is a civic open space which is surrounded by cafes, offices, a hotel and the town hall. It was redeveloped as part of the Heart of the City project for the turn of the 20<sup>th</sup>/21<sup>st</sup> century (Woolley, 2003). It has a central constructed water feature consisting of a fountain with multiple water jets that rise to different heights, together with additional constructed water features in the form of small water channels. The site includes raised grass areas, perennial planting and trees making it the only green space in the city centre and only one of two within the ring road. The water feature was not designed for children's play but as soon as it was opened children perceived and actualised the affordances of playing with water, taking their swimming costumes and towels and playing in the central constructed water feature. It was soon recognised that the jets were slightly raised and therefore a trip hazard for children and as a result were made flush with the surfacing.

Endcliffe Park is a typical neighbourhood park about two miles south west of the city centre. It is surrounded by housing on the eastern side, a wooded slope with housing at a higher level on the west and forms the start of a green route from the city to the countryside. It includes a children's playground, keep fit equipment, pathways along the river valley, a large grass area, trees and woodland. The natural water feature is the Porter Brook, where the water is usually only 30-40cm deep, has stepping stones across the river at one point and a café nearby. There are also access points directly to the river and ponds where ducks are often present in numbers. It is a popular park for families, dog walkers, football training at weekends and organised events.

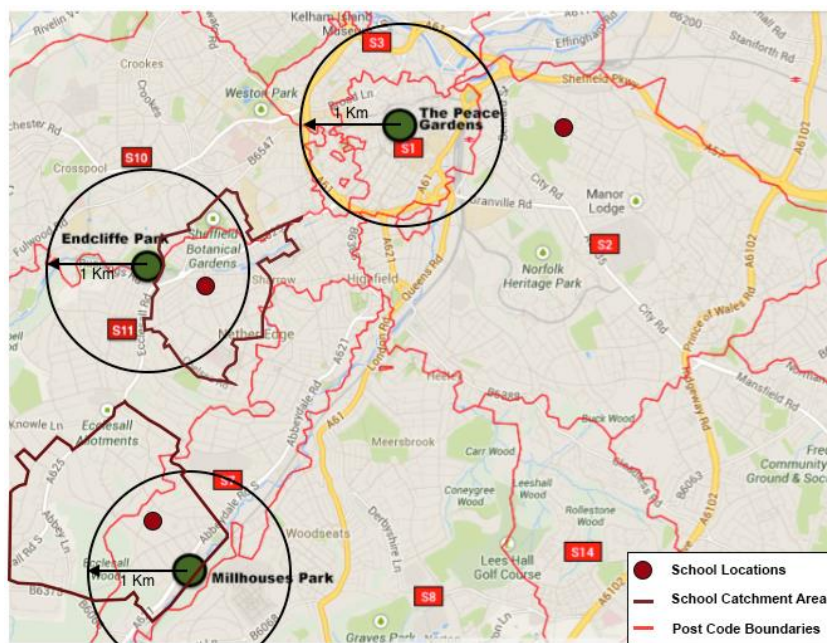
Millhouses Park is about three miles south of the city centre and has a residential area on its western side. The eastern side is bounded by the river within the park, then the mainline railway to London and beyond that a steep wooded slope where at the higher level there is a road. The River Sheaf is the natural water element running through the park, where access to the shallow water is possible in a few places. During the mid-20<sup>th</sup> century the park was a city wide destination for children and families because of the lido and constructed paddling pools but these fell into disrepair and were closed in the 1980s and 1990s respectively. In 2010 a

new, modern constructed water play area including carefully chosen pieces of equipment to support children's water play was opened. There is a small boating lake, with an adjacent café, which continues to be popular with adults, who sail model boats, and children, for the paddle boats that can be hired.

#### *Data collection methods*

Two methods of questionnaire and observation were used for collecting data. Questionnaires were used to ask children about use of all the three urban green spaces including: proximity, asking which post-code children live in; age; gender and companions, asking who they went to the sites with. Observations were used to understand the actualised affordances of the water features within the site along with age, gender, companions and ethnicity. The two methods used provided different data sets for comparison and analysis.

It was decided that the most appropriate way to approach children was through local schools and nine primary schools (children aged 5-10/11) and three secondary schools (children aged 11-18) were invited to be involved in the research. Many of the schools were not prepared to be involved including no secondary school. Reasons given were because of already being involved in research; SATS (Standard Assessment Tests) which would take place at the time the fieldwork was planned; preparation for examinations for 16 and 18 years and some did not provide a reason or respond to the mail, emails and follow up phone calls. Eventually three primary schools, one within 1km of each neighbourhood park and one within 1.5km of the civic green space agreed to participate in the research. The location of the schools, postcode areas and 1km radius from the three selected urban green spaces are shown in figure 2.



**Figure 2: One kilometre buffer zone around urban green spaces, school locations and catchment areas.**

In discussion with each school, children aged 8-11 were invited to complete a questionnaire. The questionnaire was prepared to be child-friendly and welcoming for children in its

presentation. The aim of the questionnaire was introduced on the first page using simple language, suitable for the age group. The questionnaire was clearly laid out and supported with graphics related to each question, confirming the written text for children. These graphics also made whole process exciting for the children and helped children to complete the process. The questionnaire was administered by the class teacher with the first author present, who could answer any queries the children had about the questions. Most of the questions were open-ended, in order not to lead the children to answers. As well as asking the characteristics mentioned above the questionnaire also asked how often the children visited each of the three urban green spaces; what they did on those visits; what sort of activities they did in each urban green space and what sort of activities they did in association with the water features in each space.

