

Research Article

Do We Care about Preschool Children's Leisure Time? Correlations between Anxiety Symptoms and Leisure Time Allocation. Results of a Cross-Sectional Study

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Abstract

Children's leisure time in the Western world is changing compared to what it used to be in the previous decades. Children's involvement in organized activities and screen time use is increasing, while outdoor play, despite once being the main leisure time activity for children, is declining. Gray, Oliver and other contemporary theorists link this shift in children's lifestyles to an increase in the prevalence of anxiety disorders. This study aimed to determine whether allocating preschool children's leisure time (screen time use, organized physical activities with an adult coach and organized non-athletic activities with an adult trainer, outdoor play) is associated with differences in anxiety symptoms. Parents responded to the Greek version of the revised Preschool Anxiety Scale and provided data on allocating their children's leisure



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time. Data was collected from the parents of 143 preschool children (mean age 4.8 years). The allocation of children's leisure time activities was correlated with children's anxiety symptoms (Spearman correlation coefficient), while the correlations were tested using multivariable linear regression models ($p < 0.05$). It was found that children's increased screen time use and decreased participation in organized non-athletic activities with a trainer were associated with the manifestation of symptoms of anxiety. In contrast, no correlation was found between the time spent in organized physical activities with a coach and the time spent in outdoor play with manifestations of anxiety. In conclusion, action is required to facilitate children's access to proper activities and further work is necessary to determine the safe screen use for preschool children.

Keywords

Anxiety; preschoolers; leisure time activities; screen time use; outdoor play

1. Introduction

Anxiety disorders in children and adolescents typically include excessive fear or distress affecting the individual's level of functionality [1]. The most common types are separation anxiety disorder, generalized anxiety disorder, social anxiety disorder, and specific fears [2-4]. Anxiety disorders can be onset even in the preschool years, may persist into adulthood, and are a risk factor for other mood disorders [5, 6]. The data above render anxiety disorders one of the most frequently occurring and long-term mental health problems of children in the Western world and show an increasing trend [7, 8]. Epidemiological studies in the past decade described a prevalence of anxiety disorders in preschool children ranging from 0.3% to 6.5% [3, 9], while a recent meta-analysis [10] indicates an increased prevalence of 8.5%. Given that anxiety disorders appear very early in children's development and since they are predictive of other psychopathologies and tend to be chronic, researchers highlight the necessity of their early detection and treatment to ensure public health [9, 10].

Among the primary behaviors that have been linked with the children's manifestations of anxiety are leisure time activities, such as physical activity, engagement in extracurricular activities [11], and screen time use [12]. Physical activity, both regulated under the guidance of a coach in sports clubs and free, such as outdoor play, appears to have a protective effect on the occurrence of anxiety and several other mental disorders [13-16]. For illustrative purposes, during periods of intense mobility restrictions, such as those experienced in many countries during the COVID-19 pandemic, individuals who were able to maintain even low levels of physical activity experienced milder anxiety symptoms [17, 18].

On the contrary, another leisure time activity, screen use (TV, tablet, mobile phone, etc.), has been correlated with both depressive and anxiety-related behaviors [19, 20]. To inform parents and experts to monitor the ever-increasing adoption of new technologies at younger and younger ages, the World Health Organization recommends that very young children (<2 years) should not be exposed to screens. In comparison, preschool-aged children (2-4 years) screen time should not exceed one hour per day [21]. However, children's leisure time has been changing over the past

decades. Epidemiological data from three continents (America, Europe, and Australia) note an increase in the amount of leisure time that children devote to sedentary activities, typically entertainment in front of a screen [22, 23], an increase in children's leisure time spent on structured activities, usually under the presence of an adult, and a decrease in the amount of time children spend playing freely, particularly in an outdoor environment [23-25].

The decline of outdoor free play, which was once the dominant leisure activity for young children [26], now appears to coincide with an ongoing and significant increase in anxiety disorders in preschool-aged children. Consequently, researchers have wondered whether there is a link between these two [27, 28]. Two main theoretical strands aim to explain the aforementioned inverse association. According to Oliver, children who can engage in outdoor play face uncertain situations and challenges, and they take risks. Over time, these children are helped to develop problem-solving skills and become better at regulating their emotions in stressful situations. Thus, they become more resilient to the symptomatology of anxiety [29].

According to the other theoretical strand by Gray [28], the downgrade of social play -the most mature form of free play- fails to help children experience sufficient control over their lives as well as manage anxiety, fears, and stresses adequately, making them more vulnerable to stressful situations. Preschool children are mature enough to engage in social play. According to Vygotsky's theory [30], during this play stage, children engage in constant self-regulatory behaviors, balancing their actions between the desire to act unpredictably and to follow the rules of the game. Later, Z.V. Manuilenko [31], a student of Vygotsky, demonstrated experimentally that children display more self-regulatory behaviors in play than in another work context. In addition, it appears that social play is more intense and creative in the outdoors compared to playing in a classroom or structured playground. In other words, children who engage in outdoor play exhibit more mature social play [32-36].

