



AN EXPLORATION OF THE UNDERLYING REASONS OF PRESCHOOL CHILDREN'S BIOPHILIC TENDENCIES

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Abstract:

This current study explores 48-60-month-old preschool children's biophilic tendencies by explaining their reasons. The sample of the study consisted of 116 preschool children selected from four public preschools located in Mersin, Turkey. Children's Biophilia Measure exploring young children's levels of affinity toward nature was used as a data collecting material. The findings revealed that the frequencies of young children's biophilic tendencies were much more than their non-biophilic tendencies. The effect of culture, including parental allowance and restriction, was the most striking factor influencing children's biophilic or non-biophilic tendencies. The other factors affecting children's tendencies were affordances of the natural outdoor settings for children's play, safety hazards outdoors, having fun/feeling enjoyment during nature play, attractiveness/unattractiveness of a natural stimuli, curiosity, and previous experiences in natural environment. The finding of this research suggested that there is a need for accessible natural settings to ensure young children's regular and direct interactions with nature; which in turn, strengthen their affinity toward nature.

Keywords: biophilia, biophilic tendency, affinity toward nature, young children, early childhood education

1. Introduction

Biophilia, as a term, was originally introduced by Erich Fromm (1964), who is a philosopher and psychologist, but it gained popularity via a book, namely *Biophilia*, written by Edward O. Wilson (1984, p.1). In his book Wilson defined biophilia as "*the innate tendency to focus on life and lifelike processes.*" Individuals' positive orientation to affiliate with life and life-like processes. Also, he explained the adaptiveness of biophilic tendencies through evolutionary perspective and emphasize the emotional response to

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living organisms/elements to survive. Kellert and Wilson (1993) wrote a book, which name is *The Biophilia Hypothesis* and broadened the concept of biophilia. This book influences many other researchers studying in different fields, such as psychology and environmental ethics (Kahn, 1997; Kellert, 1993). In particular, studies in the field of psychology have provided an understanding that nature has psychological effects such as feelings of well-being and happiness as well as physical benefits for people. While Ulrich (1993) relates biophilia only to positive emotional attachment, Wilson (1993) mentions that the biophilia is changeable and may refer both positive and negative feelings. It may refer attraction, awe and peacefulness, but it also may refer aversion, indifference and anxiety (Kellert, 1993; Wilson, 1993). The acceptance that the biophilia can be triggered by learning (Joye & De Block, 2011) may have enabled this concept to be the subject of educational research.

Education researchers have begun to investigate the development and strengthening of biophilia in children beginning from the first years of their lives because there is evidence that biophilia is seen in children who are two years old (Moore & Marcus, 2008). Children in early childhood period, especially between the ages of 3 and 7, have an innate curiosity, sympathy, and tendency to be close with nature, including animals (Desouza & Czemiak, 2002; Sobel, 1996). However, the important point here is that the children's natural tendency to affiliate with nature, that is, the desire to be close to various forms of the wild, can be supported by providing appropriate environments.

Providing appropriate and qualified environments for promoting children's biophilic tendencies has revealed the importance of understanding children's outdoor setting/landscape preferences. Some of the academic research advocating the biophilia hypothesis has revealed that individuals prefer natural areas more than maintained ones (Lindemann-Matthies, Junge, & Matthies, & 2010; Nedovic & Morrissey, 2013). For instance, researchers investigating children's preferences for outdoor play settings found that even children having unstructured free play experiences in the environments with low rate of natural elements, preferred natural settings rather than maintained ones (Coley, Sullivan, & Kuo, 1997; Faber-Taylor et al., 1998). In fact, Kun, Bacaicoa and Sullivan (1998) stated that children and parents who prefer to spend time in natural areas and play games feel safe in these environments. On the other hand, some other researcher found that maintained settings may also be attractive for children to prefer playing (Grahn, 1991; Yilmaz, 2017). These results might be an indicator for the development of children's inherent biophilic tendencies in the environments that are natural or maintained settings. These results also underline the importance of affordances of the environment and previous experiences.

Unfortunately, children in contemporary world spend most of their time either structured after school activities taking place indoors or still and passive activities across the screen (Faber-Taylor, & Kuo, 2006; Gray, 2011; Kemple, Oh, Kenney, & Smith-Bonahue, 2016; Louv, 2005;). Pergam and Zaradic (2006) argue that in today's world, where technology prevents children from spending time in nature, the biophilic tendencies triggered by the discovery of natural world have been replaced by the videophile, which has emerged with the attractiveness of electronic media tools.

Urbanization due to rapid population growth is another factor, which negatively affect children's affinity toward nature (Faber-Taylor, & Kuo, 2006). As a result of urbanization, green areas where children can interact with nature have become mostly maintained areas with low biodiversity (Turner, Nakamura, & Dinetti, 2004). Several authors (i.e., Lopes, Cordovil, & Neto, 2014; O'Brien, Jones, Sloan, & Rustin, 2000; Tranter, 2015) indicated that these areas also limit children's free play opportunities. In addition, since urbanization and rapid population growth are intertwined, the use of vehicles has become a major obstacle to walking, in other words individuals' being in physically active (Carver, Timperio, & Crawford, 2008). The widespread use of the vehicle has caused the traffic problem. According to Timperio, Crawford, Telford, and Salmon (2004), with the increase in traffic, the streets have become socially and physically insecure environments for playing and parents' anxieties about their children's free play outdoors have increased. Parental anxieties related to crime and security factors can be considered among the main reasons why children grow up detached from nature (Brockman, Jago, & Fox, 2011; Sandseter, Cordovil, Hagen, & Lopes, 2020; Skar, Wold, Gundersen, & O'Brien, 2016).