Non-participant observation (Flick, 2009; Dunn, 2005) and behaviour mapping (Moore and Cosco, 2010; Marusic, 2011; McKenzie and Deborah, 2006; Malone and Tranter, 2003) were used in order to understand the characteristics of children in the urban green spaces, their play with water and thus the actualised affordances. Observing and recording the play with water provided more accurate observations, than only relying on children's responses to the questionnaire.

Some of the information from the questionnaires, together with informal pilot observations, were used to inform aspects of the observations. Specifically, the questionnaires revealed that the children's use of water features in the urban green spaces increased during school holidays and so it was decided to undertake the observations and mapping in school holidays during different seasons while also taking weather and different times into account for the fieldwork. To facilitate this, observations were undertaken at six times in the year for each of the urban green spaces: during the summer holiday (August); the autumn half term holiday (late October); the Christmas holiday (late December); the winter half term holiday (late February); the Easter holiday (late March) and the spring half term holiday (late May). Each urban green space was observed for a whole week in the summer and one or two days, depending on the weather, in the longer Christmas and Easter holidays. Each open space was observed for a total of at least 14 days.

As previously discussed (Bozkurt, Woolley and Dempsey, 2019) no existing tool was suitable for mapping and recording children in public open spaces. Most previous tools have been used to observe children in enclosed spaces, such as school playgrounds (Moore, 1989; Cosco et. al. 2010); have meant that only a limited number of children could be observed (Moore, 1989; Cosco et. al. 2010) or have observed physical activity and not specifically play (McKenzie et. al., 2000; McKenzie and Deborah, 2006), especially not play with water. A new mechanism, called a Tool for Observing Water Experiences of Children (TOWEC) was designed for hand coding with symbols representing gender, age, and ethnicity. The tool also facilitated the hand recording of information including environmental characteristics; characteristics of children; and passive or active play with water as observations during the pilot study (Bozkurt, Woolley and Dempsey, 2019).

Environmental characteristics recorded included the date, time and weather for each observation session. Characteristics of children observed were recorded as gender, which was deemed to be self-evident, age and ethnicity. Age was categorised as 0-9 and 10-18 reflecting



previous findings about children's independent mobility and travel to town (Woolley et al., 1999; Johnston, 2008; Shaw et al., 2015). Ethnicity was observed and coded using the UK census data categories (Office of National Statistics, 2011) collapsed into five headings of White, Black, Asian, Mixed and Chinese or other, but no differences were found and so this is not considered further in this paper. We acknowledge that observing gender, age and ethnicity may have some element of error.

The two parks are both linear in form and so were each divided into four sections with a focus on the areas containing the water to facilitate the observations and mapping (Moore and Cosco, 2010). In all three urban green spaces the observations were undertaken in 15 minute rounds. Field photographs were also taken in order to conduct re-analysis of the environment and activities (Flick, 2009).

### **Children's use of the urban green spaces**

In total 273 questionnaires were completed by children aged 8-11 across the three primary schools and 3,399 observations of children aged 0-18 were made across all observation sessions on the three different sites. The questionnaires asked children about their use and experience of all the three urban green spaces, including the water within them and some children completed questions about more than one of the urban green spaces. The observations were focussed on the water features within each urban green space, not activities within the site as a whole, which explains some of the differences between questionnaire responses and observations recorded in the mapping.

#### *Diversity of children using the urban green spaces: ethnicity, gender, age.*

No specific differences were found in the levels of visits to the urban green spaces, nor in relation to the active and passive play by children's ethnicity and so this will not be discussed further in this paper.

With respect to gender the questionnaires revealed similar proportions of males and females used all three sites with Millhouses Park having a slighter higher number of males (53% n=169) using it than the Peace Gardens and Endcliffe Park.

This questionnaires also revealed that 54% of the children visiting both the Peace Gardens (n=208) and Millhouses Park (n=158) together with 55% of those visiting Endcliffe Park (n=169) were aged below 9/10 years of age. However, a much higher number and percentage of children below 10 years old were observed on all three sites where the focus of the observations and mapping was on play with water, not activities throughout the site. This included very young children under 1 year old and toddlers who were taken to the water features by their parents, or other adults accompanying them.

#### *Children's proximity and visits to the urban green spaces*

The questionnaires asked children to indicate which postcode they lived in and responses included S2, S7, S10 and S11, which generally reflect the catchment areas of the schools. From figure 2 it might look as if other post code areas would be relevant but they were not, and these are now explained. The city centre postcodes S1 and S3 do not include family housing but many apartments where students and young professionals live. It might appear that S8 would be mentioned for Millhouses Park but it is not for three main reasons. First, S8 is out of the school catchment area and therefore children completing the questionnaires were unlikely to live there. Second, there is very little housing in the part of S8 closest to the park.

Third, between the park and S8 there are a series of physical barriers, previously mentioned in the site selection and characteristics section.

*Proximity and fortnightly or more frequent visits*

Children’s reported fortnightly and more frequent visits were aggregated together and are shown in Table 1 but need to be considered in conjunction with the spatial relationship between the postcodes and urban green spaces shown in Figure 2. Our analysis reveals that children’s proximity of living to an urban green space appears to relate to the distance they live from that space: children using the closest space to where they live most frequently and the spaces furthest from where they live least frequently.

