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Investigation of the Relationship Between Biophilia Levels and Problem-solving Skills of 60-72 Month-old Children Attending Preschool Education

Okul Öncesi Eğitime Devam Eden 60-72 Aylık Çocukların Biyofili Seviyeleri ile Problem Çözme Becerileri Arasındaki İlişkinin İncelenmesi

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Abstract. This study aimed to examine the relationship between biophilia levels and problem-solving skills in 60-72-month-old children attending preschool education. This study was conducted using the correlational screening method, which is a general screening model within the quantitative research methodology. In this study, 305 preschool children aged 60-72 months who were selected by convenience sampling and who continued their education in the central district of Yozgat province participated. 'Biophilia Scale for Preschool Children' and "Problem Solving Skills Scale for Children" were used to collect data within the scope of the study. The data collected within the scope of the research were analysed with SPSS 23.0 package programme. As a result of the data analysis, when the problem-solving skills and biophilia levels of 60-72-month-old preschool children participating in the study were examined according to gender, no significant difference was found between genders. However, the relationship between biophilia levels and problem-solving skills was analyzed, and it was found that this relationship was at a very low level, but not significant. This result may indicate that there is no strong causal relationship between biophilia and problem solving, or that these two variables do not explain each other.
Keywords: Biophilia, Problem solving skills, Preschool

Öz. Bu araştırmanın amacı okul öncesi eğitimine devam eden 60-72 aylık çocukların biyofili seviyeleri ile problem çözme becerileri arasındaki ilişkinin incelenmesidir. Yapılan bu çalışmada nicel araştırma metodolojisi içinde yer alan genel tarama modellerinden korelasyonel tarama yöntemi kullanılarak gerçekleştirilmiştir. Araştırmaya, kolayda örnekleme yöntemiyle seçilen ve Yozgat ili Merkez ilçesinde eğitim-öğretime devam eden 60-72 aylık 305 okul öncesi dönem çocuğu katılmıştır. Çalışma kapsamında verilerin toplanmasında "Okul Öncesi Dönem Çocukları İçin Biyofili Ölçeği" ile "Çocuklar İçin Problem Çözme Becerisi Ölçeği" kullanılmıştır. Araştırma kapsamında toplanan veriler SPSS 23.0 paket programı ile çözümlenmiştir. Veri analizi sonucunda, araştırmaya katılan 60-72 aylık okul öncesi dönem çocuklarının cinsiyete göre problem çözme becerileri ile biyofili seviyeleri incelendiğinde, cinsiyetler arasında anlamlı bir farklılık bulunamamıştır. Bununla birlikte biyofili seviyeleri ile problem çözme becerileri arasındaki ilişki incelenmiş ve bu ilişkinin çok düşük düzeyde olduğu ancak bu ilişkinin anlamlı olmadığı bulunmuştur. Bu sonuç, biyofili ve problem çözme arasında güçlü bir nedensel ilişkinin olmadığını veya en azından bu iki değişkenin birbirini açıklamadığını gösterebilir.
Anahtar Kelimeler: Biyofili, Problem çözme becerisi, Okul öncesi

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Genişletilmiş Özet

Giriş. 1980'lerde Edward O. Wilson tarafından tanıtılan biyofili kavramı, insanların doğayla ve diğer canlı türleriyle içsel bir bağ kurma eğilimini ifade eder (Wilson, 1984). Bu kavram, Grinde ve Patil (2009) tarafından bitkilere ve diğer canlılara duyulan sevgi olarak tanımlanmış, Barbiero (2021) ise hayatla duygusal bir bağ olarak ele almıştır. Biyofili hipotezi, insanların doğaya karşı biyolojik bir çekim gücüne sahip olduğunu ve bu etkileşimlerin insanların refahını önemli ölçüde etkilediğini öne sürmektedir (Kals ve diğerleri, 1999). Doğayla kurulan bağlantının bireylerin yaşamları üzerindeki olumlu etkileri, bir dizi araştırma tarafından ortaya konmuştur. Örneğin, Capaldi ve diğerleri (2014), doğaya olan bağlılığın ruh halini, bilişsel işlevleri ve genel sağlığı iyileştirdiğini göstermiştir. Modern toplumlarda ise doğadan kopukluk sıkça görülmekte ve bu kopukluğun, fiziksel ve psikolojik sağlık üzerinde olumsuz etkilere yol açabileceği vurgulanmaktadır (Kesebir ve Kesebir, 2017). Yapılan çalışmalar, doğaya güçlü bir bağlılık gösteren bireylerin, dikkat, hafıza ve problem çözme gibi bilişsel yeteneklerde daha gelişmiş olduklarını göstermiştir (Lumber ve ark., 2017; Barbiero ve diğerleri, 2021). İnsanın doğayla bağlantı kurma yönündeki doğuştan gelen eğilimi olan biyofili, erken çocukluk eğitimi üzerindeki olumlu etkisi nedeniyle de giderek daha fazla tanınmaktadır. Biyofilinin çocuklara ses, bilim ve doğa hakkında bilgi edinme konusunda ilham vererek etraflarındaki dünyaya dair daha derin bir anlayış geliştirmelerini sağladığı bulunmuştur (Kristinsdóttir, 2018). Bu bağlamda, insanın doğa ile olan ve biyofili olarak adlandırılan bu derin bağlılığı, çocukların gelişimlerinin çeşitli yönleriyle ilişkilendirilmekte, özellikle de bilişsel işlevler üzerinde olumlu etkileri olduğu görülmektedir (Preuss et al., 2019; Lanzaro, 2024).