Many researchers state that cultural influences are other factors that take children away from their biophilic tendencies (i.e. Bekoff & Goodall, 2007; Fattorini et al., 2017; Hand et al., 2017, Kahn, 1997; Ulrich, 1993). Hand et al (2017) asked children whether they would prefer to be in the areas they rank on three levels in terms of biodiversity, and found that children selected to be in poor quality gardens, which may not confirm the biophilia hypothesis, but may be explained by culture. These researchers stated that parents warned their children not to move away from home, limited their access to wildlife and encouraged them to play in their front and backyards (Hand et al., 2017). From another perspective, Fattorini et al. (2017) stated that children's preferences to choose green areas having less biodiversity (i.e. backyards) have been perceived safer than natural areas and this perception can be explained by culture they live in.

Blunting children's biophilic tendencies until the point of detaching children from nature with the effect of various factors may result in some undesirable consequences both in childhood and adulthood. For example, it is known that children who grow up without adequate and appropriate interaction with the natural environment cannot develop their skills to recognize ordinary plants or animals they see in their environment (Balmford, Clegg, Coulson, & Taylor, 2002; Beatley, 2011; Pyle, 1993; Pyle & Orr, 2008; Samborski, 2010). It is also stated that children who spend limited time in nature can develop emotions such as avoidance or fear of nature (Bixler et al., 1994; Bixler & Floyd, 1997; Kellert & Wilson, 1995). According to Strife and Downey (2009), since children who live in urban cities do have limited access to nature may either be indifferent to nature or develop a sense of fear of nature (Strife & Downey, 2009). Supporting this Dutcher, Finley, Luloff, and Johnson (2007) indicated that lack of support of children's biophilic tendencies may lead to develop avoidance or disgust from nature and natural elements/living organisms. This will in turn, cause children to grow disconnected from nature and prevent them from using the infinite resources of nature in their development and learning processes.

The loss or disconnection of the bond with the natural environment can have negative consequences on not only children's learning and development, but also on their physical and mental health. Increasing obesity rate associated with immobility with the reduction of green areas (Wolch et al., 2011) and the disappearance of problem solving and risk assessment abilities (Kuo & Faber-Taylor, 2004) are stated as two important and serious consequences that threaten children's health. The loss of connection with nature or decreasing the interaction with nature has negative effects on the health of the world as well. According to Miller (2005), it cannot be mentioned that a generation that has been detached from nature has the motivation to protect it. In addition, the insufficient experience of nature in early childhood is one of the factors that threaten the sense of attachment to nature throughout life (Wells & Lekies, 2006).

According to many researchers, factors such as living in a clean environment, accessible natural areas and parks where children can interact with wildlife, some elements of nature (i.e., trees, water and animals) are important for children to reconnect with the natural world (Chawla, 1994; Derr, 2006; Yilmaz, 2017). At this point, strengthening the inherent biophilic tendencies of children will both protect them from the aforementioned negative consequences of detached from the nature, and also support their development, learning and health. In addition, supporting children's emotional affinity toward nature is important for the health of the world. One of the most effective ways of strengthening children's bond with nature is providing them regular nature experiences where they can have an interaction with the natural world.

In the light of aforementioned information, this research aims to investigate children's biophilic tendencies with their explanations for the reasons of their tendencies. The following research questions are determined to reach this aim:

- 1) What are the preschool children's biophilic tendencies?
- 2) What are the reasons for preschool children's biophilic tendencies?

2. Method

2.1 Research design

The current research utilized qualitative methodology and the research design was basic qualitative. Qualitative research provides to gain insights about people's perceptions and experiences (Bogdan & Biklen, 2007; Creswell, 2017). In addition, Merriam (2002) asserted that a qualitative research helps researchers to understand that meaning is socially constructed by individuals by the interaction with their surroundings. The main focus of a basic qualitative research is to understand and interpret this meaning (a phenomenon/a viewpoint/ a perception) (Merriam, 1998; 2002). Therefore, a basic qualitative research design was appropriate because the researcher attempts to elicit preschool children's in-depth understanding about the reasons of their biophilic or non-biophilic tendencies.

2.2 Participants

Convenience sampling method was used to determine the participants of the current study. As suggested by Creswell (2012) this method can be used when the individuals

are readily available and willing to participate in the study. The participants were comprised of a total of 116 preschool children whose age ranges from 48 to 60 months. These children enrolled in four different public early child care centers located in Mersin, Turkey. With regard to the demographic information of the participating children, 60 of the children were male (52%), whereas 56 of them were female (48%).