In Greece, some limited epidemiological studies provide data on children's outdoor play, but they focus on play in school settings [37-39]. Consequently, to the extent of our knowledge, there is no epidemiological data on how preschool children's leisure time out of school is formed. Therefore, we are unaware of whether the allocation of preschool children's leisure time is linked to manifestations of anxiety. Finally, while it has been established by research that leisure time activities are correlated to anxiety behaviors for the age groups of adolescents and young adults (either in a protective or aggravating way), data related to preschool children are scarce [16].

This study aims to determine whether the allocation of preschoolers' leisure time after school plays a protective or an aggravating role in their manifestation of anxiety. In other words, we are interested in determining whether the time spent by preschool children on organized activities (either physical activities with a coach or non-athletic activities with a trainer), as well as the time they are exposed to screens or the time when they engage in outdoor play is associated with anxiety symptoms they may manifest.

Thus, our main research hypotheses are:

1. Children who spend more of their leisure time in outdoor play or organized activities (physical and non-athletic) experience lower levels of anxiety.
2. Children who experience less screen time use also experience lower levels of anxiety.
3. Demographic parameters such as gender, children's age, and potential experience of a recent stressful event are monitored to determine whether they affect anxiety levels in preschool children.

2. Methods

2.1 Approach and Respondents

Parents of preschool children participated in this cross-sectional study. Their children attended either kindergarten or nursery school on a five-day morning basis. Concerning the request for access to kindergartens, permission was granted by the Regional Directorate of Primary and Secondary Education of Attica, under the Greek Ministry of Education. Separate permission was requested from the Municipal Authorities for access to nursery schools.

After receiving the necessary permits, five (5) Public Nursery Schools and eleven (11) Kindergartens of the Athens-Piraeus Regional Unit of the Administrative Region of Attica responded to the invitation of the research team. Educators, via email, distributed to the parents of their students the survey questionnaires, along with an alphanumeric identifier for each student and a consent form of voluntary participation for the parents. Parents, considering the consent text, sent their responses between March and May 2022. The online questionnaire for parents was designed on Google Forms, which enabled direct data collection in an Excel spreadsheet. One hundred fifty (150) parent questionnaires were collected and seven were excluded due to duplicate or missing alphanumeric identifiers. The final sample included 143 parent questionnaires for children aged 3.3 to 6.3 years (mean 4.8 years).

2.2 Materials

The questionnaires for parents included the revised Preschool Anxiety Scale (PAS-R) [40] and a constructed questionnaire developed by the research team.

The PAS-R evaluates anxiety symptoms in children aged 3 to 5 years as reported by their parents. The questionnaire comprises 28 items and is formatted on a 5-point Likert scale. The score for each item ranges from zero (not at all true) to four (very often true). The scores of the items are summed up to a maximum of 112. The items are combined to form four subscales: generalized anxiety (7 items), social anxiety (7 items), separation anxiety (5 items), and specific fears (9 items), and together, the subscales give the total "anxiety" score. This questionnaire has adequate internal consistency reliability (Cronbach's $\alpha = 0.70-0.76$ for the 4 subcategories). The PAS-R underwent translation and cultural adaptation into Greek (Syros et al., 2018). This process adhered to the four-step WHO guidelines, encompassing forward translation, expert panel review, back-translation, pre-testing, and cognitive interviewing, ensuring the cross-cultural equivalence of the instrument [41]. However, the validity and reliability of the scale has not been tested yet.

The constructed questionnaire developed by the research team focused on the identification of socioeconomic, demographic and other data from parents such as: age, gender of the child, ethnicity, educational level of the parent, as well as the characterization of the family income (low - medium - high). In addition, parents were asked if their family had experienced an intense stressful event within the past six months (e.g. illness of parent or child, death of parent or grandparent, dismissal from work, moving to Greece from a foreign country). They also provided information on the allocation of their child's leisure time into the following: time for outdoor play, time in organized physical activities with a coach or organized non-athletic activities with a trainer, and time of screen use (TV, computer, tablet, mobile phone, etc.). As stated previously, in this study, the authors focus on examining those variables associated with the anxiety score based on the PAS-R parent

questionnaire in comparison to variables related to the allocation of preschool children's leisure time.

