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Message from the Editor,

I am very pleased to inform you that we have published the third issue in 2023. As an editor of International Online Journal of Primary Education (IOJPE), this issue is the success of our authors, very valuable reviewers who undertook the rigorous peer review of the manuscripts, and those of the editorial board who devoted their valuable time through the review process. In this respect, I would like to thank to all reviewers, researchers and the editorial board members. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE). For any suggestions and comments on IOJPE, please do not hesitate to send me e-mail. The countries of the authors contributed to this issue (in alphabetical order): Australia, Bhutan, and Turkey.

Prof. Dr. Nergüz BULUT SERİN

Editor in Chief

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PARENTS' ENGAGEMENT AND READINESS IN CHILDREN ONLINE LEARNING IN BHUTAN

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Abstract

The present quantitative study explored parents' engagement in children's online learning, considering parents' readiness to engage in their child's online learning and aligned those with a discussion of parents' education qualifications. The sample of the study was 374 primary school students' parents. The data was gathered through survey questionnaires which were checked for reliability before being administered. Descriptive analysis was employed to study parents' engagement and readiness levels in their child's online learning, and to study the difference in parents' engagement and readiness levels based on parents' education level. One-way ANOVA was employed. In addition, correlation analysis was used to explore the relationship between parents' readiness level and their engagement in children's online learning. The findings from the study revealed that parents were engaged in their children's online learning and confirmed the high readiness level towards involvement in their child's online learning. However, parents' engagement and readiness level differed by parents' educational level so that there was a positive relationship noted between engagement in children's online learning and their readiness towards online learning. Therefore, the study suggests that parental education level and their readiness towards online learning needs to be considered when schools move teaching and learning online.

Keywords: Parents' educational level, parents' engagement level, parents' readiness level, primary school, Bhutan.

INTRODUCTION

There has been a great deal of research interest in parental engagement in children's education in many countries (Mantzicopoulos, 2003; Pomerantz, Moorman, & Litwack, 2007; Wahid, 2022; Yamamoto & Brinton, 2010) where it has been argued that engagement positively benefits the child. These studies generally suggest parents have multiple roles in children's education. The phrase 'parental engagement', or 'parental involvement', is generally taken to mean supporting a child's learning experiences at home or school through direct or indirect involvement (Pomerantz, Moorman, & Litwack, 2007); this engagement has become an essential part of a child's development and learning, particularly during and after the Covid19 pandemic where they were expected to support their children's virtual learning (Lee & Figueroa, 2012; Makrooni, 2019; Woofter, 2019). According to United Nation Educational Scientific and Cultural Organization (UNESCO), it was estimated that more than 990 million children were affected by the COVID-19 pandemic (UNESCO, 2020), which forced education policy makers, and those engaged in teaching and learning children to rethink strategies for teaching and learning before another crisis arise. One such strategy was the use of different Information Communication Technology (ICT) tools across the world. Bhutan is no exception. Online teaching and learning platforms substituted face to face teaching during the pandemic. In addition, the recent reform in school curriculum, popularly termed the National School Curriculum Framework, demands blending the teaching and learning strategy practiced in the country. This new approach has led to an increased and shared responsibility in

the child's learning. Parents, by virtue of being in the room, were entrusted with more roles in managing and facilitating the teaching and learning processes of their children. In fact, the involvement of parents in children's online learning has been considered vital today and is likely to be of paramount importance in the future. Though, in some of countries, online learning proved to be beneficial to both the teacher and learner (Yakubu & Dasuki, 2018), there was a new role for parental engagement during children's online learning (Stevens & Borup, 2015). In other countries, however, we do not yet know what its impact was and will continue to be (Alvarez et al., 2013). As such, this paper explores how parents are engaged in their child's learning through online and are they ready (even able) to adopt this new system of teaching and learning specifically in the developing countries like Bhutan. Accordingly, its aim is to understand the current context of parental engagement and readiness towards their children's online learning. This study was carried out to explore the following questions:

1. What are the perceptions of parents' engagement in their children's online learning?
2. What is the readiness level of parents towards children's online learning?
3. Is there any difference in parents' engagement level in children's online learning based on parents' educational level?
4. Is there any difference in parents' readiness level towards children's online learning based on parents' education level?
5. Is there a relationship between parents' readiness towards online learning and parents' engagement in children's online learning?

Parents' education level, parental readiness, and parental engagement in children's online learning

The term online learning is frequently used interchangeably with other terms including distance learning, virtual education, distance learning technologies, information, and communication technologies (ICT), however, the key feature is the use of modern information technologies (Fedina et al., 2017) and different (multi)media resources to enhance self-directed learning and give ownership over learning to different stakeholders involved in the education process (Algahtani, 2011). It became mandatory during the pandemic with the paradigm shift in teaching and learning from school to home and from face to face to online. However, learning at home through online tools demanded greater willingness and readiness of parents to step up and help manage the process to ensure at the very least the child is engaged in their learning and listening to the teacher through online tools. Thus, the parents' acceptance of their children's learning through online methods needs to be understood because of the onerous nature of the impact of this approach on parents' own work and home lives. Importantly, parents are likely to be unaware of the methods teachers use particularly when teaching and learning events that take place at home (Churiyah et al., 2020), which is exacerbated in countries like Bhutan where the move to online learning happened suddenly during and after the COVID-19 pandemic. Although parental participation has been greatly associated with children's academic achievement (Anderson & Minke, 2007; Gutman & Midley, 2000; Henderson & Mapp, 2002) attendance and pro-social behaviors (Barnard, 2004, Edwards, 2004), these studies were focused more traditionally on learning prior to the pandemic and under normal, classroom based conditions, and as these differed from the online learning system that was implemented to support learning during and after global pandemic, its effect on parents' behavior and willingness to support learning is unknown.

For instance, as far back as 10 years ago, a study by Beck, Maranto, & Lo (2013) recognized that parents have greater responsibilities when children's learning is facilitated online when compared with face-to-face learning. On the other hand, studies have noted parents' engagement in online learning depends on several factors. For example, effective communication between the teacher and the parents could enhance the positive engagement of parents in the integration of online learning (Kong & Li, 2009; Lewin & Luckin, 2010). Parents' beliefs and attitude towards technology usage in children's learning was also influential (Tsuei & Hsu, 2019). Parents' education level (Coman et al., 2020) and their occupation and knowledge of the tools of the subject area and of the lesson, or lack thereof (Putri et al., 2020; Rasmitadila et al., 2020) were all found to be influential. It is evident from the literature cited

here that parents' social and economic factors may have influenced their engagement level in their child's online learning which may adversely affect a child's engagement during online learning (Domina, Renzulli, & Murray, 2021; Herwin & Dahalan, 2022). Similarly, parents' educational attainments are found to be very robustly related with their children's educational attainments (Ermisch & Francesconi, 2001). This, however, may not be true in the case of Bhutanese parents as Bhutan's socioeconomic and cultural factors differ a lot from other countries. Thus, it is deemed important to understand the specific issues faced by Bhutanese schools and students to question school educators about how much parents were engaged and are they ready for the widespread adoption of online learning. Nonetheless, there are significant differences in the literacy rate across Bhutan's districts; specifically, urban areas have a higher literacy rate than rural areas (National Statistical Bureau, 2017). Thus, parental engagement and readiness level during online learning may or may not be efficient and effective.