2.3 Data collecting instrument

As a data collecting instrument, the researcher used Children's Biophilia Measure. This instrument was originally developed by Rice and Torquati (2013) and contained 11 biophilic and 11 non-biophilic items. With regard to the reliability of the original measure, the Cronbach's alpha coefficient was .63, which is accepted as adequately reliable. The instrument was adopted into Turkish by Yilmaz (2017) by using two-way translation method. Firstly, the items were translated into Turkish; then they were re-translated into English by three experts from early childhood education field. The experts also realized the cultural adaptation of the items and agreed on a revision in one item, which is more appropriate in Turkish context. The adopted version of the interview was also adequately reliable value of Cronbach's alpha coefficient ($\alpha = .68$). The validity of the adapted version of the instrument was confirmed by several authors (Yilmaz, 2017; Yilmaz & Olgan, 2017).

Figure 1: Example illustrations for biophilic and non-biophilic items (Yilmaz, 2017)



Non-biophilic item



Biophilic item



Non-biophilic item



Biophilic item

The researcher aimed to understand young children's biophilic tendencies; in other words, to what degree they feel emotional affinity toward nature by using this measure. In fact, the measure included interview items, which investigate children's preferences for being indoors/outdoors, the enjoyment of sensorial aspects of nature, curiosity about nature, and interaction with nature. For example, the illustrations representing the items: "This boy/girl likes to splash in puddles" (on the right side) and "This boy/girl does not like to splash in puddles" (on the left side) can be seen in Figure 1. All the implementation process took twelve days, including 116 individual meetings, or approximately 39 hours in total.

2.4 Data collecting procedure

Data were collected by the researcher in the spring semester of 2018-2019 academic year after getting necessary ethical permissions from both Mersin University Ethical Commission and Ministry of National Education in Mersin. These formal permissions were used to work with young children during the contact with the early childhood education managers of centers, teachers, and parents.

During the data gathering process, the researcher read the items one by one to each participant in a quiet room of their early child care centers. Each item was accompanied by two pictures describing the related item. One of those pictures depicted the biophilic attitude toward nature, whereas the other one depicted the non-biophilic attitude. To illustrate, "This boy/girl likes to play with sticks, leaves, and pine cones, leaves, and tree brunches" (biophilic), or "This boy/girl does not like to play with sticks, leaves, and pine cones" (non-biophilic). The gender of each child in the pictures was matched to the gender of the each of the participating child. After each item was read and the two pictures for each item were shown, the researcher asked each child the following question: "Which boy/girl is more like you?" by expecting to get their explanations why they selected a particular picture. The participants responses were recorded and audiotaped for later analysis.

2.5 Data analysis procedure

The participating children's biophilic and non-biophilic responses were calculated by using descriptive statistics. The frequency distributions and percentages were given in Table 1. On the other hand, with regard to the qualitative data, the data analysis process started with the transcriptions of interview audio-records, in which children indicated their selections for the specific pictures and explained their reasons for their selections. In order to increase the reliability of the data, transcribed data were analyzed by two experts from the field of early childhood education independently (Creswell, 2007). After the author of the current research coded the data, another expert from the field of early childhood education did recoding. The two independent coders concentrated on to identify some common words, phrases, and sentences to form the participating children's reports for their biophilic tendencies. Both of the experts, then, compared their codes by expecting a full consensus (Creswell, 2007). As a result, since both coded line segments and codes, which were created by the experts were similar, a full consensus was achieved.

3. Findings

The findings of the study include the responses of the participants' answers to each of the measurement item in terms of frequency and percentage. Also, one-to-one explanations about the reasons of the tendencies of the participants are included for each item of the measurement.

Table 1: The total frequencies of children's biophilic and non-biophilic tendencies in terms of each interview item

Interview items	Children's biophilic tendencies (f)	Children's non-biophilic tendencies (f)
Playing inside or playing outside	73	43
Digging for worms	56	60
Splashing in puddles	48	68
Watching birds outdoors	107	9
Playing near creeks and lakes	89	27
Watching cats/dogs outdoors and playing with them	106	10
Playing with natural materials (i.e., sticks, leaves, and pinecones) outdoors	96	20
Listening birds' singing outdoors	100	16
Catching bugs and looking at them	79	37
Looking at the sky at night	94	22
Learning about wild animals	95	21

3.1 Children's tendencies for playing outdoors/indoor

When the participating children were asked whether they would play indoors or outdoors, more than half of the children (73 out of 116) indicated that they would play outdoors (see Table 1). While explaining their reasons why they would play outdoors, all of the participating children emphasized the number of play opportunities outdoors based on the physical characteristics of the outdoor environment (n=73). 63 out of these 73 children were concentrated on various play occasions in outdoor environments, such as cycling, running, playing with a ball, and picnicking, 10 of them mentioned about the affordances for nature play outdoors such as climbing trees, playing with stones and playing on the grass. Children also indicated that they would have a chance to play with their friends outdoors (n=13). Some of the children (n=9) also unfolded they would like to play outdoors because the weather was clean and cool. While expressing their reasons for playing outdoors, a few of the children (n=6) also mentioned their mothers' allowance for them to play outdoors.

On the other hand, 43 out of 116 children stated that they would play indoors (see Table 1). Children's reasons for playing indoors were related to parental restriction (n=15), children's concerns about safety hazards, including both social (n=9) and physical (n=6) dangers outdoors, bad weather conditions (n=9), and playing with family members at home (n=5).

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 2. The reason why the total frequencies of children's biophilic and non-biophilic are higher than the number of children who answered these two items can be explained that each child's report may include more than one reason.