2.3 Statistical Analysis

Quantitative variables were expressed as mean values (Standard Deviation) and median (interquartile range), while categorical and ordinal variables were expressed as absolute and relative frequencies. Kolmogorov-Smirnov criterion was used for testing the normality of the PAS-R subscales distribution. Ordinal variables were tested between day nursery and kindergarten students via the Mann-Whitney test. For the comparison of proportions chi-square tests were used. Spearman correlation coefficients (ρ) were used to explore the association of two continuous variables. Multiple linear regression analysis was used with dependent PAS-R subscales. Adjusted regression coefficients (β) with standard errors (SE) and the standardized coefficients (beta) were computed from the results of the linear regression analysis. Internal consistency reliability was determined by the calculation of Cronbach's α coefficient. Scales with reliabilities equal to or greater than 0.70 were considered acceptable. All reported p values are two-tailed. Statistical significance was set at $p < 0.05$, and analyses were conducted using SPSS statistical software (version 26.0).

3. Results

The sample consisted of 143 parents (90.9% women), whose characteristics are presented in Table 1. Most participants were 30-39 years old (58.7%), of moderate economic status (79.7%), university alumni (50.3%), with Greek ethnicity (94.4%), and had not experienced a stressful event during the last six months (63.6%). The mean age of their children was 4.8 years ($SD = 0.9$); 54.5% were boys, and 40.6% attended kindergarten.

Table 1 Sample characteristics.

n = 143		n	%
Parents' characteristics			
Gender	Females	130	90.9
	Males	13	9.1
Age (years)	20-29	4	2.8
	30-39	84	58.7
	40-49	51	35.7
	>50	4	2.8
Economic status	Low	22	15.4
	Moderate	114	79.7
	High	7	4.9
Educational level	Primary	4	2.8
	Middle/High school	37	25.9
	University	72	50.3
Greek ethnicity	MSc/PhD	30	21.0
	No	8	5.6
	Yes	135	94.4

Experienced a stressful event during the last six months	No	91	63.6
	Yes	51	35.7
	I don't know	1	0.7
Children's characteristics			
Gender	Girls	65	45.5
	Boys	78	54.5
Age (years), mean (SD)		4.8 (0.9)	
School	Day nursery	85	59.4
	Kindergarten	58	40.6

Information about children's leisure time activities in the total sample and by school is provided in Table 2. A percentage of 65.5% of kindergarten students attended one or more organized extracurricular sports activities, while the corresponding rate for day nursery students was significantly lower and equal to 29.4%, $\chi^2(2) = 18.50$, $p < 0.001$. Moreover, 43.1% of kindergarten students attended one or more organized extracurricular non-athletic activities, while the corresponding percentage for day nursery students was significantly lower and equal to 18.8%, $\chi^2(1) = 9.94$, $p = 0.002$. Children in kindergarten spend considerably more hours weekly on physical exercise with a coach ($U = 318.5$; $p = 0.018$). The hours spent in non-athletic activities with a trainer, as well as the hours of screen use and the hours of outdoor play were similar in day nursery and kindergarten students ($p > 0.05$).

Table 2 Children's leisure activities in the total sample and by the school.

		Total sample (n = 143)		School			
				Day nursery (n = 85)		Kindergarten (n = 58)	
		n	%	n	%	n	%
Participation in physical activity with a coach	No	79	55.2	59	69.4	20	34.5
	Yes	63	44.1	25	29.4	38	65.5
	Do not know	1	0.7	1	1.2	0	0.0
	Less than 1 hour per week	4	6.3	3	12.0	1	2.6
Weekly hours of physical activity with a coach	1 hour per week	8	12.7	5	20.0	3	7.9
	2 hours per week	31	49.2	12	48.0	19	50.0
	3 hours per week	16	25.4	5	20.0	11	28.9
	4 hours per week	1	1.6	0	0.0	1	2.6
	5 hours per week	2	3.2	0	0.0	2	5.3
	6 hours per week or more	1	1.6	0	0.0	1	2.6
Participation in non-athletic with a trainer	No	102	71.3	69	81.2	33	56.9
	Yes	41	28.7	16	18.8	25	43.1
Weekly hours of non-athletic with a trainer	Less than 1 hour per week	4	10.0	2	12.5	2	8.3
	1 hour per week	13	32.5	5	31.3	8	33.3
	2 hours per week	16	40.0	7	43.8	9	37.5
	3 hours per week	5	12.5	1	6.3	4	16.7