METHOD

The research methodology is discussed as follows:

Research Design

To address the research questions and look specifically at Bhutan, a quantitative research approach was employed as it saves time and resources in data collection and description (Bryman, 2008; Gorard, 2001).

Research Setting

The study was conducted in the primary schools in one of the provinces of Bhutan; Chhukha Dzongkhag, as it was easy for researcher to reach parents since the researcher works in the same province. So, through the help of school personals like teachers, principals, and other support staff, the data collection was more convenient, and it was also cost effective.

Research Participants and Sample

The population consisted of parents whose children were studying in primary schools (PS) in one of the provinces in Bhutan, Chhukha Dzongkhag. The sample of the parents was drawn from the total number of students who were in the primary schools (PS) in Chukha Dzongkahg. There are 2172 students (Ministry of Education, 2022) studying in 26 primary schools under this province. The final sample of 374 parents (Krejcie & Morgan, 1970) was selected using a simple random sampling method to give every population in the sample an equal opportunity to get selected (Cresswell, 2013). Then the final 374 survey questionnaire was distributed to the parents of 26 schools in Chukha Dzongkhag.

Research Instrument Validity and Reliability

The data was collected using survey questionnaires as it enables researcher to gather data within an abbreviated period of time (Creswell, 2013), which were self-administered as well as collected with the support from school management. The survey questionnaires consisted of two parts; part 1 was demographic data focusing on parents' educational level (Above bachelor's degree, High school level, primary school level and no education). Part 2 was survey questionnaires consisting of 16 items; 8 items on parental readiness levels towards their children's online learning and the other 8 items were on parental engagement in children's online learning. The items were developed on a six-point Likert scale with 1= Strongly Disagree (SDA), 2 = Disagree (DA), 3 = Somewhat Disagree (SWDA), 4 = Somewhat Agree (SWA), 5 = Agree (A), and 6 = Strongly Agree (SA). After setting 16 items of the survey questionnaire as a tool, the validity of the instrument was carried out, mainly to see the ability of the questionnaire to measure a concept or variable that was chosen for this study (see Creswell, 2014). To achieve the objective of the study, content validity, also known as face validity, was carried out, where the instrument was assessed by the expert's suggestion, guided by their own expertise and prior experience in the field. This was done to ensure that the research instrument was within the scope of the study. After eliciting feedback from the expert, the reliability of the instrument was employed mainly to see the stability and consistency of the tool developed for the study (see Creswell, 2010). To ensure

stability and consistency, the survey questionnaire was pilot tested with 20 respondents who were not in the actual sample cohort. The data collected from these 20 respondents was analyzed using SPSS 22 to calculate the Cronbach Alpha value, which is usually accepted and reliable when found above .60 (see Andale, 2014; Pallant, 2001). Considering this value as a benchmark, the overall Cronbach Alpha value of the research instrument was found to be greater than .7 for both parental engagement (.759) during online learning and parental readiness (.860) towards online learning. Further, Cronbach Alpha indicated that 14 items were greater than .7 while two items were indicated to be greater than .6 as shown in Table1.

Table1. Reliability statistics on parental engagement (PE) during online learning

Items on Parental Engagement (PE) during online learning	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Provide Learning facilities (PE1)	.092	.786
Organize Child's online Learning (PE2)	.455	.735
Supervise Child's online learning study time (PE3)	.577	.710
Help Child's learning difficulties during online learning (PE4)	.533	.724
Make contact with child's teacher for effective learning (PE5)	.301	.759
Help child to clear doubts on topic taught through online (PE6)	.276	.761
Keep record of child's work done (PE7)	.699	.682
Help child to prepare online study timetable (PE8)	.689	.683
Overall Cronbach's Alpha=.759		
Reliability statistics on parental readiness (PR) towards online learning		
Items on Parental Engagement (PE) during online learning	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Confident to support child's online learning	.559	.848
Confident in using technologies to support online learning	.608	.847
Have Adequate internet facilities at home	.736	.831
Provide needed technological devices	.608	.843
Aware of online learning tools	.615	.844
aware of online learning platforms	.658	.842
Make use of online learning platforms	.664	.836
Spend more time with child during online learning	.543	.850
Overall Cronbach's Alpha=.860		

Data Analysis

To study the perception of parents' engagement and readiness towards their children's online learning, descriptive analysis; a mean of 1.00-1.82 = Strongly Disagree, 1.83-2.65= Disagree, 2.66-3.48=Somewhat Disagree, 3.49-4.31= Somewhat Agree, 4.32-5.14= Agree and 5.15-6.00 = strongly agree (see Pimentel, 2019) was employed. One-way ANOVA analysis was conducted to see the difference in parents' engagement level and readiness levels in their child's online learning by parents' education level. To study the relationship between parents' readiness level towards online learning and their engagement in online learning, multiple Correlational analysis was used.

FINDINGS OF THE STUDY

The current study was aimed to understand the current context of parental engagement and readiness towards their children's online learning based on the parents' education level in a Bhutanese context. Therefore, the findings of the study are presented below.

1. What are the perceptions of parents' engagement in their children's online learning?

Table 2. Descriptive analysis on parental engagement in children's online learning.

Items	Mean	Std.Dev.	Agreement Level
Provide Learning facilities	5.12	1.05	Agree
Organize Child's online Learning	4.69	1.14	Agree
Supervise Child's online learning study time	4.57	1.18	Agree
Help Child's learning difficulties during online learning	4.54	1.24	Agree
Make contact with child's teacher for effective learning	4.27	1.29	Somewhat Agree
Help child to clear doubts on topic taught through online	4.41	1.37	Agree

Table 2 (Continued). Descriptive analysis on parental engagement in children's online learning.