Table 2: Children's reasons for playing outdoors/indoors

The reasons for biophilic tendencies	Frequency (f)
Affordances of for play outdoors	73
Socialization with friends	13
Weather related issues	9
Parental allowance	6
The reasons for non-biophilic tendencies	
Parental restriction	15
Safety hazards	15
Weather related issues	9
Socialization with family members	5

Children's biophilic and non-biophilic tendencies for both situations had some shared points: parental allowance/restriction, weather related issues, and socialization.

Some of the statements that children explain either their biophilic and non-biophilic tendencies are as follows:

"I can ride my bike comfortably outside." (P₄, biophilic)

"I love playing with my friends outdoors, I'm bored at home alone." (P₂₂, biophilic)

"My mother never gets angry when I play with a ball outside, but when I play at home, she gets angry if I break things." (P₁₀, biophilic)

"If I play outside, someone might kidnap me or steal my toys." (P₄₃, non-biophilic)

"I don't want to play outside because I feel cold and get sick if I do. My mother gets angry if I get sick." (P₅₁, non-biophilic)

3.2 Children's tendencies for digging for worms

When the participating children were asked whether they would dig the soil for getting worms, almost half of the them (56 out of 116) expressed that they would dig for worms (see Table 1).

While explaining their reasons why they would dig the earth, children mostly asserted that they would not be hurt by worms since they are harmless creatures (35 out of 56). Some of them (14 out of 56) indicated that they would find the worms and care for them since they believed that worms are vulnerable creatures. Some of these 56 children (n=14) stated that it would be fun digging for worms and playing with them. While

explaining their reasons, some of these 56 children emphasized their lack of experience for digging and getting worms due to the inconvenient places to explore (n=7). 6 out of 56 children were also verified that their parents would allow them to dig the soil and play with worms. Only 5 out of 56 children's expressions included the physical appearance/physical attractiveness of the worms. In fact, these children reported that worms are cute, little, and tiny creatures. 3 out of 56 children revealed that they would like to explore worms and look at them closely. 3 out of 56 children related digging for worms to the other creatures belonging to nature. In essence, 1 out of these 3 children asserted that they would dig for worms to save the ants because worms eat ants. Moreover, 2 out of these 3 children would dig for worms to feed the birds. Lastly, very few of the children (n=2) reported that they would dig for worms since they model their parents.

On the other hand, more than half of the children (60 out of 116) voiced that they would not dig for worms (see Table 1). All of these 60 children phrased their fear of worms because of the possible action to get physically hurt by them. 19 out of 60 children expressed that worms are dirty, and they may get dirt on their hands and clothes by them. 10 out of 60 children said that worms are disgusting, and they would not dig for them. These 10 children implied the physical appearance of the worms as disgusting. Some of the children (n=7) disclosed about parental restriction as their reasons. Some of them (n=5) also reported that their parents do not dig for worms, so they model them. 4 out of 60 children mentioned about lack of worms and soil close to their home.

All of the coding related to children's biophilic or non-biophilic tendencies for this item together with the calculated frequencies can be seen in Table 3.

Table 3: The reasons of children's tendencies for digging the soil to get worms

The reasons for biophilic tendencies	Frequency (f)
No possibility of getting physical injuries	35
Instinct to save and care for living things/love of nature	14
Opportunities for children to have fun	14
Inconvenient places to explore	7
Parental allowance	6
Physical appearance/Physical attractiveness (cute, little, tiny etc.)	5
Curiosity to discover and investigate	3
Interconnectedness of living things	3
Modeling parents	2
The reasons for non-biophilic tendencies	
Avoidance of getting physical injuries	60
Dislike to get dirty	19
Physical appearance/ Physical unattractiveness (disgusting etc.)	10
Parental restriction	7
Modeling parents	5
Inconvenient places to explore	4

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Possibility of getting physical injuries/ avoidance of getting physical

injuries, physical attractiveness/ unattractiveness, parental allowance/restriction, and modeling parents.

Some of the quotations of children's explanations for either their biophilic and non-biophilic tendencies are as follows:

"I get worms out of the ground and play with them because worms don't hurt me." (P₃₂, biophilic)

"I would like to dig the earth and find worms, but there are no earth and worms in our garden." (P₇, biophilic)

"I don't dig the ground. if the worm comes out, it bites my hand and hurts" (P₁₉, non-biophilic).

"I don't dig the earth and get a worm because I get dirty." (P₂₃, non-biophilic)

3.3 Children's tendencies for splashing in puddles

When the participating children were asked whether they would splash in puddles or not, 48 out of 116 children reported that they would splash in puddles (see Table 1).

While explaining their reasons why they would splash in puddles, children mostly asserted that they would have fun (n=28). 23 out of these 48 children indicated that they love mud and enjoy it by splashing and getting wet and dirty. Also, some of the children (n=20) reported that their parents would allow them to splash in puddles. The other reasons why children would love splashing in puddles with the calculated frequencies can be seen in Table 4.

On the other hand, most of the children (68 out of 116) stated that they would not splash in puddles (see Table 1). 61 out of 68 children reported their most frequent reason why they would not splash in puddles as the possibility of getting dirt on their hands and their clothes (Table 4). Most of these 68 children (n=55) also explained their unwillingness to splash in puddles with parental restrictions. Very few of also listed their reasons as unlike to be wet (n=2) and teacher restriction (n=1).