	S2 *(n=77)			S7 *(n=49)			S10 *(n=13)			S11 *(n=55)		
	PG	EP	MP	PG	EP	MP	PG	EP	MP	PG	EP	MP
<b>Fortnightly or more frequent visits (%)</b>	46.8	10.0	7.8	28.6	50.0	55.1	-	84.6	15	40.0	66.0	21.8
<b>Monthly or less frequent visits (%)</b>	42.9	20.0	32.5	65.3	50.0	28.6	-	15.4	77	45.5	32.1	65.6
<b>Never (%)</b>	10.3	70.0	39.0	4.1	0.0	0.0	-	0.0	8	10.9	1.9	1.8

\* n is number of respondents living in each post code

\*\* % shows percentage of children living in each post code who visit each study site

**Table 1 Frequency Of Children’s Visits To Study Sites by Post Code of Residence (n=194 responses to questionnaire)**

This is most dramatically evidenced for Endcliffe Park, located at the junction of S10 and S11 where 84.6% and 66% of the children from those postcodes visited fortnightly. This space is also close to S7 and 50% of the children living there say they visited fortnightly. Similarly, for Millhouses Park more children living in the closest postcodes visited fortnightly or more: 55% from S7, 21.8% from S11, 15% from S10, and only 7.8% from the furthest post code of S2. A similar pattern of use is evidenced for the Peace Gardens with 46.8% living in the closest postcode of S2, 40% in the next closest postcode S11 and 28.7% of the children from S7 visiting fortnightly. One anomaly is that no children from S10 visited the Peace Gardens fortnightly, if at all, and this might be explained because the catchment area for the one school only just touches the S10 postcode area.

*Proximity and monthly or less frequent visits*

The data clearly shows that the further children live from a site, the less frequent are their visits (see table 1 and figure 2). This is most dramatic for the Peace Gardens where the highest percentage of children visiting monthly or less was from the most distant postcode of S7 (65.3%), followed by the closer postcodes of S11 (45.5%) and S2 (42.9%). Similarly for Endcliffe



Park the highest percentage of children visiting monthly or less was from the most distant postcode of S7 (50%) followed by the closer postcodes of S11 (32%) and S10 (14.5%). For Millhouses Park the highest percentage of children visiting monthly or less were from the most distant postcode of S10 (77%), followed by the closer postcodes of S11 (65.6%) and S2 (32.5%). An anomaly here is that S2 is the furthest postcode from Millhouses Park, and the attraction, even if for less frequent visits, to this more distant space may be familial remembrance that it was a destination park for many generations.

*Children's mode of travel to the urban green spaces*

A total of 273 questionnaires included responses about the method of getting to each urban green space. Children could answer for more than one of the spaces and for more than one of the methods of getting to each urban green space with the result that columns and rows do not add up to 100% in table 2. Again, this is considered in conjunction with the spatial relationship between the postcodes and urban green spaces shown in Figure 2.

Mode of Travel	The Peace Gardens *(n=208)				Endcliffe Park *(n=169)					Millhouses Park *(n=159)			
	Total	S2	S7	S11	Total	S2	S7	S10	S11	Total	S2	S7	S11
Walk	33.6	37.0	15.1	23.3	53.5	21.9	24.0	47.8	42.2	34.6	2.9	41.8	17.1
Cycle	8.8	31.6	15.8	15.8	32.9	15.6	20.3	21.7	23.3	28.9	11.4	29.1	17.1
Bus	55.3	39.2	16.7	25.0	12.9	15.6	3.8	4.4	6.7	15.1	17.1	0.0	7.9
Tram	14.3	61.3	3.2	16.1	0.0	0.0	0.00	0.00	0.00	0.0	0.0	0.0	0.0
Car	61.3	20.3	30.1	26.3	62.4	46.8	51.9	26.0	27.7	74.2	68.6	29.1	57.9

\*n is number of children who visit each of the study sites: children were allowed to answer for more than one study site.

**Table 2: Children's Mode of Travel to Study Sites (%) (n=273 responses to questionnaire)**

The car was the most mentioned mode of transport to each urban green space across all the postcodes: Millhouses Park (74.2%), Endcliffe Park (62.4%) and The Peace Gardens (61.3%). The second most frequent mode of transport for two sites was walking (Endcliffe Park, 53.5%; Millhouses Park, 34.6%) and third was cycling (Endcliffe Park, 32.9%; Millhouses Park, 28.9%). For the Peace Gardens the second most frequent mode was bus (55.3%) with walking third

(33.6%) and tram fourth (14.3%). However when the picture is different when considering mode of travel and proximity of living to each urban green space.

For children living in the two post codes closest to Endcliffe Park walking was the most frequent mode of travel (47.8% for S10 and 42.2% for S11) with travel by car second most frequent (27.7% for S11 and 26% for S10) and cycling third (23.3% for S11 and 21.7% for S10). For children living further away the most frequent mode of travel was car in both S7 (51.9%) and S2 (64.8%). Children living closest to Millhouses Park, in S7, report walking (41.8%) followed by going by car and bicycle (equally 29.1%). Children from further away predominantly travelled by car from S11 (57.9%) and S3 (68.6%). When looking at mode of transport by postcode the anomaly of 61.3% of children from S2 using the tram to the Peace Gardens can be explained by the fact that the tram serves the city centre and goes through part of S2, but goes nowhere near the other urban green spaces or post codes in this study.