Items	Mean	Std.Dev.	Agreement Level
Keep record of child's work done	4.25	1.36	Somewhat Agree
Help child to prepare online study timetable	4.31	1.42	Somewhat Agree

The result in Table 2 revealed that of the eight items measuring parents' engagement in their children's online learning, five of the items; providing learning facilities (Mean=5.12); organizing child's online learning (Mean=4.69); supervising child's online learning study time (Mean=4.57); helping child's learning difficulties during online learning (Mean=4.54) and helping child to clear doubts on topic taught through online (Mean=4.41) were rated at an agree level, while, making contact with child's teacher for effective learning (Mean=4.27); keeping record of child's work done (Mean=4.25) and helping child to prepare an online study timetable (Mean=4.31) was rated at a somewhat agree level.

2. What is the readiness level of parents towards children's online learning?

Table 3. Descriptive analysis on parent's readiness level towards their children's online learning.

Items	Mean	Std.Dev.	Agreement Level
Confident to support child's online learning	4.54	1.34	Agree
Confident in using technologies to support online learning	4.23	1.41	Somewhat Agree
Have Adequate internet facilities at home	4.02	1.58	Somewhat Agree
Provide needed technological devices	4.66	1.42	Agree
Aware of online learning tools	4.53	1.31	Agree
aware of online learning platforms	4.48	1.28	Agree
Make use of online learning platforms	4.49	1.23	Agree
Spend more time with child during online learning	4.38	1.27	Agree

The answers presented in Table 3 suggest parents' readiness level on the items; confident to support child's online learning (Mean=4.54); providing needed technological devices was higher (Mean=4.54); aware of online learning tools (Mean=4.53); aware of online learning platforms (Mean=4.48); making use of online learning platforms (Mean=4.49) and spending more time with child during online learning (Mean=4.38) was showed at agree level, whereas in relation to the other responses ,confidence in using technologies to support child's online learning (Mean=4.23) and having adequate internet facilities at home (Mean=4.02) was indicated at somewhat agree level.

3. Is there any relationship between parents' education level and parents' engagement in children's online learning?

Table 4. One-way analysis of variance of parents' engagement in online learning by parents' education level.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.99	3	4.33		
Within Groups	277.14	370	.75	5.78	.001
Total	290.13	373			

One-way ANOVA data analysis in Table 4 showed that there was a significant difference in parental engagement in their child's online learning at the $p<.05$ level based on the parent's education level with $F_{(3,370)} = 5.78$, $p = .001$.

Table 5. Descriptive analysis on parental engagement in child's online learning by parents' education level.

Parents' education level	N	Mean	Std. Deviation	Std. Error
Above Bachelor's degree	68	4.62	.805	.098
High school	169	4.67	.793	.061
Primary School	92	4.31	.946	.099
No education	45	4.22	1.03	.153
Total	374	4.52	.882	.046
Model	Fixed Effects		.866	.04
	Random Effects			.123

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Post hoc comparison using the Turkey HSD test in table 5 indicated that the mean score for parents with high school educational level (Mean=4.67, Std.Dev.=.793) and parents with primary school education level (Mean=4.31, Std.Dev.=.946) was significantly different than parents with no school education levels (Mean=4.22, Std.Dev.=1.03). However, no statistically significant difference was found between parents with education level of bachelor's degree and above, high school level, primary school, and no education level. Furthermore, there was no significant difference found between parents with no education level and primary education level in terms of their engagement in online learning.

Table 6. Multiple comparisons on parents' engagement in child's online learning by education level of parents.

(I) Parents Education Level	(J) Parents Education Level	Mean Difference (I-J)	Std.Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Above bachelor's degree	High school	-.052	.124	.975	-.373	.268
	Primary School	.316	.138	.104	-.042	.673
	No education	.402	.166	.076	-.027	.831
	Above bachelor's degree	.053	.124	.975	-.268	.373
High school	Primary School	.368*	.112	.006*	.079	.658
	No education	.454*	.145	.010*	.080	.829
	Above bachelor's degree	-.316	.138	.104	-.673	.042
Primary School	High school	-.368*	.112	.006*	-.658	-.079
	No education	.086	.157	.947	-.320	.493
	Above bachelor's degree	-.402	.166	.076	-.831	.027
No education	High school	-.454*	.145	.010*	-.829	-.080
	Primary School	-.086	.157	.947	-.493	.320

*The mean difference is significant at the .05 level.

The Turkey HSD post hoc multiple comparison analysis in Table 6 showed that the education level among parents with high and primary school educational qualifications was statistically significant when compared with parents with the no educational qualifications with p=.006 between the high school education level and primary school education level, p=.010 between the high education level and no school education level.

4. Is there any difference in parents' readiness level towards children's online learning based on parents' education level?

Table 7. One-way analysis of variance on parent's readiness toward children's online learning by parent's education level.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.97	3	7.99		
Within Groups	324.43	370	.88	9.11	.000*
Total	348.40	373			

*p<.05

One-way ANOVA data analysis in Table 7 showed that there was a significant difference in parents' readiness towards children's online learning at the p<.05 level based on the parent's education level with $F_{(3,370)}$=9.11, p=.000.

Table 8. Descriptive Analysis on Parent's readiness in children's online learning by parents' education level.

Parents' education level	N	Mean	Std.Dev.	Std.Error
Above bachelor's degree	68	4.84	.786	.095
High school	169	4.47	.964	.074
Primary School	92	4.20	.993	.104
No education	45	4.03	.920	.137
Total	374	4.42	.966	.050
Model	Fixed Effects		.936	.048
	Random Effects			.168

In Post hoc comparison using the Turkey HSD test in Table 8, it was indicated that the mean score for parents with a bachelor degree and above educational level (Mean=4.84, Std.Dev.=.786) was significantly different than the parents with a high school education level (Mean=4.47, Std.Dev.=.964), parents with primary education level (Mean=4.20, Std.Dev.=.993) and parents with no education level (Mean=4.03, Std.Dev.=.966). Furthermore, mean scores of parents with high school education level were also significantly different than parents with no education level. However, no statistically significant difference was found between parents with a high school level and primary school education levels and those with a primary school education level and no education level.

Table 9. Multiple comparisons on parents' readiness in child's online learning by education level of parents.

(I) Parents Education Level	(J) Parents Education Level	Mean Difference (I-J)	Std.Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Above bachelor's degree	High school	.375*	.134	.028*	.028	.721
	Primary School	.648*	.150	.000*	.262	1.035
	No education	.810*	.180	.000*	.346	1.274
	Above bachelor's degree	-.375*	.135	.028*	-.722	-.028
High school	Primary School	.273	.121	.111	-.040	.586
	No education	.436*	.1571	.030*	.0302	.841
	Above bachelor's degree	-.648*	.150	.000*	-1.035	-.262
Primary School	High school	-.273	.121	.111	-.586	.039
	No education	.162	.170	.776	-.277	.602
	Above bachelor's degree	-.810*	.180	.000*	-1.274	-.346
No education	High school	-.436*	.157	.030*	-.841	-.030
	Primary School	-.162	.170	.776	-.602	.277

*The mean difference is significant at the .05 level.