Bilişsel işlevler, bireyin zihninde gerçekleşen dikkat, bellek, algı, akıl yürütme, karar verme ve problem çözme gibi yürütücü işlevlerden oluşur. Yürütücü işlevlerin, okul öncesi dönemdeki bilişsel gelişimde çok önemli bir rol oynadığı ve bu işlevlerin küçük çocukların bilişsel gelişimlerinde merkez olduğu görülmektedir (Blair ve Razza, 2007). Erken yaşta desteklenmesi gereken işlevler arasında yer alan problem çözme becerisi; çocukların karşılaştıkları zorlukları aşabilme yetilerini ifade eder ve yaşamları boyunca başarıları üzerinde belirleyici bir etkiye sahiptir. Okul öncesi dönem çocuklarının problem çözme becerileri, onların gelecekteki başarılarının temelini oluşturur. Çocukların düzenli olarak doğal ortamlarda vakit geçirmelerinin soru sorma, açık uçlu görevleri tamamlama, esnek olma, analiz etme ve problem çözme gibi becerileri göz önüne alındığında; biyofili seviyesinin artmasının, çocukların problem çözme becerilerine etkili olacağı düşünülmektedir (Wojciehowski & Ernst, 2018). Bu nedenle okul öncesi eğitime devam eden çocuklarda biyofili seviyeleri ile problem çözme becerileri arasındaki ilişkinin düzeyi önemli bir araştırma konusu olarak değerlendirilebilir. Bu çalışmanın amacı okul öncesi eğitime devam eden 60-72 aylık çocukların biyofili seviyeleri ile problem çözme becerileri arasındaki ilişkinin incelenmesidir. Bu bağlamda çalışmada biyofili seviyeleri ile problem çözme becerileri ve demografik özellikler (cinsiyet) arasındaki ilişki incelendi ve aynı zamanda biyofili seviyeleri ile problem çözme becerileri arasındaki ilişki ele alındı. Çalışmanın soruları şu şekildedir;

1. Okul öncesi eğitime devam eden 60-72 aylık çocukların biyofili seviyeleri arasında cinsiyete göre anlamlı bir fark var mıdır?
2. Okul öncesi eğitime devam eden 60-72 aylık çocukların problem çözme becerileri arasında cinsiyete göre anlamlı bir fark var mıdır?
3. Okul öncesi eğitime devam eden 60-72 aylık çocukların biyofili seviyeleri ile problem çözme becerileri arasında anlamlı bir ilişki var mıdır?

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4. Okul öncesi eğitime devam eden 60-72 aylık çocukların biyofili seviyeleri problem çözme becerisini anlamlı bir şekilde yordamakta mıdır?

Yöntem. Araştırma niceliksel metodolojiye göre korelasyonel tarama yöntemi kullanılarak gerçekleştirilmiştir. Korelasyonel tarama modeli genel tarama modellerinin bir türüdür. Bu yöntem, iki veya daha fazla değişken arasındaki ilişkiyi, onları manipüle etmeden, birlikte nasıl değiştiklerine odaklanarak analiz etmeyi içerir (Karasar, 2005; Maison vd., 2021). Bu çalışmada 2023-2024 eğitim-öğretim yılında Yozgat ili Merkez ilçesinde bulunan ilköğretim okullarının anasınıfları, bağımsız anaokulları, özel ilköğretim okullarının anasınıfları ve özel anaokullarına kayıtlı 60-72 aylık 305 tane okul öncesi dönem çocukları incelenmiştir. Çalışma kapsamında veriler, "Okul Öncesi Dönem Çocukları İçin Biyofili Ölçeği" ve "Çocuklar İçin Problem Çözme Becerisi Ölçeği" ile toplanmıştır. Çocukların biyofili seviyeleri ile problem çözme becerileri arasındaki ilişkinin varlığı ve şiddeti hakkında bilgi edinmek amacıyla Pearson korelasyon katsayısı hesaplanmıştır. Pearson korelasyon katsayısı, iki sürekli değişken arasındaki doğrusal ilişkinin gücünü ve yönünü belirlemek için kullanılır (Chen, 2019). Tüm analizler %95 güven aralığında ve $p<0.05$ anlamlılık düzeyine göre yapılmıştır. Ayrıca bu çalışmada 60-72 aylık çocukların Biyofili Seviyeleri ve Problem Çözme Becerileri için oluşturulan ölçüm modelleri ve teorik yapısal model incelenmiştir. Analizler uygun istatistik programlar kullanılarak gerçekleştirilmiştir. Hipotez testleri için $p<.05$ alfa anlamlılık düzeyi benimsenmiştir. Ölçüm modellerini test etmek için doğrulayıcı faktör analizi (DFA), yapısal modeli test etmek amacıyla yapısal eşitlik modeli analizi için yol analizi yöntemi kullanılmıştır.

Bulgular. Veri analizi sonucunda, araştırmaya katılan 60-72 aylık okul öncesi çocuklarının cinsiyete göre problem çözme becerileri ile biyofili seviyeleri incelendiğinde cinsiyetler arasında anlamlı bir farklılık bulunamamıştır. Bununla birlikte biyofili seviyeleri ile problem çözme becerileri arasındaki ilişki incelenmiş ve bu ilişkinin çok düşük düzeyde olduğu ancak bu ilişkinin anlamlı olmadığı bulunmuştur.