### Activities in the urban green spaces

Children's questionnaire responses named 17 different types of activities they did in Millhouses and Endcliffe parks with 7 of these being related to water, as can be seen in table 3. The management of the Peace Gardens does not allow playful activities, apart from water play, and so this site is not included in table 3. The most popular reported activity was playing in the park or playground for both parks (55% for Millhouses Park and 84% for Endcliffe Park). The second and third most popular activities in Millhouses Park were playing in the water park (34%) and playing in the sports park (24%) while for Endcliffe Park these were eating in the café (17%) and playing with the stepping stones (16%), associated with the Porter Brook. The skatepark (16%) and boating in the lake (14%) were the next most mentioned activities in Millhouses Park while in Endcliffe Park the next most popular activities were walking/running/walking the dog (11%) and then paddling in the river (7%).

<i>Activity</i>	<i>Millhouses Park (n=159)</i>	<i>Endcliffe Park (n=169)</i>
Playing in the park or playground	55	84
<b>Playing in the water park</b>	<b>34</b>	-
Playing sports in the park	24	-
Skate/scooter park	16	-
<b>Boating in the lake</b>	<b>14</b>	-
Riding bike	9	-
Eating in the café	9	17
Walking/running/dog walking	6	11
Having picnics	2	2
<b>Watching things and water</b>	<b>1</b>	<b>1</b>
Outdoor gym	1	-
<b>Stepping stones</b>	<b>1</b>	<b>16</b>
<b>Driving model boats</b>	<b>1</b>	-
<b>Paddling in the river</b>	<b>1</b>	<b>7</b>
<b>Feeding ducks</b>	-	<b>7</b>
Cycling	-	5
Climbing	-	4

**Table 3 . Activities undertaken by children in the parks (%) (n=273 questionnaires)**

### **Children's perceptions and use of the water features in urban green spaces**

Moving on to consider children's 'playing with water' (Kyttä, 2002, p112) we seek to understand how many play with the water, their perception of the water, the type of water play the children engage in, exploring these by age and gender.

Lower numbers of children played with the water features than visited each urban green space. The questionnaires reveal that 59% of children visiting the Peace Gardens (n=201), 65% of children visiting Millhouses Park (n=129) and 51% of children visiting Endcliffe Park (n=120) engaged with the water features monthly or at less frequent intervals. This is consistent with the already mentioned finding that 7 of the 17 activities children reported involved play with water. In addition, use of the water features is understood to change by season from both the questionnaires and the observations, with less active play taking place in the late autumn and winter, a time when the constructed water features were closed.

Across all three sites children mentioned that they liked the water features because they are: nice to play with; fun; exciting; cooling; and nice to look at. For Millhouses Park, with the modern constructed water play park, children also stated that it was clean, safe and child friendly. The perception of the natural water feature of rivers in both parks was less positive being described by some as cold, polluted and dirty.

#### *Play with water*

Of the play with water reported for Millhouses Park (n=159) the highest was playing in the water park (34%), with boating in the lake being second highest (14%) and driving model boats, paddling in the river and watching things and water each being reported least (1%). In Endcliffe Park the most frequently mentioned play with water was the stepping stones across the river (16%) with paddling in the river and feeding ducks equal second (7% each), and watching (things and) the water being the reported least (1%).

*Active* and *Passive* modes of playing with water have been previously suggested (Bozkurt, Woolley and Dempsey, 2019) where *active* includes running/walking in/under the water; jumping in the water; chasing games; playing with water equipment; walking around the water; feeding animals in the water and *passive* includes lying around the water; standing around the water; sitting on a bench; sitting on a wall; sitting on grass; and observing the water features.

Active play with water was reported in the questionnaires as higher than passive across all three urban green spaces, as can be seen in Table 4, and this is particularly the case for Millhouses Park where 92.5% (n=120) of the play with water was reported as being active while only 7.5% was passive. The Peace Gardens (n=202) and Endcliffe Park (n=130) had levels of active play with water similar to each other (61.4% and 62.3%) and lower levels of passive play with water (38.6% and 37.7% respectively).