The Turkey HSD post hoc multiple comparison analysis in Table 9 showed there was a significant difference in parents' readiness to assist with children's online learning between parents with bachelor degree and above education level and parents with high school education level with p=.028, parents with bachelor's degree and above education level and primary education level with p=.000, parents with bachelor's degree and above education level and parents with no education with p=.000. In addition, there was also a significant difference in parents' readiness towards children's online learning between parents with high school education qualification and parents with no education qualification with p=.030.

5. Is there a relationship between parents' readiness towards online learning and parents' engagement in children's online learning?

Table 10. Pearson product moment correlation coefficient between parents' readiness level towards online learning and parents' engagement level during the online learning (N=374).

	Parents Engagement in Online Learning
Parents' readiness towards online learning	.674**

*Correlation is significant at .01 level (2-tailed)***

Table 10 revealed that there was a moderate positive correlation between parents' readiness towards online learning and parents' engagement during online learning (r=.674 with p≤.01).

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

The discussion will focus on four themes: (1) parents' engagement in their children's online learning, (2) their readiness towards supporting their children through online learning, (3) their engagement in online learning and readiness based on education level, and (4) the relationship between parents' readiness to support their children's online learning and parents' engagement in children's online learning.

Parents' engagement in children's online learning

Schooling and education would not be possible without the active participation of parents in their children's learning. Thus, research suggests that the greater the involvement of parents in their children's learning, the better the performance of children in school (Lara & Saracostti, 2019; Wang & Sheikh-Khalil, 2014; Sheldon, 2009). In line with those studies, the current study found that Bhutanese parents rated they agree that their involvement was important to their child's success and suggested their engagement in supporting online learning could take many forms including providing learning facilities, organizing the child's learning at home, supervising online learning study time, helping with the child's learning difficulties, and helping the child to clear up any issues they had during online learning. The present study validates the work of Dwiyono, Harnowo, and Ridani (2021), who found that the role of parents was seen to be particularly important in the child's learning at home. Similarly, Hoover-Dempsey, Walker, Sandler, Whetsel, Wilkins, and Closson (2005) stated that parents should be more aware of the importance of home access to ICT. However, the study found that parents did not completely agree in terms of their engagement, including contacting the child's teacher to determine their role in effective online learning, keeping a record of work done by the child, or helping the child to prepare an online study timetable. Thus, to fully involve parents in their children online learning may require campaigns that focus on effective parent-teacher communication, home-school communication, and improving parents' understanding of their role and the requirements for involvement in their children's learning (Smith, Burdette, Cheatham, & Harvey, 2016), which could improve the collaboration and engagement of parents in the online learning of their children.

Parents' readiness towards children's online learning

The role of parents in children's online learning included organizing learning, facilitating learning, monitoring learning, motivating learning, nurturing learning, and supporting learning (Budhrani et al., 2021). In line with these previous findings in other studies, it was noted here that Bhutanese parents felt some level of confidence in supporting their child's online learning, providing technological devices, their awareness of learning tools, and some capacity at making use of online learning platforms, and spending more time with their children. On the other hand, the parents' readiness level in using technologies and providing adequate home internet facilities was considered challenging possibly due to the specific and unique challenges of living in a developing country.

Parents' engagement in children's online learning by parents' education level

Involving themselves in children's online learning was deemed essential, but such involvement may be easier said than done. This is because children come from divergent backgrounds, and it is this difference in backgrounds that plays an important role in parents' ability to engage effectively in their children's online learning. It is well known that a parent's socioeconomic background significantly affects their participation in their children's online learning, as found in the study conducted by Amanor-Mfoafo, Akrofi, Edonu and Dowuona in 2020. The researchers concluded that high socioeconomic status parents are more comfortable and able to assist with their children's learning at home than low socioeconomic status parents. In line with their study, the findings of this current study reveal that parents' education level significantly influenced their engagement in their child's online learning.

Parents' readiness toward children's online learning by parent's education level

Effective engagement in a child's learning may depend on how one perceives the importance of learning online, but more than that, the readiness of a parent to assist with online learning needs to be considered, which depend on one's socioeconomic background, not least because of a difference in ability to afford the tools to facilitate online learning. In addition, a study conducted by Bhamani et al., (2020) concluded that parents' level of familiarization with technology usage and online learning tools affected their ability to support their children, and those who are most effective in engaging in children's learning at home are those who have a good deal of experience with the tools. Furthermore, Lase, Zega, Daeli, and Zaluchu (2022) concluded that parent's inability to become teacher at home influence parent's involvement in the online learning. Similarly, the current study revealed that while all parents have a high readiness level toward their children's online learning and are broadly sympathetic to their role

helping their children, their education level influenced their ability to turn that readiness level into effective support for their children's online learning.

Relationship between parents' readiness level towards online learning and their engagement in children's online learning.

Parents' engagement in children's online learning depends on several factors and one very crucial factor is parents' readiness level towards online learning (Siahaan, Murniarti, & Simbolon, 2021) as capacity to help their children learn online. Similarly, the current study found there was a positive relationship between parent's readiness towards online learning and their engagement in children's online learning. However, the parents training and readiness towards online learning need to be considered (Dong, Simin, & Hui, 2020) before involving parents in online learning with their children.

Conclusion

Parents' involvement plays a crucial role in the wholesome development of a child. The recent move made by Bhutan's Ministry of Education in adopting, implementing, and continuing learning through online tools can only be effective if schools, teachers, parents, and children work collaboratively. In fact, more than educational institutions, it is imperative to understand from the parent's perspective, as they are the ones sitting there in the room with children while they undertook their online lessons. So, the current study, which aimed to explore the level of parental engagement and readiness level in children's online learning, was so important. It concluded that parents do get engaged in their children's online learning with high readiness towards online learning, specifically in the Bhutanese context, but it was each parents' education level that determined the level of parental engagement and readiness towards the child's online learning. Hence, based on the current study, schools could partner with parents to have effective online teaching and learning considering the parents educational qualification and their readiness towards online learning. Potentially, home hubs with supportive parents with higher education levels could be established to help 'train' parents with lower education levels toward readiness and effectiveness in supporting online learning.