	4 hours per week	1	2.5	1	6.3	0	0.0
	5 hours per week	0	0.0	0	0.0	0	0.0
	6 hours per week or more	1	2.5	0	0.0	1	4.2
	Less than 1 hour per week	2	1.4	1	1.2	1	1.7
	1 hour per week	5	3.5	4	4.7	1	1.7
Weekly hours of screen use (TV, mobile, laptop etc.)	2 hours per week	16	11.2	15	17.6	1	1.7
	3 hours per week	15	10.5	8	9.4	7	12.1
	4 hours per week	18	12.6	7	8.2	11	19
	5 hours per week	37	25.9	20	23.5	17	29.3
	6 hours per week or more	50	35.0	30	35.3	20	34.5
	Less than 1 hour per week	7	4.9	5	5.9	2	3.4
	1 hour per week	9	6.3	6	7.1	3	5.2
Weekly hours of outdoor play	2 hours per week	13	9.1	7	8.2	6	10.3
	3 hours per week	21	14.7	13	15.3	8	13.8
	4 hours per week	17	11.9	9	10.6	8	13.8
	5 hours per week	19	13.3	10	11.8	9	15.5
	6 hours per week or more	57	39.9	35	41.2	22	37.9

Descriptive measures, reliability indexes for PAS-R subscales and their correlation with the weekly time of outdoor play are presented in Table 3. All reliability indexes were in the acceptable range (0.7 and above), indicating acceptable reliability of PAS-R subscales. Children’s anxiety did not differ significantly between day nursery and kindergarten students, $p > 0.05$ (Table S1).

Table 3 Descriptive measures, reliability indexes for PAS-R subscales.

	Mean (SD)	Median (IQR)	Cronbach's alpha
PAR'S			
Generalized Anxiety	10.56 (3.78)	11 (8–13)	0.76
Social Anxiety	8.18 (4.53)	8 (5–11)	0.74
Separation Anxiety	5.00 (3.18)	5 (2–7)	0.70
Specific Fears	11.93 (5.99)	12 (8–16)	0.76
Total PAS-R score	35.00 (12.27)	35 (27–44)	0.83

Max scores: Generalized Anxiety: 28; Social Anxiety: 28; Separation Anxiety: 20; Specific Fears: 36; total PAS-R max score: 112.

More hours spent in non-athletic activities with a trainer were significantly associated with lower separation anxiety, $\rho = -0.18$; $p = 0.028$ (Table 4) on the contrary, more hours of screen use were significantly associated with higher scores in subscales “Separation Anxiety” ($\rho = 0.16$; $p = 0.049$) and “Specific Fears” ($\rho = 0.18$; $p = 0.034$) and with higher total anxiety score ($\rho = 0.19$; $p = 0.026$).

Table 4 Correlation of PAS-R scale with children’s leisure time allocation via Spearman’s correlation coefficient (rho); Significant correlations are denoted with bold numbers.

	Generalized Anxiety	Social Anxiety	Separation Anxiety	Specific Fears	Total PAS-R score
Weekly hours of physical activity with a coach	0.08	0.00	0.04	-0.02	0.03
Weekly hours of non-athletic activities with a trainer	0.05	-0.04	-0.18*	-0.04	-0.04
Weekly hours of screen use	0.14	0.02	0.16*	0.18*	0.19*
Weekly hours of outdoor play	-0.10	-0.03	0.04	-0.07	-0.06

*p < 0.05; **p < 0.01; ***p < 0.001.

After multiple regression analyses, generalized anxiety was not significantly associated with participant characteristics (Table 5). On the contrary, having experienced a stressful event during the last six months was significantly associated with higher social anxiety ($\beta = 0.104$; $p = 0.042$). More hours of children participating in non-athletic activities with a trainer were significantly associated with less separation anxiety ($\beta = -0.039$; $p = 0.025$). Furthermore, more hours of screen use were significantly associated with higher specific fears score ($\beta = 0.030$; $p = 0.035$) and higher total anxiety score ($\beta = 0.018$; $p = 0.050$).

Table 5 Multiple linear regression analysis results with PAS-R subscales as dependent variables); Significant correlations are denoted with bold numbers.