Sonuç ve Tartışma. Çalışmanın sonuçları doğrultusunda, 60-72 aylık çocukların cinsiyete göre biyofili seviyeleri incelendiğinde cinsiyetler arasında anlamlı bir farklılık bulunamamıştır. Alanyazında biyofili seviyelerinin cinsiyet değişkenine göre farklılık gösterip göstermediğini inceleyen çeşitli çalışmalar bulunmaktadır. Yılmaz ve Olgan (2017), 105 okul öncesi dönem çocuğu üzerinde yaptıkları çalışmada erkek ve kız çocuklarının biyofili puanları arasında anlamlı bir fark bulunmadığını belirtmişlerdir. Ahmetoğlu (2019) tarafından yapılan bir başka çalışmada da biyofili seviyelerinin cinsiyete bağlı olmadığı bulunmuştur. Bu bağlamda, literatürde biyofili seviyelerinin cinsiyet değişkeni arasındaki ilişki incelendiğinde benzer sonuçların elde edildiği görülmektedir. Dolayısıyla bu çalışmanın bulgularını destekleyen çalışmalar olduğu görülmektedir.

60-72 aylık çocukların cinsiyete göre problem çözme becerileri incelendiğinde anlamlı bir farklılık bulunmamıştır. Literatürde yapılan incelemeler de benzer sonuçlar ortaya koymaktadır; çocukların problem çözme becerilerinin cinsiyete göre bir fark olmadığına dair çalışmalar mevcuttur. Güven, Ayvaz ve Göktaş (2019) tarafından 82 okul öncesi dönem çocuğuyla yapılan araştırmada problem çözme becerilerinin cinsiyet açısından farklılaşmadığı gözlemlenmiştir. Bayrak ve Akkaynak'ın 50 çocukla yaptıkları çalışmada, problem çözme becerilerinde cinsiyetler arasında anlamlı bir fark bulunmadığı sonucuna varılmıştır. Güven ve Karasulu Kavuncuoğlu (2020) tarafından gerçekleştirilen başka bir araştırmada da benzer şekilde, cinsiyete dayalı anlamlı bir farklılık saptanmamıştır. Öte

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yandan, literatürde bu sonuçlarla uyumlu çalışmaların yanı sıra, Walker, Irving ve Berthelsen (2002) tarafından yürütülen bir çalışmada çocukların sosyal problem çözme stratejilerinin, akranın cinsiyeti ve problem durumunun içeriği gibi faktörlere göre değişkenlik gösterdiği belirlenmiştir. Yine kız çocukların problem çözme becerilerinin erkek çocuklara göre daha iyi olduğunu gösteren çalışmalara da rastlanmaktadır (Walker, Irving ve Berthelsen, 2002). Bu bağlamda literatürde problem çözme becerilerinin cinsiyet değişkeni arasındaki ilişki incelendiğinde farklı sonuçların olduğu görülmektedir. Dolayısıyla bu araştırmanın bulgularını destekleyen ve desteklemeyen çalışmalar mevcuttur.

Son olarak bu çalışmada biyofili seviyeleri ile problem çözme becerileri arasındaki ilişki incelenmiş ve bu ilişkinin çok düşük düzeyde ancak anlamlı olmadığı bulunmuştur. Bu sonuç, biyofili ve problem çözme arasında güçlü bir nedensel ilişkinin olmadığını veya en azından bu iki değişkenin birbirini açıklamadığını gösterebilir. Ancak Beames, Higgins ve Nicol (2012) ise doğada geçirilen zamanın çocukların doğa sevgisi kazanmalarını, çevre farkındalıklarını geliştirmelerini ve çevre sorunlarına yönelik problem üretebilme becerilerini desteklediğini belirtmişlerdir. Çalışmanın bulgularıyla Beames, Higgins ve Nicol (2012) tarafından yapılan çalışma bulguları arasındaki uyumsuzluk araştırmanın metodolojisi, örneklemin büyüklüğü ve kullanılan ölçüm araçlarının güvenilirliğinden kaynaklanabileceği düşünülmektedir.

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Introduction

The concept of biophilia, introduced by Edward O. Wilson in the 1980s, refers to the tendency of humans to have an intrinsic connection with nature and other living species (Wilson, 1984). This concept was defined by Grinde and Patil (2009) as love for plants and other living things, and Barbiero (2021) considered it as an emotional connection with life. The biophilia hypothesis suggests that humans have a biological attraction to nature, and that these interactions significantly affect human well-being (Kals et al., 1999). This concept also emphasizes that individuals may develop different emotional attitudes towards natural environments, and that these attitudes may influence their motivation to interact and conserve natural resources (Kals et al., 1999). Considering all these definitions, the concept of biophilia is recognised as an important tool for understanding the depths of the human-nature relationship and evaluating the importance of the connection with the natural world on the quality of life of individuals.