Limitations and recommendations

The first limitation of the study is the sample size. Because the study was conducted in one province, it cannot fully account for how every parent perceived online learning as whole in the country. Therefore, a future study could focus only on large scale sample covering other provinces in the country to explore the level of engagement and readiness towards their child's online learning. Involving more participants in the study would give more insights on the research topic. Second, the study was targeted only at Primary schools with a single quantitative research approach, and as such, it cannot be concluded that the same pattern of parental engagement and readiness level would be replicated across all levels of a school. So, future research studies could include different school levels with a mixed method study approach.

Ethics and Conflict of Interest

The authors declare that the study has not unethical issues and that research and publication ethics have been considered carefully. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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TEMPERAMENT AND PARENT-CHILD RELATIONSHIP AS PREDICTORS OF PROSOCIAL BEHAVIOR OF 60-72-MONTH-OLD CHILDREN

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Abstract

This research aims to determine to what extent temperament and parent-child relationship predict the prosocial behaviors of 60-72-month-old children. The study group of the research consists of 313 mothers and 126 fathers. Data analyzes were carried out separately in mother and father groups. "Personal Information Form", "Child Prosocialness Scale", "Short Temperament Scale for Children", "Child-Parent Relationship Scale" were used as data collection tools. Data were analyzed using Pearson product-moment correlation coefficient and multiple regression analysis. The results obtained from the mothers in the study group revealed that approach, persistence, rhythmicity, reactivity which are the child temperament, and negative mother-child relationship together significantly predicted children's prosocial behaviors. As for the results obtained from the father participants in the study group, it was found that approach, the persistence of the child temperament, and negative father-child relationship together significantly predicted children's prosocial behaviors. As a result of the study, the importance of the relationship between child temperament and the child-parent relationship with prosocial behaviors was revealed. The findings of the research were discussed in light of the literature and research, and suggestions were presented.

Keywords: Prosocial behavior, temperament, parent child relationship, preschool period.

INTRODUCTION

As genuinely social creatures, human beings have always strived to socialize and integrate themselves into society (Malti & Dys, 2018). There are a lot of values helping individuals to enhance their well-being in society, and these values affect them positively by allowing both individuals and societies to become more contended and more robust. When people display behaviors in accordance with the goals of people around them rather than merely focusing on achieving their own life goals, they start to lead a more meaningful life (Van-Tongeren et al., 2016). Such behaviors are called prosocial behaviors.

Prosocial behaviors play a significant role in social development and a coherently functioning society (Eisenberg, 2003; Eisenberg et al., 2006; Zhao, 2009). They basically involve behaviors displayed by individuals on their own will for the benefit and well-being of others (Eisenberg & Mussen, 1997) and emotions reflecting how they care and worry about others. Prosocial behaviors provide invaluable benefits for the self, others, and society (Eisenberg et al., 2006). They are often explained by referring to different concepts such as cooperation (Malti & Dys, 2018; Svetlova et al., 2010) and sharing, helping, and comforting a troubled person (Carlo et al., 2011; Dunfield et al., 2011; Knafo-Noam et al., 2015; Knafo- Noam et al., 2018; Warneken & Tomasello, 2013; Zahn- Waxler et al., 1992). All

societies attach special importance to prosocial behaviors, and those who display such behaviors promote a positive social environment and a sensitive and healthy society (Caprara et al., 2000). Children start to exhibit prosocial behaviors starting from the pre-school period. The preschool period, which covers the 0-6 age group, is very vital in terms of the realization of linguistic, cognitive, sexual, social, and emotional development. In addition to these, children's empathy skills and positive peer relations also develop in the preschool period. They build up their inclination to display prosocial behaviors while developing their perceptions of others and the world (Grusec et al., 2002; Hay, Cook, 2007). The studies reported that children who display prosocial behaviors while solving the problems they encounter in their social life are more successful in making friends and maintaining their relationships (Özkan, 2015; Webster-Stratton et al., 1999). Prosocial behaviors have a therapeutic effect on both individuals and societies, which allows especially children to maintain their social relationships in an effective and quality way (Altıntaş & Bıçakçı, 2017; Güngör Aytar, 2015).

It has been suggested that social skills develop significantly between 5 and 6 years of age, which also corresponds to the late preschool period (Ekici, 2015; Göktaş & Gülay, 2010; Karoğlu & Ünüvar, 2017). Preschool children with developed social skills display more prosocial behaviors and contribute to the development of a positive social environment (Caprara et al., 2000). Under proper conditions, preschool children can help others (Liszkowski, 2005), they can noticeably express their sadness when someone has problems or feels troubled and embrace him/her with affection (Brownell et al., 2009; Zahn-Waxler et al., 1992), cooperate with others to achieve common goals (Brownell et al., 2006; Warneken & Tomasello, 2007) and voluntarily share his toys and food (Brownell et al., 2009; Dunfield et al., 2011). However, there are some individual differences among preschool children in terms of displaying such behaviors (Yağmurlu & Sanson, 2009). Some children might voluntarily and easily display prosocial behaviors such as comforting, helping, and sharing while others might find it difficult to show these behaviors, may not be sensitive towards their environment or may not display prosocial behaviors although they are aware that others need help (Padilla-Walker & Carlo, 2014). In order to explain prosocial behaviors, researchers deal with temperament as a biological factor (Knafo & Plomin, 2006; Kumru et al., 2005; Laible et al., 2014; Laible et al., 2017; Malti & Dys, 2018; Prior et al., 2000; Sanson et al., 2004; Yağmurlu et al., 2005; Yağmurlu & Sanson, 2009) and parental behaviors as an environmental factor (Bureau et al., 2017; Daniel et al., 2015; Ferreira et al., 2016; Gryczkowski et al., 2018; Hallers-Haalboom, 2014; Padilla-Walker, 2015; Ruiz-Ortiz et al., 2017; Robinson et al., 2021).

Temperament, which is a factor affecting prosocial behavior, is defined as biological and partially stable features in emotion, behavior, and attention processes as well as personality traits that can be shaped according to environmental experiences (Callueng & Oakland, 2014). Temperament also refers to certain characteristics that exist in the early phases of human life and often lead to different reactions to the experiences regarding social relationships shaped within the framework of social and environmental interactions (Shiner & Caspi, 2003). Temperament contributes to social development by determining how the child perceives his environment and how he reacts accordingly (Rothbart & Bates, 2006). Relatively calm and patient children have better social relationships with their peers (Laiable et al., 2017; Yağmurlu & Sanson, 2009). On the other hand, children with a fiery temperament, i.e those who are more prone to display anger and frustration, have weaker social skills in their relationships with their peers and tend to display anti-social behaviors more (Acar et al., 2019; Diener & Kim, 2004; Yağmurlu & Altan, 2010). The related studies show that flexibility and persistence correlate with positive emotional and behavioral adjustment and social skills (Laible et al., 2014), and fiery temperament correlates with problematic behaviors (Arı & Yaban, 2012; Diener & Kim, 2004; Yağmurlu et al., 2005; Yağmurlu & Sanson, 2009; Yağmurlu & Altan, 2010). Temperament correlates also with ego resilience (Önder et al., 2018), emotion regulation skills (Akbaba, 2017), self-regulation skills (Özdemir & Budak, 2019), attention and focusing skills (Laible et al., 2014) and quality time spent with parents (Brown et al., 2011). Temperament plays a crucial role in the social and emotional development of children, and it has a long-term effect on to what extent they adapt to life in a wider circle of relationships in school environment (Rothbart & Bates,