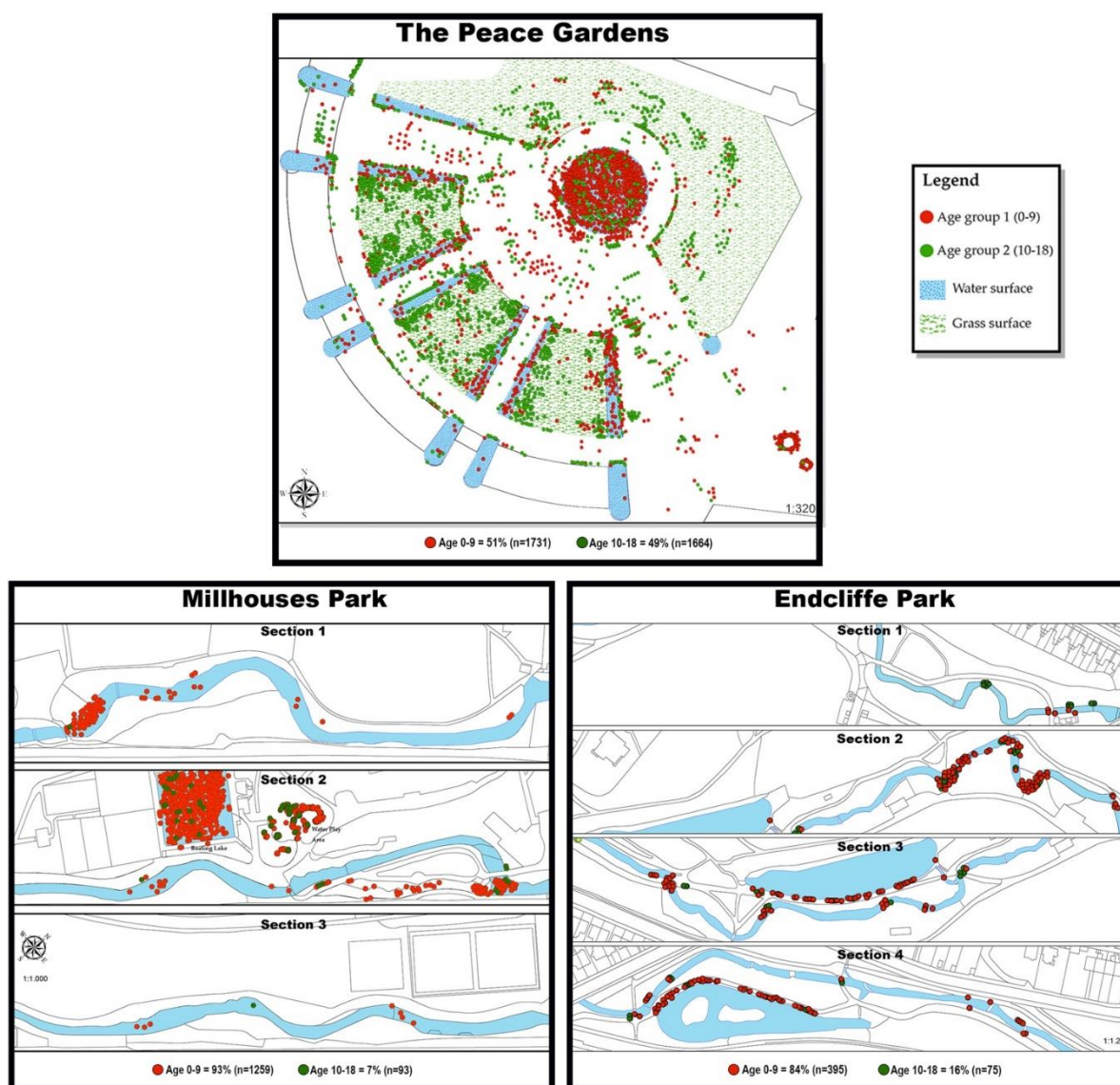
	<i>The Peace Gardens</i> <i>*(n=202)</i>		<i>Millhouses Park</i> <i>*(n=120)</i>		<i>Endcliffe Park</i> <i>*(n=130)</i>	
<b>ACTIVE INTERACTION</b>	Playing in the water	35.6%	Playing in water park	62.5%	Splashing in the stream	23.1%
	Running through water	14.9%	Boating in the lake	18.3%	Playing on stepping Stones	22.3%
	Playing on sliding balls	4.5%	Water fights	6.7%	Playing pooh sticks	6.9%
	Putting just hands or feet in	3.0%	Playing in the stream	1.7%	Throwing Stones	3.8%
	Chasing games	2.5%	Throwing Stones in the water	0.8%	Duck race	3.8%
	Play around water	1.0%	Feet in the water	0.8%	fishing	1.5%
			Fishing for insects/fish	0.8%	Play around water	0.8%
			Playing Pooh Sticks	0.8%		
	61.4%		92.5%		62.3%	
<b>PASSIVE INTERACTION</b>	Watching water	20.3%	Watching water	7.5%	Feeding ducks	22.3%
	Picnic around water	8.9%			Watching water	6.9%
	Sitting on grass and relax	5.4%			Bird / duck watching	5.4%
	Throwing coins	1.5%			Interesting play	1.5%
	Reading boks near by	1.0%			Pşay with dog	1.5%
	Listening music near by	0.5%				
	Chat with friends	0.5%				
	Taking Pictures	0.5%				
	38.6%		7.5%		37.7%	

\* n= the number of responses for each study site.

**Table 4. Types of Active and Passive Play with Water in Each Study Site (total n=273 questionnaires)**

Additional information about the mode of play with water is shown in figures 3-5, where each figure indicates the 3,399 cumulated observations from across all three sites. Counting the dots of children playing with water provides percentages to support these cumulative observations, thus adding rigour to the findings, for each site by age (Fig 3), gender (Fig 4) and active and passive play with water (Fig 5) with the percentages shown in table 5.