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 4.

Table 4: The reasons of children's tendencies for splashing in puddles

The reasons for biophilic tendencies	Frequency (f)
Opportunities for children to have fun	28
Loving mud and like to get wet and dirty	23
Parental allowance	20
Lack of experience	3
Modeling parents	2
No possibility of getting physical injuries	1
The reasons for non-biophilic tendencies	
Dislike to get wet and dirty	63

Parental restriction	55
Teacher restriction	1

Children’s biophilic and non-biophilic tendencies for both situations included some common focuses: Like/dislike to get wet and dirty, and parental allowance/restriction.

Some of children’s quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

“Jumping in muddy water is fun, I love playing in mud.” (P₁₀₁, biophilic)

“My mother is not angry with my jumping in muddy water, and I always jump and play” (P₅₅, biophilic).

“My new clothes get dirty if I play in the mud, I don’t want them to get dirty. My mom also says that I have just washed your clothes.” (P₃₃, non-biophilic)

3.4 Children’s tendencies for watching birds

When the participating children were asked whether they would watch birds outdoors, most of them (107 out of 116) had biophilic tendencies (see Table 1).

While reasoning their arguments, children mostly condensed on the physical attractiveness of the birds (n=46), the attractiveness of sounds in nature (n=30), curious about how they fly (n=30), fun activity (n=25), previous experience of watching birds (n=24), and instinct to protect and care for birds. Other reasons why children would love watching birds with the calculated frequencies can be seen in Table 5.

Then again, very few of the children (n=9) stated that they would not watch birds outdoors (see Table 1) because of its being boring activity (n=10) and disgusting voice of the birds (n=5).

All of the coding related to children’s biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 5.

Table 5: The reasons of children’s tendencies for watching birds

The reasons for biophilic tendencies	Frequency (f)
Physical appearance/ Physical attractiveness	46
Attractiveness of sounds in nature	30
Curiosity to discover and investigate	30
Opportunity for children to have fun	25
Previous experience	24
Instinct to save and care for animals	24
No possibility of getting physical injuries	10
Parental allowance	7
The reasons for non-biophilic tendencies	
Lack of opportunity for children to have fun	10
Dislike of the sounds in nature (disgusting etc.)	5

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Opportunity/ lack of opportunity for children to have fun and attractiveness/dislike of sounds in nature.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"I like watching birds because its' feathers are colorful and shiny." (P₁₁₅, biophilic).

"I listen to beautiful songs of birds. It is like a music." (P₁₀₅, biophilic)

"Playing with my friends is more fun than watching birds." (P₄, non-biophilic).

"I can never sleep from birds' singing." (P₁₀₀, non-biophilic)

3.5 Children's tendencies for playing near creeks and lakes

When the participating children were asked whether they would play near creeks and lakes, 89 out of 116 children had biophilic tendencies (see Table 1).

While explaining their reasons, children mostly focused on affordances of play near water areas (n=53). 45 out of these 89 children mentioned playing near water as a fun activity. The other reasons why children would love splashing in puddles with the calculated frequencies can be seen in Table 6.

On the other hand, 27 out of 116 children stated that they would not play near creeks and lakes. All of these 27 children reported their most frequent reason why they would not play near water as possible parental restriction. 11 out of 27 children explained their unwillingness to play near creeks and lakes because they do not like to get wet and dirty.

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 6.

Table 6: The reasons of children's tendencies for playing near creeks and lakes

The reasons for biophilic tendencies	Frequency (f)
Affordance for play	53
Opportunity for children to have fun	45
Like to get wet and dirty	13
Lack of experience	7
Modeling parents	3
The reasons for non-biophilic tendencies	
Parental restriction	27
Dislike to get wet and dirty	14
Avoidance of getting physical injuries	4

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Like/dislike to get wet.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"It's very fun to put my hands and feet into the water." (P₃, biophilic)

"I float my toys in the water and I love watching it when the trail appears in the water." (P₆₇, biophilic)

"I fall into the water, get wet, I feel uncomfortable and my clothes get dirty." (P₃₄, non-biophilic)

"If I play by the water, I get wet, I get sick and my mother gets angry." (P₃₃, non-biophilic)

3.6 Children's tendencies for watching and playing with cats/dogs outdoors

When the participating children were asked whether they would watch and play with cats/dogs outdoors, almost all of them (106 out of 116) showed biophilic tendencies (see Table 1).

While explaining their reasons, 96 out of these 106 children mostly concentrated on it's a fun activity. 39 out of these 106 children indicated that they would feed or give water to cats and dogs. In other words, they would love and care for those animals. Also, 36 out of these 106 children explained their biophilic tendencies based on the physical appearance, in fact, the physical attractiveness of the cats and dogs. The other reasons why children would watch and play with cats/dogs with the calculated frequencies can be seen in Table 7.

On the other hand, only 10 children stated that they would not watch and play with cats/dogs outdoors (see Table 1). Almost all of these children's (9 out of 10) reasons were related to the parental restriction and the possibility of getting physical harm by those animals outdoors (n=8).

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 7.