2006; Sanson et al., 2004; Stright et al., 2008). As for prosocial behaviors, the presence of a social environment to encourage these behaviors is crucial for children with different temperaments (Carlo et al., 2010; Mc Ginley, 2008). The closest social environment to a child at his birth and throughout the preschool period is his parents. Therefore, parent-child relationship is vital in the development of social skills, which might affect children's interpersonal relationships in the following years.

Social environment as well as personality traits have remarkable effects on the development of an individual. Behaviors to be acquired by children at early ages are inevitably the outcomes of an ongoing mutual interaction in this social environment (Yazıcı & Salıkutluk, 2018). When we consider the fact that children interact for the first time in a social environment with their parents, it is obvious that the way parents interact with their children builds up a strong basis for the development of prosocial behaviors that are essential for many areas of functionality (Gryczkowski et al., 2018). Especially, the experiences in the preschool period are significant in terms of parent-child relationship, and the related studies showed that such experiences lead to the most rapid changes in the development process in the first six years of a human's life (Kleim & Jones, 2008). Children need the care of their parents and should develop trust in them. They gain new experiences as a result of their interactions with their parents throughout the developmental phases. These experiences help children to form a basis for their emotions and behaviors towards themselves, others, and the world (Fabes et al., 2001; Fraley et al., 2013; McElwain et al., 2007). The effects of parent-child relationship differ depending on whether the parent is a mother or father. The mother and the father independently have strong effects on the development of the child (Daniel et al., 2015). The time spent with the child, the activities they do together, and their interaction style might vary according to the gender of the parent (Hallers-Haalboom et al., 2014; Lewis & Lamb, 2003). It has been emphasized that the recent studies conducted with preschool children have often focused on mother-child relationship (Buraeu, 2016; Daniel et al., 2015). In addition, father-child relationship plays a significant role in children's social development (Cabrera et al., 2007). Fathers are now being involved in children's social development more and more (Robinson et al., 2021).

Healthy mother-child and father-child relationships allow children to enhance their sensitivity and direct their attention towards understanding others as well as their own emotions and needs (Malti et al., 2013; Grusec & Davidov, 2010; Hastings et al., 2007). A healthy parent-child relationship and mutual sensitivity contribute to the development of prosocial behaviors, which also require the development of empathy with others (Daniel et al., 2015). A negative parent-child relationship implies the presence of conflict. In other words, a hostile, conflicting, and aggressive parent-child relationship may result in conflicting relationships between the child and others. These negative experiences might also affect the child's relationships with others (Myers & Pianta, 2008). Parents feel insufficient and distressed in a conflicting relationship, and children feel insecure and develop negative schemes and become insensitive toward others' needs (McGinley, 2008). On the other hand, a mutually sensitive and positive parent-child relationship in preschool period positively affects children's social development (Hastings et al., 2007; Kochanska & Murray, 2000; Padilla-Walker & Carlo, 2015); however, there is a negative correlation between conflicting and negative parent-child relationship and the child's prosocial behaviors (Cornell & Frick, 2007; Deater-Deckard et al., 2001; Knafo & Plomin, 2006; Romano et al., 2005; Padilla-Walker, 2014; Smetana et al., 2009). Mothers and fathers have unique effects on their children, it is seen that the variables related to parents regarding children's positive social behaviors in both Turkish and foreign literature are mostly related to mothers (Laible et al., 2017; Padilla-Walker & Carlo, 2014). While there is no research examining the relationship between children's positive social behaviors and father-child relationship in Turkey, it is seen that it is a variable that has just started to be investigated abroad (Bureau et al., 2017; Daniel et al., 2015; Ferreira et al., 2016; Gryczkowski et al., 2018; Hallers-Haalboom et al., 2014; Robinson et al., 2021; Ruiz-Ortiz et al., 2017). As valuable as it is to examine the place of mothers in child development, it is also important to evaluate how fathers affect children's development.

Temperament has also an undeniable effect on children's social development and their communication with important people (mother and father) in their environment (Yağmurlu & Sanson, 2009). A common finding reported by many studies on social development is that environment affects temperament and social relationship and it is not possible to deal with this correlation as an issue independent from the nearby environment (Sarı, 2018). Studies found that there was a relationship between prosocial behaviors and temperament (Acar, 2013; Eisenberg et al., 2019; Hipson & Seguin, 2016; Laible et al., 2017; MacGowan & Schmidt, 2020a; MacGowan & Schmidt, 2021; Song et al., 2018; Stright et al., 2008; Yağmurlu & Sanson, 2009; Waller et al., 2001; Laible et al., 2017; Romano et al., 2005; Gross et al., 2017; Hastings et al., 2007; Padilla-Walker, 2014) prosocial behaviors and the mother-child relationship (Cornell & Frick, 2007; Deater-Deckard et al., 2001; Laible et al., 2017; Romano et al., 2005; Gross et al., 2017; Hastings et al., 2007; Padilla-Walker, 2014) prosocial behaviors and father-child relationship (Bureau et al., 2017; Daniel et al., 2015; Ferreira et al., 2016; Gryczkowski et al., 2018; Haller-Haalboom et al., 2014; Robinson et al., 2021; Ruiz-Ortiz et al., 2017). However, examining the relationship between child temperament and parent-child relationship with prosocial behaviors together is as essential as examining them separately.

It is thought that it is important to investigate both environmental and individual characteristics together, rather than associating positive social behaviors with only environmental or only individual characteristics, and to address the interaction of environmental and individual characteristics that affect the child's development. Temperament, one of the individual characteristics, manifests itself, especially in social environments (Prior et al., 2000). When considered in the context of 60-72 months, this age period is the period when children begin to be actively involved in peer groups. When children start preschool education and begin to be actively involved in peer groups, it is seen concretely how the characteristics of their temperament and their relationship with their parents affect their social life. In the preschool period, while playing games with their friends, children face some problems brought about by being in collective activities. While solving these problems, they may use the relationship models they have adopted as a result of their experiences in their relationships with their parents or exhibit behaviors brought about by their temperamental characteristics. Therefore, it is considered valuable that the parents of children who have started and continue preschool education and who are included in peer groups constitute the study group of this research. It is important to reveal the effects of temperament, mother-child, and father-child relationships that affect positive social behaviors in this group. As a result of revealing these effects, the ways that can be followed to improve positive social behaviors according to temperament types can be evaluated and suggestions can be made to improve the relationship of mother and father with the child. Thus, prosocial behaviors, which are reflections of a child's personality traits, are evaluated together with the child's temperament and the parent-child relationship. The aim of the current study is to examine whether temperament and parent-child relationship are predictors of prosocial behavior in 60-72-month-old children.