Biophilia, the innate human tendency to connect with nature, is increasingly recognised for its positive impact on early childhood education. Several studies have demonstrated the positive effects of a connection with nature on individuals' lives. For example, Capaldi et al. (2014) showed that engagement with nature improves mood, cognitive functioning and general health. In the research conducted by Sefalı (2019) on the effect of nature education activities on biophilia levels of prospective science teachers, a significant difference was found in favor of the experimental group. A systematic review by Coventry et al. (2021) highlighted that individuals with a greater emotional connection to nature experience enhanced eudaimonic well-being, suggesting that engaging in nature-based outdoor activities significantly contributes to mental health improvements beyond mere exposure to natural environments. This finding is supported by Bratman et al. (2019), who emphasized the importance of natural experiences in enhancing cognitive functioning and emotional well-being, particularly in the context of urbanization, which often diminishes opportunities for such experiences. The restorative effects of nature are further corroborated by Hossain et al., who reported significant improvements in mental health outcomes, including reductions in depressive symptoms and anxiety associated with exposure to natural environments (Hossain et al., 2020). Studies have shown that individuals with a strong attachment to nature are more developed in cognitive abilities such as attention, memory and problem solving (Barbiero et al., 2021; Lumber et al., 2017). It has been determined that individuals who maintain their connection with nature experience less stress and positive effects both mentally and physically (Grahn and Stigsdotter, 2004; Ulrich, Simons, Losito, Fiorito, Miles and Zelson, 1991). Biophilia has been found to inspire children to learn about sound, science and nature, enabling them to develop a deeper understanding of the world around them (Kristinsdóttir, 2018). Sefalı and Köse (2021) also emphasized that it is important to determine the biophilia levels of individuals and increase these levels in order to protect nature and understand the value of living things. These findings emphasise the critical role of the connection with nature on children's well-being and reveal how important rebuilding relationships with the natural environment is for children's health and happiness. In this context, this deep human connection with nature, called biophilia, is associated with various aspects of children's development, especially with positive effects on cognitive functions (Lanzaro, 2024; Preuss et al., 2019).

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Cognitive functions encompass executive functions, such as attention, memory, perception, reasoning, decision-making, and problem solving. These executive functions are crucial for cognitive development during the preschool years and are central to the overall cognitive development of young children (Blair and Razza, 2007). The skills acquired during this period help children develop life skills, such as cooperation, communication, and problem-solving, as well as their academic life. It would not be wrong to say that problem-solving skills, which are among the skills that preschool children should gain and support, play a critical role in the following years. Children's problem-solving skills form the basis of their cognitive development and support their social and emotional development (Gaete et al. 2019; Özbey and Köyceğiz 2020; Özkan and Aksoy 2017; Ştefan and Miclea 2013). Problem-solving skills are becoming increasingly critical in our knowledge-based society, enabling students to be successful in their future careers and daily lives (Trilling and Fadel, 2012). Problem solving skills, which are among the functions that need to be supported at an early age, express children's ability to overcome the difficulties they face and have a determining effect on their success throughout their lives. Problem solving skills of preschool children form the basis of their future success.

Nature's role in fostering problem-solving skills is particularly noteworthy. Engaging in natural environments provides children with diverse, dynamic contexts for exploration and learning. Zeng et al. (2017) conducted a systematic review that underscored the positive effects of physical activity on cognitive development, including problem-solving skills. Nature's variable and less constraining qualities encourage children to engage in risk-taking behaviors, make decisions, and solve problems creatively, as noted by Zamani (2016). Sella et al. conducted a systematic review that found that interactions with nature can improve cognitive resources such as attention and working memory, which are essential for problem-solving tasks (Sella et al., 2023). Activities that involve nature observations not only foster a connection with living things, but also enhance cognitive development, as highlighted by Karakaya et al. (Karakaya et al., 2022). This aligns with the principles of biophilia, which posits that humans have an innate connection to nature that can enhance their cognitive development. Considering the skills of children, such as asking questions, completing open-ended tasks, being flexible, analyzing, and problem-solving when children regularly spend time in natural environments, it is thought that increasing the level of biophilia will affect children's problem-solving skills (Wojciehowski and Ernst, 2018). Accordingly, the relationship between biophilia levels and problem-solving skills in children attending preschool education can be considered an important research topic.

This study sought to explore the relationship between biophilia levels and problem-solving skills in preschool children aged 60-72 months. Specifically, the research investigated not only the connection between biophilia levels and problem-solving skills but also how these relationships might vary with demographic characteristics such as gender. This study aimed to address the following questions:

1. Is there a significant difference between the biophilia levels of 60-72-month-old children attending preschool education according to gender?
2. Is there a significant difference between the problem solving skills of 60-72-month-old children attending preschool education according to gender?
3. Is there a significant relationship between biophilia levels and problem-solving skills in 60-72-month-old children attending preschool education?

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4. Do the biophilia levels of 60-72-month-old children attending preschool education predict problem-solving skills significantly?

Method

Research design

This study employs a correlational survey method within a quantitative research framework. The correlational survey model is a general survey method. This approach entails examining the relationships between two or more variables without altering them, concentrating on how they vary in tandem (Karasar and Yöntemi, 2005; Maison et al., 2021).

Population and sample

In this study, 305 preschool children aged 60-72 months were enrolled in kindergartens of primary schools, independent kindergartens, kindergartens of private primary schools, and private kindergartens in the central district of Yozgat province in the 2023-2024 academic year. Convenience sampling was adopted in this study. The sex distribution of the children included in the study was analyzed, and the results are presented in Table 1.

Table 1.
Descriptive Statistics of the Study Group

Variable	Category	Frequency	Percent
Gender	Girl	158	51.8
	Boy	147	48.2
Total		305	100

The study group consisted of 305 preschool children according to the descriptive statistics given in Table 1. Of these, 158 (51.8%) were girls and 147 (48.2%) were boys. When the data in Table 1 were analyzed, it was observed that the numbers of girls and boys were almost equal.