Dependent variable	Independent variable	β +	SE++	beta#	t	P
Generalized Anxiety F(9,131) = 0.78; p = 0.640; R ² = 0.00	Child's gender (Boys vs Girls)	0.040	0.036	0.097	1.12	0.264
	Child's age (years)	-0.009	0.023	-0.040	-0.40	0.691
	Economic status (Moderate/High vs Low)	-0.026	0.053	-0.045	-0.49	0.626
	Highest educational level (University/MSc/PhD vs High school at most)	0.033	0.042	0.072	0.79	0.429
	Experienced a stressful event during the last six months (yes vs no)	0.049	0.038	0.114	1.30	0.197
	Weekly hours of physical activity with a coach	0.011	0.013	0.094	0.89	0.375
	Weekly hours of non-athletic activities with a trainer	0.006	0.014	0.037	0.40	0.686
	Weekly hours of screen use	0.011	0.011	0.083	0.95	0.345
Social Anxiety F(9,131) = 0.58; p = 0.811; R ² = 0.00	Weekly hours of outdoor play	-0.003	0.009	-0.024	-0.28	0.778
	Child's gender (Boys vs Girls)	-0.019	0.048	-0.034	-0.40	0.692
	Child's age (years)	0.017	0.031	0.057	0.56	0.574
	Economic status (Moderate/High vs Low)	0.064	0.070	0.084	0.90	0.369
	Highest educational level (University/MSc/PhD vs High school at most)	0.006	0.055	0.010	0.12	0.908
	Experienced a stressful event during the last six months (yes vs no)	0.104	0.050	0.182	2.06	0.042
	Weekly hours of physical activity with a coach	-0.007	0.017	-0.043	-0.41	0.684
	Weekly hours of non-athletic activities with a trainer	-0.007	0.018	-0.034	-0.37	0.710
Separation Anxiety F(9,131) = 1.21; p = 0.294; R ² = 0.01	Weekly hours of screen use	0.009	0.015	0.051	0.58	0.560
	Weekly hours of outdoor play	0.000	0.013	-0.001	-0.02	0.987
	Child's gender (Boys vs Girls)	0.048	0.045	0.092	1.08	0.283
	Child's age (years)	-0.010	0.029	-0.033	-0.33	0.744
	Economic status (Moderate/High vs Low)	-0.014	0.066	-0.019	-0.20	0.838
	Highest educational level (University/MSc/PhD vs High school at most)	-0.019	0.052	-0.033	-0.37	0.713
	Experienced a stressful event during the last six months (yes vs no)	0.020	0.048	0.037	0.43	0.668
	Weekly hours of physical activity with a coach	0.023	0.016	0.153	1.47	0.144

Specific Fears F(9,131) = 1.26; p = 0.264; R ² = 0.02	Weekly hours of non-athletic activities with a trainer	-0.039	0.017	-0.205	-2.26	0.025
	Weekly hours of screen use	0.023	0.014	0.137	1.59	0.114
	Weekly hours of outdoor play	0.011	0.012	0.078	0.93	0.357
	Child's gender (Boys vs Girls)	-0.055	0.044	-0.106	-1.25	0.213
	Child's age (years)	0.016	0.029	0.055	0.55	0.581
	Economic status (Moderate/High vs Low)	-0.093	0.065	-0.130	-1.42	0.158
	Highest educational level (University/MSc/PhD vs High school at most)	-0.010	0.051	-0.017	-0.19	0.850
	Experienced a stressful event during the last six months (yes vs no)	0.021	0.047	0.039	0.45	0.655
	Weekly hours of physical activity with a coach	-0.003	0.015	-0.021	-0.20	0.841
Total PAS-R score F(9,131) = 0.92; p = 0.512; R ² = 0.00	Weekly hours of non-athletic activities with a trainer	-0.002	0.017	-0.013	-0.14	0.885
	Weekly hours of screen use	0.030	0.014	0.183	2.13	0.035
	Weekly hours of outdoor play	-0.010	0.012	-0.075	-0.89	0.374
	Child's gender (Boys vs Girls)	0.000	0.029	-0.001	-0.01	0.989
	Child's age (years)	-0.001	0.019	-0.006	-0.06	0.950
	Economic status (Moderate/High vs Low)	-0.024	0.042	-0.051	-0.56	0.579
	Highest educational level (University/MSc/PhD vs High school at most)	0.020	0.033	0.053	0.59	0.554
	Experienced a stressful event during the last six months (yes vs no)	0.050	0.030	0.145	1.66	0.099
	Weekly hours of physical activity with a coach	0.002	0.010	0.024	0.23	0.817
Weekly hours of non-athletic activities with a trainer	-0.009	0.011	-0.070	-0.77	0.445	
Weekly hours of screen use	0.018	0.009	0.170	1.96*	0.050	
Weekly hours of outdoor play	-0.004	0.008	-0.041	-0.48	0.633	

Note. Analysis was performed with the logarithmic transformation of the dependent variables.

+ regression coefficient ++ Standard Error ‡ Standardized regression coefficient.

4. Discussion

Screen use, physical activity, constant extracurricular activities and their association with anxiety have so far been studied widely in adolescents and young adults [14]. However, the data on preschool age groups are not sufficient, and knowledge in this area seems to be “borrowed” from research in older age groups [16].