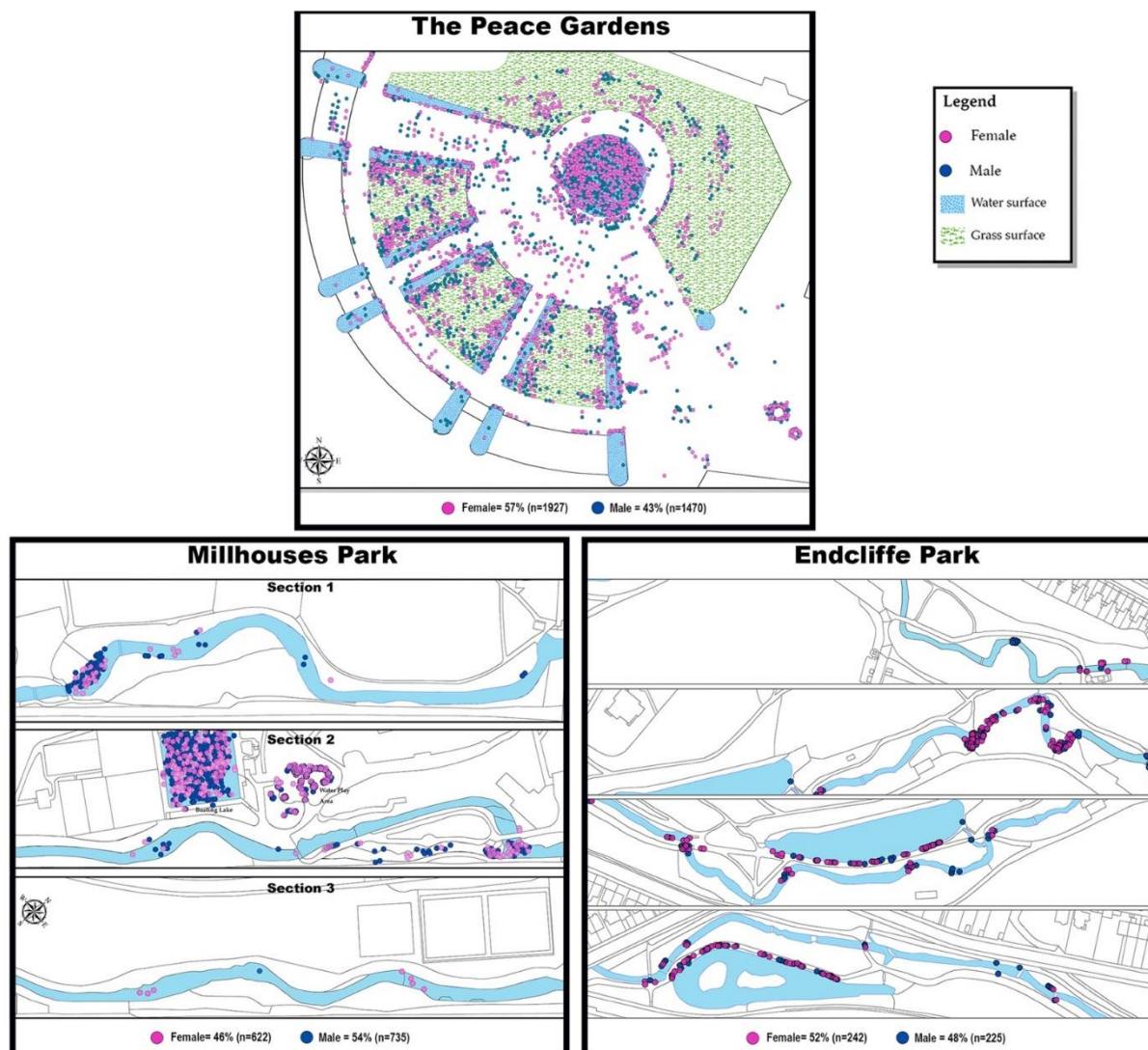
Figure 3 shows that the age group of 0-9, (red) is mainly focussed within and close to the water in each of the three urban green spaces, while the age group 10-18 (green) is predominantly further away from the water. In the Peace Gardens 51.4% of those playing in the water features were younger children while 48.6% were older. The attraction of the water features is noticeably higher for younger children in the parks: 93.1% in Millhouses Park 84.4% in Endcliffe Park 84.4%. The natural features of the river and ponds in both parks appear to be less popular with the younger children than the constructed spaces. There are more younger children in all three spaces close to the water, especially in the Peace Gardens.



**Figure 3: Play with water by age**

Moving on, figure 4 shows play with water by gender (females pink; males blue). In the Peace Gardens 56.7% of those playing with water were females, compared to 43.3% being males. In Endcliffe Park more females (51.8%) were playing with water and males (48.2%). Both these sites differ from Millhouses Park where more males (54.2%) were playing with water than

females (45.8%). Again the constructed features of fountain jets, boating lake and water play park seem to be more frequently played with than the natural areas of the rivers and ponds.



**Figure 4: Play with water by gender**

Modes of active and passive play with water by age are shown in figure 5 (active green; passive pink/purple). The highest percentage of active play was seen in Millhouses Park (88.6%), with Endcliffe Park second (56%) and the Peace Gardens third (28.4%). The lighter shades of both colours indicate younger children (0-9) while the darker shades represents older children (10-18) allowing for further analysis of active and passive play by age. The younger children were the most active in all three urban green spaces, with Millhouses Park (94.9%) having the highest percentage, followed by the Peace Gardens (88.4%) and Endcliffe Park (82.8%). The younger children undertook more passive play in Endcliffe Park (86.3%) and Millhouses Park (79.1%). However the opposite was the case in the Peace Gardens where older children were more engaged in passive play with water (63.3%).