Data collection instruments

Biophilia scale for preschool children

In this study, the Child Biophilia Scale was used as the data collection tool. This scale was originally developed by Rice and Torquati (2013), and includes 11 biophilic and 11 non-biophilic items. The reliability test of the original form found Cronbach's alpha coefficient to be 0.63, and this value was considered reliable. Yılmaz (2017) used a two-way translation method to adapt the scale to Turkish. First, the items were translated into Turkish and then back-translated into English by three experts in the field of early childhood education. Considering the cultural adaptability of the items, the experts agreed to change to an item that was more appropriate in Turkish. The Cronbach's alpha value of the

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adapted measurement tool was 0.68, which indicates a sufficient level of reliability. In addition, the validity of the tool has been confirmed by various researchers (Yılmaz, 2017; Yılmaz and Olgan, 2017).

Problem solving skills scale for children

The Problem Solving Skills Scale for Children (PSSS) was developed by Oğuz and Köksal-Akyol (2015). This is a five-point Likert-type scale consisting of a list of 18 problem situations and 18 drawings appropriate for each problem situation. Each problem was scored on a scale of 0–4. The scoring system was based on the number of solutions provided by the children: 0 points were awarded for no solution, 1 point for one solution, 2 points for two solutions, 3 points for three solutions, and 4 points for more than three solutions. Thus, the score range can vary from 0 to 72, with a higher score indicating higher problem-solving ability. The content validity index of the scale was calculated as 0.99 by the developer of the scale, the reliability coefficient was calculated as 0.86, and the scale had sufficient reliability. The content validity index of the scale was calculated as 0.99 by the developer of the scale, the reliability coefficient was calculated as 0.86, and the scale had sufficient reliability.

Data collection

The scales used were applied simultaneously to 305 children aged 60-72 months attending kindergartens of primary schools, independent kindergartens, kindergartens of private primary schools, and private kindergartens in the central district of Yozgat province in the 2023-2024 academic year.

Data analyses

The findings were derived using statistical methods aligned with the study's sub-objectives. The normality of the continuous variables in the dataset was assessed using skewness and kurtosis values. According to the literature, skewness and kurtosis values typically fall between -2 and +2, with values in this range indicating a normal distribution (Bahri et al., 2021). The values obtained in this study were within the acceptable ranges. Additionally, a sample size exceeding 30 supports the use of parametric tests (Ghasemi and Zahediasl, 2012; Kim, 2024). Parametric tests offer greater statistical power than nonparametric tests (Norman and Streiner, 2008). Consequently, parametric tests were utilized to test the hypotheses, including an independent-sample t-test to determine whether there were significant differences in biophilia levels and problem-solving skills based on gender. The independent-sample t-test compares the means of two independent groups, and is regarded as a robust analysis tool when its assumptions are satisfied (Derrick et al., 2017). Pearson's correlation coefficient was used to examine the strength and direction of the linear relationship between children's biophilia levels and problem-solving skills. This coefficient quantifies the degree of linear relationship between two continuous variables (Chen, 2019). All analyses were performed with a 95% confidence interval and significance level of $p<0.05$. Additionally, both measurement and theoretical structural models concerning biophilia levels and problem-solving skills in children aged 60–72 months were analyzed. The analyses were performed using appropriate statistical software, and a significance level of $p < .05$ was used for hypothesis testing. Confirmatory factor analysis (CFA) was conducted to assess the

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measurement models, and structural equation modeling (SEM) and path analysis were employed to evaluate the structural model.

Ethical procedures

This study was approved by the Yozgat Bozok University Social and Human Sciences Research Ethics Committee, as indicated by decision number 11/26, dated February 21, 2024. Additionally, all required permissions were obtained from the provincial directorate of national education, with authorization dated March 14, 2024, and numbered E-55005497-20-98887303. Parental consent was secured for all children involved in the study, and participation was entirely voluntary, allowing any child to withdraw at any time. The study adhered to confidentiality principles and maintained ethical standards throughout.

Results

Biophilia levels of 60-72 month-old children by gender

It was examined whether there was a significant difference between the biophilia levels of 60-72-month-old children according to gender. In this context, the Biophilia Scale for Preschool Children was applied to the students. Descriptive statistics and *t* test results obtained from the scale are presented in Table 2.

Table 2.
Descriptive Statistics and T-Test Results of the Biophilia Scale for Preschool Children

Gender	*N*	*X*	*ss*	*t*	*sd*	*p*
Girl	158	7.22	2.05	1.749	305	.081
Boys	147	6.80	2.12			

According to Table 2, the t-test results of Biophilia Levels (Total) show that the mean scores of female students were 7.22 (sd=2.05) and the mean scores of male students were 6.80 (sd=2.12). As a result of the independent sample t-test conducted to determine whether the biophilia levels of children differed significantly according to gender, no statistically significant difference was found ($t(305) = 1.749$; $p>0.05$).

Problem solving skills of 60-72 month-old children by gender

It was examined whether there was a significant difference between the problem solving skills of 60-72-month-old children according to gender. In this context, the Problem Solving Skills Scale (PSSS) was administered to students. Descriptive statistics and t-test results obtained from the scale are presented in Table 3.

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Table 3.
Descriptive Statistics and T-Test Results of Problem Solving Skills Scale

Gender	N	X	ss	t	sd	p
Girl	158	23.34	8.09	-1.157	305	.24
Boy	147	24.44	8.51			

According to Table 3, when the t-test results of Problem Solving Skills (Total) are analyzed, it is seen that the mean score of female students is 23.34 (sd=8.09) and the mean score of male students is 24.44 (sd=8.51). As a result of the independent sample t-test conducted to determine whether children's problem-solving skills differed significantly according to gender, no statistically significant difference was found (t (305) = -1.157; p>0.05).