It is now well established that, in recent decades in the Western world, the way children allocate their leisure time has changed. There has been an increase in children's leisure time being occupied by organized activities, an increase in the amount of leisure time children spend in sedentary activities, usually sitting in front of a screen [22, 23] and a decrease in the amount of time children spend playing freely, particularly in outdoor environments [23-25]. This study aimed to demonstrate whether and how the allocation of preschoolers' leisure time is associated with manifestations of anxiety in preschool-aged children and how this takes place.

In the sample we studied, we found no correlations of anxiety behaviors with children's gender and age. Similar results for preschool age also emerged from a study of 541 three-year-old children who met the criteria for at least one anxiety disorder [42]. Because in the adult population anxiety symptoms are prevalent in females with a significant statistical difference [43], this finding needs to be further investigated so that we can further increase our knowledge about the developmental trajectory and gender-related expressions of anxiety symptoms. We could assume that various factors could contribute to the difference above. For example, alterations in sex hormones between males and females, as well as differences in neurotransmitter systems could be one reason [44]. In addition, reasons related to social stigma may prevent males at older ages from expressing their dysphoric feelings, in contrast to women who, on the contrary, are encouraged by the family environment to express their feelings and seek help more openly [45].

As many as 35.7% of parents reported that, in the last six months, they had experienced an intense stressful event in their family. It has been illustrated in the existing literature that stressful life events are significantly associated with the onset of anxiety behaviors in adults, as well as adolescents and children [42, 46, 47]. In the current study, stressful life events were associated with social anxiety in preschool children. Possible causal mechanisms involved in this association include developmental vulnerability in this age period, the impact of stress on brain development, the avoidant responses to stress, and the parental influence on children due to these stressful events [48-50]. It should be noted that this study was conducted two years after the onset of the COVID-19 pandemic, while some of the social distancing measures were still in force in Greece for the protection of the general population. Therefore, there is a high probability that the stressful life events experienced by the families of the young children were related to losses and problems caused by the pandemic and that the pathological anxiety that occurred manifested itself in the form of social phobia. Although exposure to stressful situations appears to be a common factor in causing manifestations of anxiety in all age groups, there is a need for further focused research on the impact of stress especially in the preschool age group.

Furthermore, no beneficial effect of physical exercise in preventing the onset of pathological anxiety was found in our study, in contrast to its well-established benefit in older age groups [12, 13, 15, 17, 18, 51]. In the current study, physical activity is present in children's regular weekly engagement in sports, as well as in the varying amount of physical activity that children engage in

when playing freely in an outdoor environment. However, neither of these categories of children's leisure time was positively correlated with a lower level of anxiety in preschool children. This is likely because preschool children, even when restricted indoors during activity, are still highly mobile, unlike adolescents, adults, and older people, for whom even mild physical activity has a protective effect [52]. Furthermore, we do not know what amount of physical activity is sufficient for preschool children. Even the widely accepted guidelines of the Canadian Society for Exercise Physiology, recommending that children move at a moderate to vigorous pace for at least one hour a day, with more exercise resulting in more physical health benefits, apply to children older than five years [53]. Therefore, the epidemiological data we have on the positive effects of exercise are based on populations older than six years of age and may not be universal [16, 54].

On the other hand, there seemed to be a correlation between preschool children's separation anxiety from their parents and their participation in organized non-athletic activities with a trainer. In other words, the less separation anxiety experienced by preschool children, the more hours they spent in a non-athletic activity or vice versa, a finding that is in line with the findings of previous studies. Based on these studies, children and adolescents who were not involved in leisure time activities [11, 15, 47, 55-57] or preschool children who spent more time close to their parents due to a shortened time in educational settings [42] were diagnosed with higher levels of anxiety symptoms. Regarding organized physical or non-athletic activities, it is considered that in adolescents and young adults, they have a protective effect because they reinforce the sense of belonging [57]. Also, in the same age population, intra-individual differences were found among those who preferred a creative extracurricular activity such as playing a musical instrument, writing texts or lyrics and those who chose athletic activities, the former being more open to new experiences and the latter appearing more outgoing and emotionally stable [55]. Individual characteristics may be the factors involved in the choice of leisure time activities in adolescents and young adults, where physical and non-athletic activities contribute to their emotional self-regulation and sense of well-being. However, this knowledge does not seem to be directly transferable to preschool-aged children, where it was found that non-athletic activities with a trainer are more influential in terms of controlling anxiety behaviors.

Furthermore, a significant correlation was found between preschool children's specific fears and the time of screen use. In line with our study, other epidemiological studies with preschool-aged children showed that screen time use was linked to a delay in the attainment of developmental milestones, as well as emotional and behavioral problems [18, 58-60]. On the other hand, in an eleven-year longitudinal study, it was found that an increase in time spent watching television or engaging with a screen was correlated with an increase in symptoms of anxiety disorders. Still, the sample in that study consisted of adolescents [14]. As noted in the results section, 35% of preschool children in our sample appeared to have spent at least 6 hours in the past week using screens (watching TV or playing computer games, etc.). At the same time, this amount of time did not differ between nursery school children and kindergarten children (Table 2). Similar results in children's screen time use are derived from a plethora of other studies [61-64] where it can be seen that the actual screen time use of young children exceeds the recommended time by the World Health Organization [65].