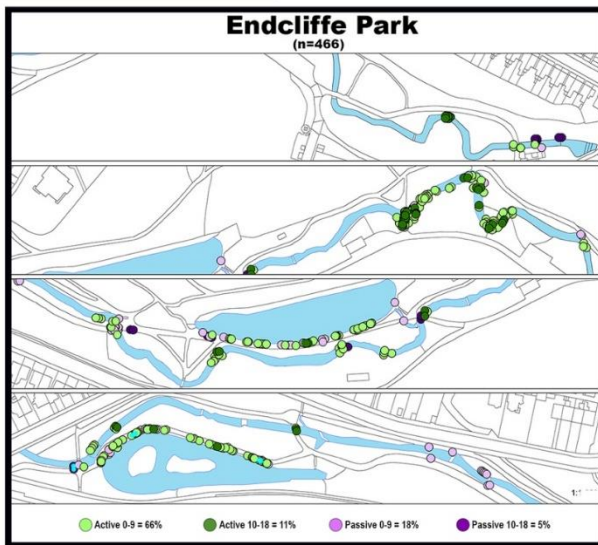
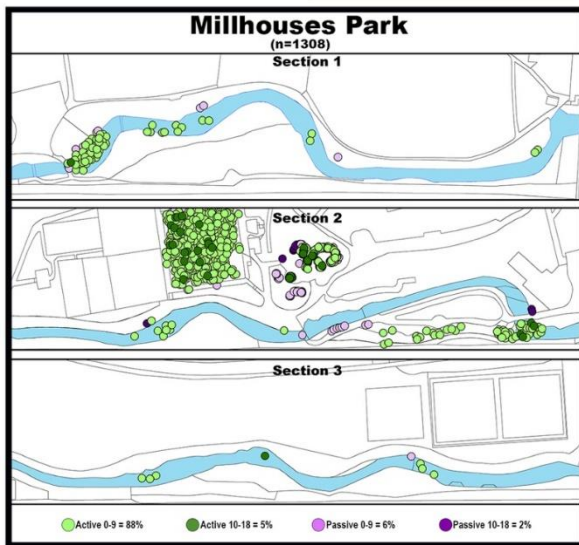
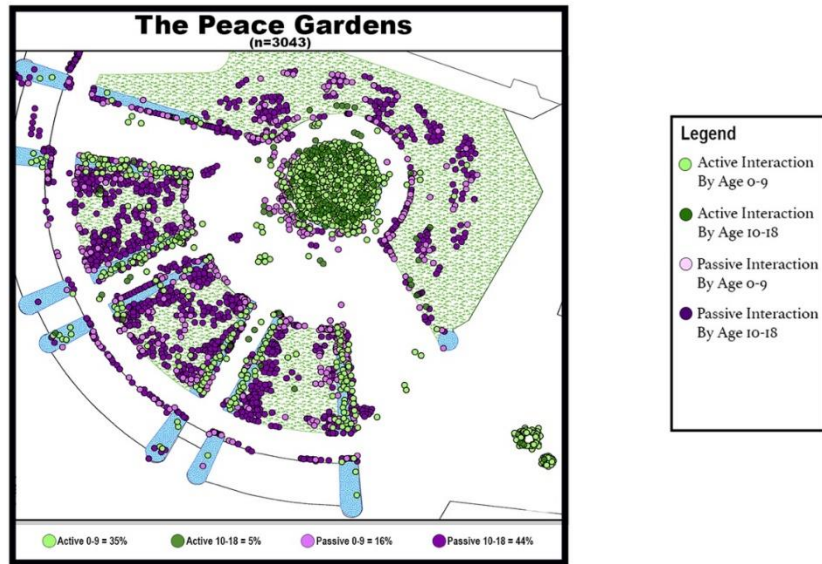


Figure 5: Active and passive play with water by age



		<b><i>Peace Gardens</i></b>		<b><i>Millhouses Park</i></b>		<b><i>Endcliffe Park</i></b>	
		N	%	N	%	N	%
<b>AGE</b>	Age 0-9	1746	<b>51,4</b>	1259	<b>93,1</b>	394	<b>84,4</b>
	Age10-18	1652	<b>48,6</b>	93	<b>6,9</b>	73	<b>15,6</b>
<b>GENDER</b>	Male	1470	<b>43,3</b>	735	<b>54,2</b>	225	<b>48,2</b>
	Female	1925	<b>56,7</b>	622	<b>45,8</b>	242	<b>51,8</b>
<b>ACTIVITY</b>	Active Interaction	964	<b>28,4</b>	1202	<b>88,6</b>	262	<b>56,0</b>
	Passive Interaction	2434	<b>71,6</b>	155	<b>11,4</b>	206	<b>44,0</b>
	Active Age 0-9	852	<b>88,4</b>	1138	<b>94,9</b>	217	<b>82,8</b>
	Active Age 10-18	112	<b>11,6</b>	61	<b>5,1</b>	45	<b>17,2</b>
	Passive Age 0-9	894	<b>36,7</b>	121	<b>79,1</b>	177	<b>86,3</b>
	Passive Age 10-18	1540	<b>63,3</b>	32	<b>20,9</b>	28	<b>13,7</b>

\*Percentages are counted number of dots recorded on the observation mapping figures.

**Table 5: Play with water by age and gender: modes of active and passive play with water, including by age and gender**

### **Discussion**

Our aim has been to understand children’s play with water (Kyttä, 2004) in three urban green spaces and to understand this with respect to constructed and natural water features, differences by age and gender, the mode of play with water, and the affordances actualised by the children. The water features are set within urban green spaces and our findings clearly indicate that the children will go to the urban green space closest to where they live most frequently, agreeing with previous research (Giles-Corti and Donovan, 2002; Roovers, et al., 2002) and that the most frequent mode of getting to these local spaces was walking. We have also identified that less frequent visits are made to the urban green spaces further from where the children live and that these are more likely to be made by car.