Investigation of the relationship between biophilia levels and problem solving skills of 60-72 months old children

Within the scope of the study, the relationship between biophilia levels and problem solving skills of 60-72-month-old children attending preschool education was analysed. Pearson correlation coefficients between children's biophilia levels and problem solving skills are presented in Table 4.

Table 4.
Distribution of the Relationship between Children's biophilia levels and problem-solving skills

	Problem Solving Skills (Total)
Biophilia Levels (Total)	.052*

*p<.05

As shown in Table 4, Pearson correlation analysis was conducted to assess the presence of a significant relationship between biophilia levels and problem-solving skills. The analysis revealed a very weak correlation (.052) between these variables, and this relationship was not statistically significant at p = .05.

Goodness of model fit of measurement models formulated for biophilia levels and problem-solving skills of 60-72 month-old children attending preschool education

In this study, confirmatory factor analysis (CFA) was used for the Biophilia Scale for Preschool Children and Problem Solving Skills for Children (PSPS) to examine the model data fit and factor loadings of the scales. Table 5 presents the model data fit indices for the CFA results of the Biophilia Scale for Preschool Children and Problem Solving Skills for Children (PSPS) scales.

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Table 5.
Model Data Fit Indices for Biophilia and Problem Solving Scales for Children

Scale	Chi-square/sd	RMSEA	*NFI*	*CFI*	*IFI*	*RFI*
Biophilia Scale for Preschool Children	.940	.000	.872	1.000	1.009	.835
Problem Solving Skills for Children (PSPS)	1.351	.034	.917	.977	.977	.904

For the Biophilia Scale, the chi-square to degrees of freedom ratio was below five, and the RMSEA value was under 0.080. Hair et al. (2009) suggest that an RMSEA value less than 0.08 reflects an excellent model fit. Therefore, the RMSEA value for the Biophilia Scale confirms a strong fit for the model. Moreover, CFI and IFI values of 0.95 or above are regarded as indicative of a good fit, while NFI values ranging from 0.80 to 0.90 are considered moderate (Hair et al., 2018; Prudon, 2015; Bentler and Bonett, 1980). Conversely, the Problem-Solving Skills Scale exhibits a chi-square to degrees of freedom ratio greater than five, an RMSEA value exceeding 0.080, and NFI, CFI, and IFI values above 0.95, which also indicates an excellent fit (Hair et al., 2009). Thus, according to the criteria outlined by Jöreskog and Sörbom (1993), it can be concluded that the model and the data are a perfect match for this scale. The factor loadings for the items on the Biophilia Scale are shown in Figure 1, whereas those for the Problem-Solving Skills Scale are presented in Figure 2.

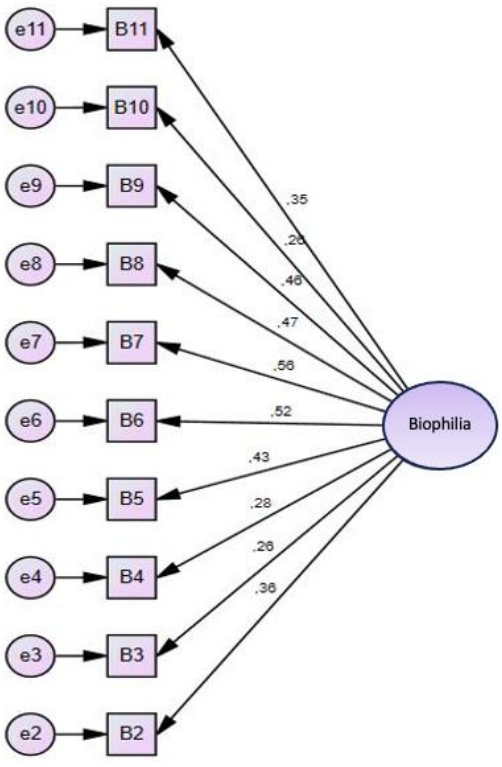

Figure 1. Factor loadings of the items of the biophilia scale

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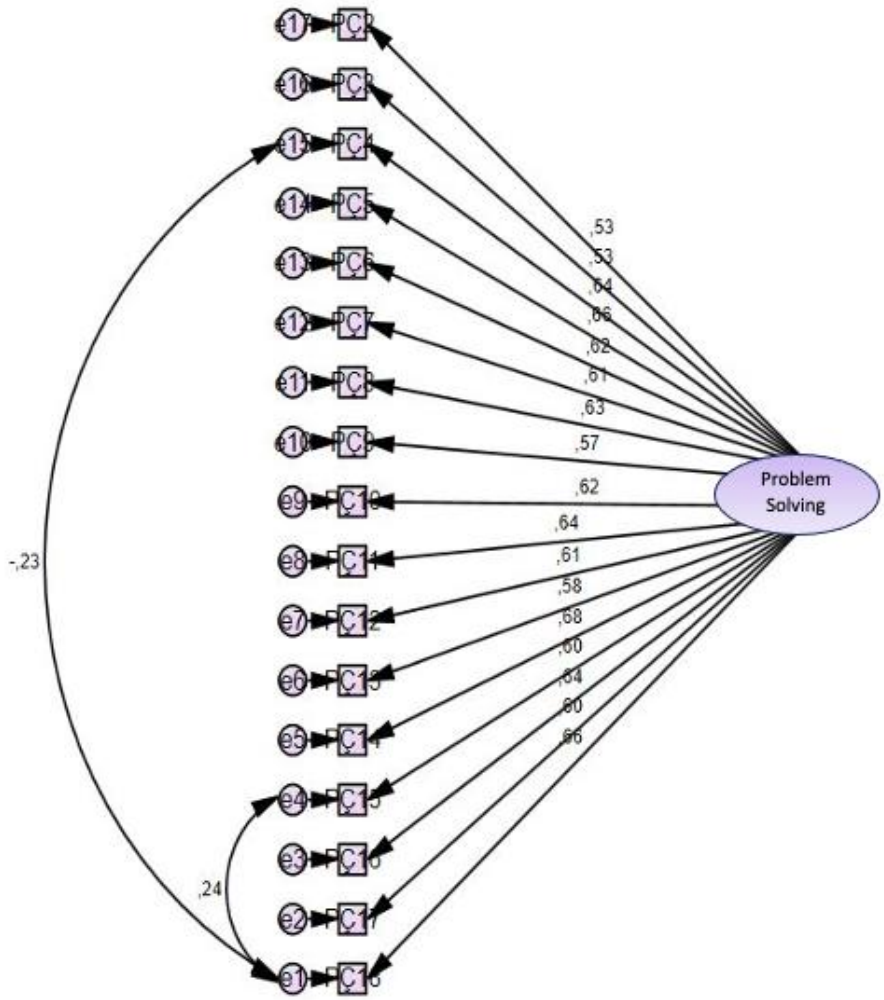