METHOD

Research Model

This research was carried out with a prediction study, which is one of the correlational designs. Prediction studies aim to identify which of a set of variables is most highly correlated with the dependent variable (Gay et al., 2009; McMillan & Schumacher, 2006). This study, which was conducted by using correlational design, examined to what extent temperament and parent-child relationship were predictors of prosocial behavior of 60-72-month-old children.

Participants

The study group consisted of parents of 60-72-months-old children who attended preschool educational institutions. The data were collected from 439 parents (313 mothers and 126 fathers). Table 1 and Table 2 below presented the frequency and percentages of the demographic information about the children for the following variables: gender, order of birth, duration of preschool education, the number of siblings, age of mother, age of father, educational background of mother and

educational background of father.

Table 1. The demographics of the recruited study participants (Mother Group).

Variables		*n*	%
Gender	Female	164	52.4
	Male	149	47.6
Birth Order	First Child	155	49.5
	Second or Older Child	158	50.5
Preschool education period	1 Year	233	74.4
	2 Years or Above	79	25.2
	None	1	.3
Siblings Number	No Sibling	73	23.3
	1 Sibling	169	54
	2 Siblings or Above	71	22.7
Mother Age	20-25	19	6.1
	26-30	75	25.5
	31-35	98	33.3
	36-40	87	29.6
	41 +	34	11.6
Father Age	20-25	1	.3
	26-30	29	9.3
	31-35	87	27.9
	36-40	108	34.6
	41+	83	26.6
Mother Education	None	5	1.6
	Elementary School	83	26.5
	High School	97	31
	Bachelor's degree or higher	131	41.9
Father Education	None	2	.6
	Elementary School	84	26.8
	High School	93	29.7
	Bachelor's degree or higher	130	41.5
	None	6	1.9
	Total	313	100

Table 1 includes the demographic information of the children of 313 mothers in the study. When the table is examined, 164 (52.4%) of the children are girls and 149 (47.6%) are boys.

Table 2. The demographics of the recruited study participants (Father Group).

Variables		*n*	%
Gender	Female	60	47.6
	Male	66	52.4
Birth Order	First Child	58	46
	Second or Older Child	68	50.5
Preschool education period	1 Year	98	77.8
	2 Years or Above	28	22.2
Siblings Number	No Sibling	27	21.4
	1 Sibling	63	50
	2 Siblings or Above	36	28.6
Mother Age	20-25	4	3.2
	26-30	31	29
	31-35	40	37.4
	36-40	36	33.6
	41+	15	11.9

Table 2 (Continued). The demographics of the recruited study participants (Father Group).

Variables		*n*	*%*
Father Age	20-25	0	0
	26-30	10	7.9
	31-35	38	32.8
	36-40	40	34.5
	41+	38	32.8
Mother Education	Elementary School	38	30.2
	High School	49	38.9
	Bachelor's degree or higher	38	30.2
	None	1	.8
Father Education	Elementary School	36	28.6
	High School	33	26.2
	Bachelor's degree or higher	56	44.4
	None	6	1.9
	Total	126	100

Table 2 shows the demographic information of the children of 126 fathers who participated in the research. According to the table, 60 (47.6%) of the children are girls and 66 (52.4%) are boys.

Data Collection Tools

The data regarding demographic information about the children and the parents were collected by administering the "Personal Information Form". In addition, "Child Prosocialness Scale" was used to measure the children's prosocial behavior levels and the data to evaluate their temperament were collected by administering the "Short Temperament Scale for Children". Finally, the "Child Parent Relationship Scale" was employed to determine levels of child-mother and child-father relationships. The data instruments used in the present study are explained in detail below.

Personal Information Form

The Personal Information Form was developed by the researchers to indicate the demographic characteristics of the participants. The form includes the child's gender, duration of preschool education, the number of siblings, the ages of mother and father, their educational background, and their marital status.

Child Prosocialness Scale

Developed by Bower (2012) and adapted to Turkish by Bağcı and Öztürk Samur (2015), *Child Prosocialness Scale* aims to determine prosocial behavior levels of 5-7-year-old children. A pilot study was carried out with parents and teachers of 30 children for the validity and reliability studies of the scale. This 5-point Likert scale uses the following ranking: (1) Never, (2) Rarely, (3) Sometimes, (4) Usually, and (5) Always. The scale has three different forms: Mother, Father, and Teacher. The present study used the "Mother and Father Forms" to collect the data. A high score obtained from the scale indicates a high level of prosocial behaviors. The Mother Form consists of 21 items and the Father Form has 22 items, and both forms have a single-dimensional structure. The exploratory factor analysis of the Mother Form showed that it accounted for 37.45% of the total variance and the Father Form 38.09% of the total variance. The single factor structure of both forms was confirmed by the results of the confirmatory factor analysis. The reliability coefficient was calculated as .91 for the Mother Form and .92 for the Father Form in the reliability study of the scale (Bağcı & Özturk Samur, 2015). In this research, the Cronbach alpha coefficient was found to be .81 for the Mother Form and .91 for the Father Form.

Short Temperament Scale for Children

The *Short Temperament Scale for Children* was developed by Prior et al. (1989) to evaluate temperament characteristics in early childhood and adapted to Turkish by Yağmurlu and Sanson (2009). The first step of the adaptation process was to employ the translation-back translation method, which was followed by its administration to the parents of 58 Turkish children residing in Australia.