Studies link increased screen use by children to sleep problems. That is because of disruptions caused to linked biological processes such as vitamin D and melatonin production, and serotonin circulation that contributes significantly to children's ability to control emotions and behaviors [66,

67]. It is suggested that children's sleep has been gradually decreasing since the previous century due to the technological development which involves a wide array of inventions ranging from light bulbs to the portable digital screens of today. The negative effect of the latter is significantly increased when they are found in children's bedrooms [68]. It is estimated that children who use screens for a longer time, even preschool-aged ones, get cumulatively less sleep during weekdays go to bed later, and even later on weekends, further disrupting their circadian rhythm [69-71]. Such alterations are stressful to children, and there are now several studies linking behavioral problems in children with increased screen time and a night sleep duration of fewer than nine hours [60, 72].

Nevertheless, to a large extent, preschool children's daily routines are controlled by their parents. According to research exploring parents' intentions, parents may expose their children to screens so that parents can complete their tasks or even use screens to calm their children's emotional reactions [73, 74]. In this way, preschool children, when using screens alone, are deprived of interaction time with their family members or peers and thus hindered in terms of learning and cultivating emotional and social interaction skills [75, 76]. Things look even worse for children living in deprived areas where safety issues are raised and where children's unmitigated screen time use increases in the absence of other opportunities for engagement outside the house [77]. However, screen use, a passive exposure, shrinks the amount of time spent interacting with others [23, 78].

Moreover, the link between anxiety and screen time might be related to the content of the exposure. Children may be bombarded by images and information that they cannot handle. Violent scenes often appear in both television programs and video games. Children generally tend to imitate what they see [79]. Exposing school-aged children to violent video game scenes has aggravated their aggressive mood and behavior [80, 81], and the impact of this type of content on younger children, whose cognitive development is still incomplete, resulting in them confusing the pretend with reality, is unknown. As described by Piaget and experimentally documented by Rheta De Vries [82] and John Flavell [83], preschool-aged children cannot distinguish between the way objects appear and the way they are. For example, a preschooler, seeing an older child wearing a Halloween mask, may be frightened as if the mask is a witch or a dragon. Three-year-olds, at the sight of an object that looks like something else, generally respond incorrectly to "what really" is what they see; four-year-olds are in a state of transition, providing sometimes correct and sometimes incorrect answers; and it is only after the age of five that children can consistently distinguish between appearance and reality [84, 85]. For this reason, the American Academy of Pediatrics, in its guidelines [86], recommends that parents remain by the side of their children when children are engaged with screens, checking the content and helping them to understand it in depth. Constant exposure of preschool children to stimuli on screens, which they do not understand sufficiently, can lead to confusion and reinforce imaginary fears. In an experimental procedure conducted by Fang and colleagues, preschool children who played a selected range of digital educational games while having fun, but without restriction and supervision, had a higher rate of anxiety and disengagement compared to their peers who engaged with the same material but with time restriction and supervision by their teachers or parents [87].

Finally, regarding the last parameter of preschool children's leisure time, namely outdoor free play time contrary to our research hypothesis, it did not appear to have a protective effect against children's anxiety manifestations. This finding contradicts research studies demonstrating a protective effect [31, 88-96]. The possible reason for not finding a correlation could be the qualitative degradation of outdoor play [97], leading to the fact that outdoor play contributes to

children's self-regulation under certain conditions. Researchers report that preschool-aged children demonstrate poorer adaptive skills in their play [98] and that they approach a more mature form of play -social play- at a slower pace compared to their peers of previous generations [98, 99]. In a related domestic study by Doliopoulou & Rizou [100], teachers, observing children's free play in kindergarten playgrounds, reported that children, at a high rate, did not participate in group play, and their play was rated as aggressive. In the same study, the children's parents reported that due to the limited amount of time they have, their children are restricted indoors, in front of a screen, playing computer games, which results in them growing more competitive, not sharing their games and often waiting for adults to resolve their differences [100]. Finally, according to Kalpogianni [39], in the name of excessive safety, parents and teachers tend to place restrictions on children's outdoor play. This tactic seems to hinder the emotional strengthening of children, as in this way they do not face everyday stressful situations [29].