Figure 2. Factor loadings of the items of the problem solving skills scale

The Goodness of the structural model in which biophilia levels predict problem solving skills of 60-72 months old children attending preschool education

After determining the suitability of the measurement model and structural equation model to be tested, the structural model shown in Figure 3 was created to test the research hypothesis. The path diagram of the model is given in Figure 3. Figure 3 shows that biophilia level had no effect on problem-solving skills (estimated std = 0.283, p>0.01). This shows that the biophilia levels of 60-72-month-old children attending preschool education did not predict their problem solving skills.

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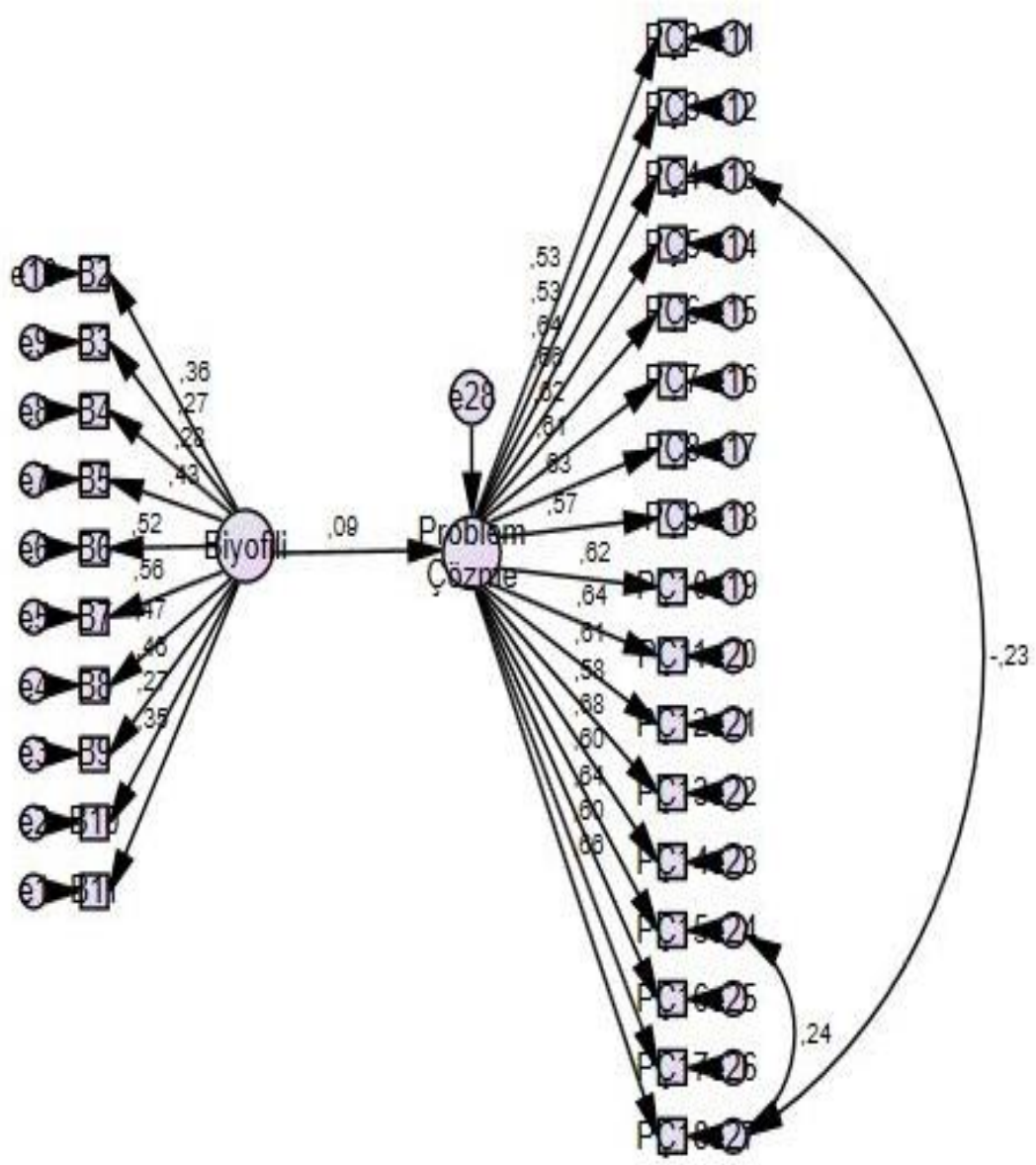

Figure 3. Path diagram of the structural model in which children's biophilia skills predict problem solving skills

Discussion, Conclusion and Recommendations

In this study, the relationship between biophilia levels and problem solving skills of 60-72-month-old children attending preschool education was examined. The findings obtained are discussed in this section.