Table 7: The reasons of children's tendencies for watching and playing with cats/dogs outdoors

The reasons for biophilic tendencies	Frequency (f)
Opportunity for children to have fun	96
Instinct to save and care for animals	39
Physical appearance/physical attractiveness	36
No possibility of getting physical injuries	15
Like to have sensory experiences with animals (to hug, to touch etc.)	8
Parental allowance	5
The reasons for non-biophilic tendencies	
Parental restriction	9
Avoidance of getting physical injuries	8
Previous experience	2

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Parental allowance/ restriction, possibility of getting physical injuries/ avoidance of getting physical injuries.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"Playing with cats and dogs is great fun. I throw the ball to the dog; it runs and brings it. I extend the rope to the cat doing funny movements." (P₁₀₁, biophilic)

"They are very sweet; they are beautiful and their hairs are soft. I want to cuddle." (P₆₇, biophilic)

"I want to take cats and dogs on my lap, but I can't take them because my mom and dad are getting angry with me." (P₁₉, non-biophilic)

"If I approach cats can chew me, dogs can also bite. If the dog bites, I'll be rabies." (P₃₃, non-biophilic)

3.7 Children's tendencies for playing with natural materials

When the participating children were asked whether they would play with natural materials, such as sticks, leaves and pine cones, 96 out of 116 children showed biophilic tendencies (see Table 1).

While explaining their reasons, almost all of these 96 children (n=91) focused on affordances of play opportunities, and focused on to use such natural materials different from their real purposes. In fact, children indicated they would play with those natural materials. Also, 13 out of these 91 children indicated that their parents would not restrict their play with such natural materials.

On the other hand, a few of children (n=20) reported that they would not play with sticks, leaves, and pine cones (see Table 1). More than half of these 20 children (n=15) explained their reasons with their parents' restrictions to their play with such materials. Some children (9 out of 20 children) focused on the possibility of getting physical harm by those natural materials, whereas 6 out of 20 of them mentioned about the possibility of getting dirty by playing with them.

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 8.

Table 8: The reasons of children's tendencies for playing with natural materials

The reasons for biophilic tendencies	Frequency (f)
Affordances for play	91
Parental allowance	13
Physical attractiveness	3
The reasons for non-biophilic tendencies	
Parental restriction	15
Avoidance of getting physical injuries	9
Dislike to get dirty	6

Children’s biophilic and non-biophilic tendencies for both situations included some common focuses: Parental allowance/ restriction.

Some of children’s quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

“I like playing with pine cones. I make them wheels and build cars and play with them (P7, biophilic)

“I like playing with pine cones, tree branches and leaves, my mom never gets angry.” (P17, biophilic)

“I can’t play with pine cones and leaves because my mom and dad won’t let me play, they say do not touch them.” (P98, non-biophilic)

“An insect may come out of the pine cones and bite my hand. There may be a spider on a tree branch, and it poisons my hand.” (P103, non-biophilic)

3.8 Children’s tendencies for listening birds’ singing outdoors

When the participating children were asked whether they would listen to birds’ singing outdoors, most of the children (100 out of 116) had biophilic tendency (see Table 1).

The most frequent reason reported by children (n=86) was related to the beauty of the singing of the birds. The other reasons explaining children’s biophilic tendencies with the calculated frequencies can be seen in Table 9.

On the other hand, some of the children (22 out of 116) stated that they would not listen birds’ singing. All of these 22 children expressed their non-biophilic tendencies with the annoying voice of the birds.

All of the coding related to children’s biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 9.

Table 9: The reasons of children’s tendencies for listening birds’ singing outdoors

The reasons for biophilic tendencies	Frequency (f)
Attractiveness of sounds in nature	86
Physical appearance/ physical attractiveness	19
Instinct to save and care for animals	12
Modeling parents	5
Parental allowance	5
No possibility of getting physical injuries	4
Lack of experience	2
The reasons for non-biophilic tendencies	
Dislike of sounds in nature (disgusting etc.)	22

Children’s biophilic and non-biophilic tendencies for both situations included some common focuses: Attractiveness/dislike of sounds in nature.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"The colors and sounds of the birds are beautiful; I watch them and listen their singing." (P₈₉, biophilic)

"I take the bait in my hand, feed them, and give water if they are thirsty." (P₈₆, biophilic)

"They sound loudly, their singing hurts my head." (P₁₉, non-biophilic)

3.9 Children's tendencies for catching bugs and looking at them

When the participating children were asked whether they would catch bugs and look at them, most of them (79 out of 116) had biophilic tendencies (see Table 1). In essence, all of these 79 children indicated that there is no risk for getting physical harm by bugs. Also, some of the children focused on the physical attractiveness of the bugs (mostly butterflies and ladybugs). The other reasons why children would catch and look at the bugs with the calculated frequencies can be seen in Table 10.

On the other hand, some of the children (37 out of 116) showed non-biophilic tendencies (see Table 1). All of these 37 children explained their reasons with the possibility of getting physical harm by bugs (mostly bees and spiders).

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 10.