Once within the urban green spaces the children undertook a series of activities and play with water was the second and third most frequently reported activities in the urban parks, agreeing with previous research that identified water as one of children’s five favourite

elements of childhood play in an outdoor environment (Brunelle et al., 2016). From our research, the self-reporting of activities classed as play with water, together with analysis of the mapped observations of play with water lead us to conclude that the constructed water features are a greater attraction to children than the natural water features. This may be because the children perceived the constructed water features to be more fun and exciting, compared to natural water features which were perceived to be cold, polluted and dirty, even if they are not. We believe this is the first published recording of the difference in the attraction between constructed and natural water features for children's play with water.

Differences in children's experiences of cities, especially mobility in the city, and use of city centres, has previously been identified to be influenced by both age and gender (Woolley et al. 1999; Shaw, et al., 2015). These two factors were identified in our research as influencing children's play with water because in all three urban green spaces younger children were observed playing more with water than older children, especially in the neighbourhood parks. In addition, most research about children and cities identifies that males have more freedom than females so it is interesting to note that females were observed to participate in play with water more than males in one park and the civic urban green space.

Previous research has suggested that water affords opportunities for swimming and fishing (Kyttä, 2004), together with activities such as mixing and splashing (Lerstrup and Refshuage, 2016) but produced no classification of different types of play with water. Our research has added to this limited published knowledge by identifying that play with water can take two modes, active and passive, and that a wide range of different activities can take place within each of these two modes. Some of the activities within both modes are the same, or very similar, across the three urban green spaces. Similar active play with water includes playing in the water/water park and playing on the stepping stones while differences in active play with water includes throwing stones, playing 'Pooh sticks', fishing and an annual duck race (of plastic ducks). The passive mode also includes similar activities across the three urban green spaces include watching the water while different passive activities include sitting on the grass, picnicking around the water and chatting with friends.

Younger children were more likely to be involved in both active and passive play with water except in the Peace Gardens where more older children engaged in active water play. We consider that this may be because of one of three reasons: the location in the city centre; the specific design of the multiple jets of the constructed water feature, the fountain; the design of the entire space. Another key is that females were more attracted to active water play than males in two of the urban green spaces, which should be capitalised on because of previous findings that water can increase active recreation of girls (Hume et al., n.d.).

In addition to these differences by age and gender, the similarities and differences in activities in both active and passive forms of play with water across the three urban green spaces are suggested as being a result of the different designs and elements within both the constructed and natural water features and the perceived and actualised affordances of each child.

#### *Affordances of playing with water*

From our findings it is clear that where water exists in urban green spaces then children will play with it. Where the water feature was constructed for the specific purpose of children's

play, the children used the water feature for that purpose, as in Millhouses Park. However, where the water feature was constructed but not for the purpose of play the children found affordance and actualised a wide range of activities, as in the Peace Gardens, (Kytta, 2002). The natural water features, rivers in both parks, were not designed for play and here too, the children actualised their perceived affordances of play with water.

The water features studied were set in both neighbourhood and civic urban green spaces and this may not be important for the overall perception and actualisation of affordances of children's play with water but could be explored in future research. It also appears that the factors of age and gender also influence children's play with water. However, our discussion leads us to conclude that three other dimensions influence children's play with water in urban green spaces: the type of water feature being constructed or natural; the intention of the designer to support children's play or not; and the children's perceived and actualised affordances of the water features. Informed by these three dimensions we suggest different types of water features. First, *intentionally constructed water features* where children can and will play with water in constructed features which have been specifically designed for this purpose. In our findings this includes the water park and the boating lake, both in Millhouses Park. Second, *affording natural water features* where children will play with water features that are natural but where the intention was not that children would play with water. In our findings this included the (small) river and brook in both the parks where children perceived and realised the affordances of play with water in the form of paddling and playing with the stepping stones. Third, *affording constructed water features* where water features are constructed with no original intention that children would play with water. In our findings this is highlighted by the perceived and actualised affordances of play with the fountain jets and channels in the Peace Gardens.

## **Conclusion**

In understanding something of children's play with water in urban green spaces we have confirmed that children will more frequently use the urban green space closest to where they live and that this frequency of visits is supported by walking to those spaces. Less frequent visits were made to more distant urban green spaces and the mode of travel to these was more likely to be by car. So it is important for the ongoing planning of cities to ensure that new developments where children will live should have urban green spaces close to them. The provision of water features within such urban green spaces provides opportunities for children to play with water in both active and passive modes. The most active play with water took place in constructed water features, whether they were designed for children's play or not, and where these were not designed for children's play children perceived and actualised the affordance for play with water. Thus the inclusion of constructed water features in urban green spaces should be considered because of the opportunities they provide for active play with water, especially for younger children and females. Natural water features can also be provided, or capitalised on if they exist on a site to be developed, because of the play with water they support although, the perceptions of these features being less positive than constructed features may need to be addressed to encourage more active play with water. Active play with water, in particular should be encouraged by planners, designers and managers of urban green spaces in cities because of the contribution this might make to ameliorate the ongoing concerns about children's inactivity and increasing obesity, especially for younger children and females.

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