5. Conclusions

In conclusion, preschool children's screen time was positively and strongly linked to anxiety, as is already known regarding older populations. Participation in physical activities with a coach, a factor that has repeatedly been shown to be protective against anxiety symptoms in adolescents and young people, did not appear to have a similar effect in preschool children. Similarly, gender and age factors did not seem to influence the level of anxiety in preschool children. In addition, in this study, outdoor play time did not appear to protect preschool-aged children from manifestations of anxiety, a finding that requires further investigation. In contrast, participation in organized, but non-athletic, activities with a trainer was correlated with lower levels of separation anxiety in children from their parents. At the same time, a recent experience of stressful life events remains detrimental to the manifestation of social anxiety in this age group as well.

6. Proposals

Preschool children's leisure time is not "of no interest" since it involves everyday activities that have either a protective or a detrimental effect on symptoms of stress and thereby on children's mental health. Balancing the time a child spends between everyday activities is an intervention goal for the parents, the teachers and the mental health professionals. More particularly, action is required by parents to limit young children's time in front of screens of all kinds, as there has been a clear association with anxiety symptoms. There is a need for mental health professionals to work further to determine the safe use of screens by preschool children. Mental health professionals, in collaboration with teachers, are invited to develop programs and actions to raise awareness and educate parents on proper screen use practices to ensure safe screen use by preschool children. For example, according to the American Academy of Pediatrics guidelines [101], parents are encouraged to remain by the side of their children when they are engaged with screens to check the content and help them understand it in depth.

On the other hand, those children who participated in organized non-athletic activities with a trainer showed lower levels of anxiety. Although we do not know exactly what the direction of this correlation is, it is necessary to take action to facilitate children's involvement in such activities, since in Greece, this is a family responsibility and is mainly a burden on the family budget.

7. Limitations of the Study

Although the sample size is deemed sufficient, the selection of families took place exclusively from schools in the administrative region of Attica, who participated voluntarily, with no adequate representation from families of the suburbs with a diverse socio-economic profile. Regarding the parents who participated, some limitations were also identified. Our sample includes disproportionately more parents with high education and average financial income. Yet, this is to be expected, as higher education correlates with a lower risk of poverty. Additionally, Attica has the lowest percentage (6.6%) of people out of compulsory education and employment in Greece, well below the EU average of 9.6% [102]. There is also a lack of data regarding parents' profession, whether they both work or their working method (e.g. working online from home) which could potentially be related to parents' availability to accompany their children to extracurricular activities or outdoor play or affect their permissiveness to children's screen use [103, 104]. Moreover, the vast majority of respondents were the children's mothers. However, it is well established that in a large proportion of mental health studies, fathers' involvement is underrepresented [105, 106].

While we know parents' anxiety affects their children [107], we did not ask parents for such sensitive data as we approached them through their children's schools. However, we collected data on whether families have experienced stressful events in the last six months, which is also closely related to individual anxiety [42, 46, 47].

In addition, limitations emerge from the PAS-R questionnaire which was used to record children's anxiety. Unlike questionnaires addressed primarily to the adult population which, among other things, examine psychological as well as physical manifestations of anxiety [108], PAS-R is based solely on parents' reports and their ability to observe psychological reactions – anxiety behaviors of their children. We also lack other sources of information that could help us evaluate the existence and intensity of anxiety in children (e.g. direct clinical observation, teachers' reports). It is also important to note the lack of a control group, especially concerning the fact that the PAS-R questionnaire used to record anxiety has not been validated in a Greek population. Nevertheless, it is essential to reiterate that this questionnaire has high psychometric properties.

Finally, data on children's screen time use and outdoor play were based solely on parents' subjective reports. However, this data was requested one week before being recorded, which enhances the reliability of the report.

8. Benefits

This study provides interesting epidemiological data concerning the allocation of the leisure time of preschool children living in the capital of Greece, Athens. To our knowledge, such data are currently unavailable in domestic studies on preschool children. The present study demonstrates the correlations of everyday leisure-time activities with anxiety symptoms in these children, as well as information on the link between various demographic factors (e.g., gender, age, experience of stressful events) and the occurrence of anxiety symptoms in this age group. Particular emphasis is placed on comparing our findings with similar correlations found in older age groups.

9. Ethics

The collection of data adhered to the principles of the World Medical Association Declaration of Helsinki [109]. For access to kindergartens, permission was requested from the Ministry of Education. Participation of parents in the study was voluntary and data collection was conducted on an anonymous and confidential basis.

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Author Contributions

Matina Lazaraki conceived the original idea and wrote the manuscript. Ioannis Syros helped form the original idea, shape and write the manuscript. Niki Skopeliti performed the statistical analysis of the sample.

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Competing Interests

The authors have declared that no competing interests exist.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Table S1: PAS-R scales by type of school.

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