Table 10: The reasons of children's tendencies for catching bugs and looking at them

The reasons for biophilic tendencies	Frequency (f)
No possibility of getting physical injuries	79
Physical appearance/ Physical attractiveness	58
Benefits of bugs	12
Instinct to save and care for living things/love of nature	7
Parental allowance	6
The reasons for non-biophilic tendencies	
Avoidance of getting physical injuries	37
Dislike of sounds in nature (disgusting etc.)	15
Physical appearance/ Physical unattractiveness (disgusting etc.)	14
Previous experience	12
Parental restriction	11

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: No possibility of getting physical injuries/avoidance of getting physical injuries, physical appearance (physical attractiveness/unattractiveness), and parental allowance/ restriction.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"Butterflies have colorful wings, they are beautiful." (P₄₈, biophilic)

"Little bugs don't harm us, they're tiny. I protect the bees too, they give us honey" (P₈, biophilic)

"Bees have a sting and can sting us. Spiders and flies can sting us too, they hurt me, I run away from them." (P₂₃, non-biophilic)

3.10 Children's tendencies for looking at the sky at night

When the participating children were asked whether they would look at the sky at night to watch moon and stars, 94 out of 116 children had biophilic tendencies (see Table 1).

While explaining their reasons why they would look at the sky at night, children mostly indicated that they would be curious about the sky and want to learn about it (n=72). 36 out of 94 children mentioned about the physical attractiveness of stars and moon, and mostly focused on its' brightness. Other reasons why children would look at the sky with the calculated frequencies can be seen in Table 11.

On the other hand, 22 out of 116 children indicated that they would not like to look at the sky (see Table 1). 17 out of 22 children explained their such kind of tendency with the parental restriction. 12 out of 22 children also reported that they would play with their toys rather than looking at sky.

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 11.

Table 11: The reasons of children's tendencies for looking at the sky at night

The reasons for biophilic tendencies	Frequency (f)
Curiosity to observe and learn about it	72
Attractiveness of the sky	36
Lack of experience	6
Light source	5
Modeling parents	3
The reasons for non-biophilic tendencies	
Parental restriction	17
Unattractiveness of the sky	12

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Attractiveness of the sky.

Some of children's quotations for their explanations for biophilic and non-biophilic tendencies are as follows:

"The moon and the stars are very bright. I love watching." (P₇, biophilic)

"It's fun to watch the stars slide. I wonder how it slips." (P₂₂, biophilic)

"If I open the window and look at the sky or go out onto the balcony, my mom will get angry, says you will be sick and get in." (P₁₁₃, non-biophilic)

"The sky doesn't interest me. I like playing with my toys instead." (P₉₅, non-biophilic)

3.11 Children's tendencies for learning about wild animals

When the participating children were asked whether they would like to learn about wild animals rather than playing with their toys, 95 out of 116 children had biophilic tendencies (see Table 1).

While explaining their reasons, 74 out of the 95 children indicated that they were curious about wild animals and would like to learn about their lives. Parental allowance was also included in children's reports (n=15). The other reasons why children would like to learn about wild animals with the calculated frequencies can be seen in Table 12.

On the other hand, some of the children (n=21), who would not like to learn about wild animals expressed that it would be more fun to play with their toys rather than learning about wild animals. Moreover, 6 out of 21 children mentioned about their parents' restriction as barrier for them to learn about wild animals on Tv or magazines.

All of the coding related to children's biophilic or non-biophilic tendencies together with the calculated frequencies can be seen in Table 12.

Table 12: The reasons of children's tendencies for learning from wild animals

The reasons for biophilic tendencies	Frequency (f)
Curiosity to learn about it	74
Parental allowance	15
Love of wild animals	8
Lack of wild animals in real life	6
No possibility of getting physical injuries	4
The reasons for non-biophilic tendencies	
Unattractiveness of the wild animals	15
Parental restriction	6

Children's biophilic and non-biophilic tendencies for both situations included some common focuses: Curiosity to learn about it/unattractiveness to learn about it.

Some of the quotations from children's reports are as follows:

"I want to learn how lions live and their claws." (P₁₀₁, biophilic)

"I wonder how wild animals hunt and what they eat." (P₉₂, biophilic)

"It is boring to watch wild animals on TV, I play with my toys instead." (P₂₃, non-biophilic)

"If I watch them, my mom and dad get angry with me because I'm young." (P₄₃, non-biophilic)

4. Conclusion, Discussion and Implications

In this part, the key findings of the current study will be discussed. The results of the current research have revealed that the frequencies of young children's biophilic tendencies were more than the non-biophilic ones considering all items of the measurement. There are several related research results, which also emphasize children's high levels on biophilic tendencies early periods in their lives (Deretarla-Gül & Polat, 2018; Yılmaz, 2017; Yılmaz, Çığ, & Yılmaz-Bolat, 2020; Yılmaz & Olgan, 2017). With regard to the reasons of children's biophilic tendencies, the researcher only discusses the key findings of the research considering the frequencies of children's biophilic or non-biophilic responses.

One of the most frequent reason for children's biophilic and non-biophilic tendencies was related to parental allowance and parental restriction. The participating children generally expressed their non-biophilic tendencies with the possibility of their parents (mostly mothers) getting angry with them. In this case, it can be said that parents prevent their children from interacting with animals or natural materials (i.e. mud, water, and tree branch etc.). In this study, the influence of parents was revealed even when participating children explained their biophilic tendencies. At this point, when children explain both of their biophilic and non-biophilic tendencies, their expressions about the way of their parents' reaction (allowance or avoidance), could be the evidence of parental influence; in other words, the impact on culture on their biophilic tendencies. Several researchers (i.e. Moore & Marcus, 2008; Rice & Torquati, 2013; Yılmaz, 2017; Yılmaz & Olgan, 2017) also confirmed the effect of culture on children's affinity toward nature.