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When the biophilia levels of 60-72-month-old children were analysed according to gender, no significant difference was found between genders (Table 2). In the literature, there are various studies examining whether biophilia levels differ according to gender variable. Yılmaz and Olgan (2017) reported that there was no significant difference between the biophilia scores of boys and girls in their study on 105 preschool children. Another study conducted by Ahmetoğlu (2019) found that biophilia levels did not depend on gender. In this context, when the relationship between biophilia levels and gender variables is analyzed in the literature, similar results are obtained. Therefore, it is seen that there are studies supporting the findings of this study. While gender roles can shape how individuals interact with the world, including how they engage with nature, these effects might be less pronounced in early childhood. In the preschool years, children are still forming their social identities and are less likely to exhibit gender-specific preferences for nature or outdoor activities. Socialization processes, which can influence gendered behaviors and attitudes toward nature in later childhood or adolescence, may not be fully developed in children aged 60-72 months. Therefore, any gendered differences in environmental attitudes and preferences may not yet manifest at this age.

When the problem solving skills of 60-72-month-old children were analysed according to gender, no significant difference was found (Table 3). Examinations in the literature reveal similar results; some studies show that there is no difference in children's problem-solving skills according to gender. In the study conducted by Güven, Ayvaz, and Göktaş (2019) with 82 preschool children, it was observed that problem solving skills did not differ in terms of gender. Bayrak and Akkaynak's (2020) study involving 50 children concluded that problem-solving skills did not show a significant difference according to gender. Güven and Kavuncuoğlu (2020) also concluded that there was no significant difference according to gender in their study. In addition to the studies supporting these findings, Walker et al. (2002) found that children's social problem-solving strategies differed according to variables such as the gender of the peer and the content of the problem situation. There are also studies showing that problem-solving skills of girls are better than those of boys (Walker, Irving, and Berthelsen, 2002). In this context, examining the relationship between problem-solving skills and gender in the literature reveals varying results. Consequently, some studies either support or contradict the findings of this study. The differences observed in the literature may be attributed to the diverse content and scope of the measurement tools employed in these studies. It is important to note that, while no gender differences were found in this study, research has shown that problem-solving abilities can vary depending on the context or type of problem. For instance, in certain social or emotional problem-solving scenarios, girls may exhibit more advanced strategies, particularly those involving interpersonal skills. Conversely, boys may demonstrate different approaches in more physically oriented tasks. However, in general, in problem-solving tasks that do not emphasize either of these areas, the results tend to be similar across genders. This variability underscores the complexity of problem-solving skills and suggests that gender differences may emerge only under specific conditions or types of tasks.

Finally, in this study, the relationship between biophilia levels and problem-solving skills was analyzed, and it was found that this relationship was very weak, but not significant (Table 4). This result may indicate that there is no strong causal relationship between biophilia and problem solving, or that these two variables do not explain each other. However, Beames, Higgins, and Nicol (2012) stated that

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time spent in nature supports children to gain love for nature, develop environmental awareness, and support their ability to produce problems related to environmental problems. The inconsistency between the findings of the study and the findings of the study conducted by Beames, Higgins, and Nicol (2012) is thought to be due to the methodology of the study, the size of the sample and the reliability of the measurement tools used.

Recommendations

This study can be replicated in different age groups and children from various regions. The research relied solely on quantitative data; therefore, incorporating qualitative data could provide additional insights. The scales used may be reassessed by incorporating diverse demographic information. Moreover, different scales can be employed to explore the relationship between biophilia levels and problem-solving skills.

Limitations of the study

There are some limitations that should be considered when interpreting and generalizing the findings of this study. First, the study was limited to 60-72 month-old children who continued their education in the central district of Yozgat province, which limits the generalizability of the results to different sociocultural regions. In addition, although the validity and reliability values of the data collection tools used are acceptable in the literature, the inherent limitations of the measurement tools may affect the reliability of the findings of the study.

Methodologically, the study was conducted within the framework of a correlational model and aimed to reveal the changes between the variables rather than explain the causal relationship. Therefore, definitive conclusions cannot be drawn regarding the mechanisms underlying the relationship between biophilia and problem-solving skills. Although basic demographic variables (age and gender) were considered in the study, other potentially influencing factors, such as the socioeconomic level of the families, the educational status of the parents, and the time children spent in nature were excluded from the evaluation.

This study was conducted using quantitative data-collection methods. The lack of qualitative methods that can provide in-depth information has limited the development of a more comprehensive understanding of biophilia and problem-solving skills. Furthermore, owing to the cross-sectional design of the study, it was not possible to observe the long-term effects of biophilia levels on problem-solving skills or their changes over time.

Finally, children's level of direct interaction with nature was not measured. This may constitute an important gap in our understanding of how biophilia levels are shaped by direct environmental experiences. These limitations require careful evaluation of the study results to provide important guidance for future research.

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