Safety hazards were another factor affecting children's biophilic and non-biophilic tendencies. The participating children both mentioned social (i.e., kidnapping) and physical dangers (risk of getting physical injury by animals) in outdoor/natural environments. This result shows that children prefer to feel safe and do activities where there is no risk of physical injury. Parallel to this result, safety hazards including both physical and social dangers in an environment also affected children's preferences for play outdoors. Physical dangers, such as traffic density (Van Andel, 1990), and social dangers, such as kidnapping (Simmons, 1994) can be given as examples for safety hazards. According to Yılmaz (2017), animals and vegetation affects children's preferences for outdoor settings and their possible play opportunities in such environments. In fact, if children feel any safety hazards, that may end with a physical injury, in a natural setting they would not prefer to play in such a setting. This result can also be explained by the effect of culture and lack of experience. Sandseter (2009) emphasized the overprotective supervision of children by their parents affect children's play in natural environment. Moreover, Louv (2005) indicated that perceived danger as well as culture are two factors influencing children's connection with nature. Therefore, in this study, children might be affected by their parents' perceptions about dangers. Supporting this, while explaining biophobia, Ulrich (1993) indicated individuals' aversive reactions, fears or non-biophilic tendencies to natural stimuli, including animals, can be learned unconsciously in the culture, in which they grow up.

With regard to the findings of the current research, the participating children's biophilic tendencies can also be explained through the affordances of natural outdoor settings (such as water, sticks, leaves, and pine cones). Children emphasized that nature offer them to play natural materials and use them other than their real uses. Parallel to this finding, several researchers also found that the affordances of the natural outdoor settings for children's play as an important factor affecting young children's preferences (Fjortoft, 2004; Moore, 1986; Sargisson & McLean, 2012; Tunstall et al., 2004). For instance, Rydberg and Falck (2000) found that nature, which offers manipulative and movable materials (loose parts) for children's unstructured play is preferable play environments for them. In addition, several researchers asserted that loose parts provide children opportunities for social play, free movement and creative play (Fjortoft, 2001; Nedovic & Morrissey, 2013; Zamani, 2016).

This research also revealed that, having fun also affects children's biophilic tendencies. For example, splashing in muddy water, playing with toys near water, and watching birds were fun activities for the participating children. Parallel with the participant children's ideas, many researchers (Müderrisoğlu & Gültekin, 2013; Staempfli, 2009; Yılmaz & Olgan, 2017) found that having fun and feeling of enjoyment are important factors affecting children's play in a natural environment.

The findings of the current research also revealed that the physical characteristics and attractiveness/unattractiveness of nature, (such as birds' singing or butterflies physical characteristics) affected children's biophilic tendencies. Parallel to this finding, several researchers emphasized the importance of aesthetic features and physical attractiveness of the things, which belong to the nature (i.e. Müderrisoğlu & Gültekin, 2013; Norodahl & Einarsdottir, 2015) and relaxing atmosphere (i.e. Yılmaz, 2017; Yılmaz & Olgan, 2017), which may give a sense of calm and peace, for children to play in natural environment.

Lastly, curiosity was another factor, which has an impact on the participating children's biophilic tendencies. Children indicated that they were curious about birds, sky, and wild animals. This finding can be supported by Dymont and O'Connell (2013), who emphasized the stimulating effect of the natural outdoor environments for children's curiosity for discovering.

There may be several implications based on the results of the study. In order to promote children's biophilic tendencies children's interaction with nature should be increased. Many researchers (i.e., Chawla, 2007; Cheng & Monroe, 2012; Kalvaitis & Monhardt, 2015) indicated that children's nature experiences impact children's affinity toward nature. Several researchers also (i.e., Chawla, 1998; Wilson, 1996) highlighted the importance of regular and direct interaction with nature can nurture children's connection with nature and make them to feel comfortable in natural environments. Therefore, children should be provided regular nature experiences, which give them opportunity to engage with natural materials.

In order to provide opportunities for children to engage in nature there should be accessible and appropriate natural environments, where children can visit such places in their local environments (Skar & Krogh, 2009). Also, since children need to feel safe

outdoors, as suggested by Sandseter (2012), natural places where children can play independently can be designed by landscape planners. This may also help parents to understand the value of children's independent play in natural environment and may limit parental restriction to children's outdoor play. Having an interaction with natural materials is important for children's development and learning. Therefore, outdoor environments which have variety of natural materials, such as water, grass, trees and herbs, should be available and accessible to stimulate children's curiosity and willing to investigate the environment. All these efforts will provide children available hands-on activities in natural environments and will contribute to the promotion of their innate affinity towards nature.

5. Limitations and Recommendations

In the current study, preschool children's biophilic and non-biophilic tendencies were examined by interview items, which are included in Children's Biophilia Measurement. Observation of young children in their real play settings could be suggested for further research. Through this way, the researchers can have a chance to compare children's biophilic tendencies based on the visual materials and real-life situations.

Lastly, the cultural impact on children's biophilic or non-biophilic tendencies is clear, as a further research, it can also be suggested to investigate both children's biophilic tendencies and the parents' perceptions of their children's biophilic tendencies in different cultures.

Conflict of Interest

The authors declare that they have no conflict of interest.

About the Author

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