This scale consists of 30 items under four dimensions: reactivity, persistence, approach/withdrawal, and rhythmicity. Approach/withdrawal dimension refers to the ability to adapt to new people and environments and reactivity is about being alert for reacting to an instruction and situation while persistence explains the ability to focus one's attention on an activity and rhythmicity means the regularity of a child's routine behaviors in his daily life such as eating and sleeping patterns. This 6-point Likert scale uses the following ranking system: (1) Almost never; (2) Not very often; (3) It depends, it generally happens; (4) It depends, it generally does not happen, (5) Often; and (6) Almost always. A high score from each dimension indicates high reactivity, high persistence, high approach and high rhythmicity. Yağmurlu and Altan (2010) administered this scale to the mothers of 46-70 months-old children who attend daycare centers in İstanbul. The participant mothers (n=145) were from middle-class and upper-class families. The reliability of the scale for each dimension was calculated as follows: .75 for approach/withdrawal, .69 for reactivity, .75 for persistence, and .63 for rhythmicity. In this research for the Cronbach alpha values for the mothers, the following values were found for each dimension: .72 for approach/withdrawal, .76 for reactivity, .73 for persistence, and .53 for rhythmicity. For the fathers were calculated as .72 for approach/withdrawal, .81 for reactivity, .73 for persistence, and .39 for rhythmicity.

Child-Parent Relationship Scale

The Child-Parent Relationship Scale was developed by Pianta (1992) in order to explore the parent-child relationship. The scale was adapted to Turkish by Akgün and Yeşilyaprak (2010) in a study conducted with 234 mothers of children whose ages range between 4 and 6. The analyses done for reliability and validity showed that this 24-item scale has two dimensions: "conflict" (14 items) and "positive relationship" 10 items. It has a 5-point Likert scale that uses the following ranking system: (1) not true of me at all, (2) not true of me, (3) undecided, (4) true of me, and (5) certainly true of me. A high overall score obtained from the scale indicates a conflicting relationship and a low score a positive relationship. The results of the exploratory factor analysis showed that positive relationship accounts for % 22 of the total variance while conflict accounts for %14 of the total variance and both dimensions % 36 of the variance. The test-retest reliability coefficient was calculated as .98 for conflict, .96 for positive relationship, and .96 for the overall scale. As for the internal consistency coefficients of the scale, the researcher found the following values: .85 for the conflict dimension, .73 for the positive relationship dimension, and .73 for the overall scale (Akgün & Yeşilyaprak, 2010). In the current study, Cronbach alpha value was found to be .80 for the data collected from the mothers and .77 for those obtained from the fathers.

Data Collection

The dataset of the study includes the data collection instruments used in the present study. In the first part of the data set is the *Informed Consent Form* which provides detailed information about the purpose of the study, information about the researcher, and how to fill out the questionnaire. The form also specifies that participation in the study is on a voluntary basis and the personal data collected will not be shared with anyone and will be used only for the purposes of the study. The later sections of the data set involve personal information form as well as the instructions for the scales and the items. The data was uploaded as a Google Form link in an electronic environment so that they could be printed out when needed. The ethical clearance was obtained from a state university and the Aydın Provincial Directorate of National Education. The principals of public and private kindergartens and primary schools in the city were informed about the study so that the researcher could collect the data from these educational institutions. The preschool teachers were accessed via the principals, and the printed or electronic versions of the scales were provided for the parents of children in 60-72 months age range. The data collection procedure lasted approximately 10 minutes, and the data were collected in January - February 2022.

Data Analysis

SPSS 28.0 software was used for the statistical analyses at .05 level of significance. Multiple regression analysis was done in order to examine to what extent child's temperament and his

relationship with either of the parents predict prosocial behaviors. Skewness and kurtosis values and whether the data have normal distribution or not were examined prior to the regression analysis. The skewness and kurtosis values ranging between -2 and +2 indicate normal distribution (Bryne, 2010; George & Mallery, 2010; Kline, 2011). Mahalanobis distances were employed while determining the extreme values and the criteria here was that the values should not be lower than .001, which is the critical value (Büyüköztürk, 2012). The results did not reveal any extreme values and the data showed a multi-variable normal distribution, which is a requirement to do regression analysis (Büyüköztürk, 2012). Other assumptions to be met in order to do multiple regression analysis are that the correlation between dependent and independent variables should be linear and there should not be a high correlation between predictive variables (correlation should be lower than .80) (Field, 2005). Pearson correlation analysis showed that the correlation between the variables was not higher than .80. Another way to determine the multiple correlation between predictive variables is to examine variance inflation factors (VIF) or tolerance values, which refers to the percentage of the variance that is not accounted by other independent variables (Can, 2020) When VIF value is 4 or lower (Black et al., 2010) and tolerance value is higher than 0.2, there is not a multiple correlation that might cause a problem for the analysis (Field, 2005). The analysis showed that tolerance and VIF values are within the acceptable range: negative relationship (tolerance =.84, VIF=1.17), approach (tolerance =.99, VIF=1.01), persistence (tolerance =.80, VIF=1.25), and rhythmicity (tolerance =.88, VIF=1.15) in the data collected from the mother group; and negative relationship (tolerance =.93, VIF=1.07), approach (tolerance =.99, VIF=1.00), persistence (tolerance =.92, VIF=1.08) and rhythmicity (tolerance =.88, VIF=1.15) in the data collected from the father group. Therefore, multiple correlation analysis was done since all the conditions were met.

RESULTS

First, the mean, standard deviation, and standard error values of the scales were analyzed. The values for the mother and father groups are presented in Table 3.

Table 3. The descriptive statistics of the variables (Mother and Father Group).

Variables (Mother group)	**n**	**Mean**	**Std.Error**	**Std.Dev.**
Prosocial Behavior	313	79	.73	12.92
Approach	313	27.92	.42	7.51
Persistence	313	29.64	.40	7.07
Rhythmicity	313	29.64	.32	5.66
Reactivity	313	25.09	.48	8.55
Negative relationship	313	50.43	.62	10.96
Variables (Father group)	**n**	**Mean**	**Std.Error**	**Std.Dev.**
Prosocial Behavior	126	84	1.16	13.09
Approach/Withdrawal	126	26.92	.64	7.21
Persistence	126	28.08	.63	7.12
Rhythmicity	126	29.10	.46	5.16
Reactivity	126	24.23	.80	9.03
Negative relationship	126	50.62	.92	10.37

Pearson correlation analysis was conducted to determine the relationships between prosocial behavior, temperament, and parent-child for the mother and father groups. Later, the multiple regression analysis is conducted to child temperament and mother-child relationship predict prosocial behaviors, the prediction of prosocial behaviors of child temperament and father-child relationship.

Correlation values between .01 and .29 indicate a low-level, and correlation values between .30 and .70 indicate a medium-level relationship (Pallant, 2011). As can be seen in Table 4, a moderately positive and significant relationship between prosocial behavior and approach (r=.35, p<.01), a low level of positive significant correlation between prosocial behavior and persistence (r=. 28, p<.01), a low level of positive significant correlation was found between prosocial behavior and rhythmicity

(r=.23, p<.01). On the other hand, there is a low level, negative significant relationship between prosocial behavior and reactivity (r= -.11, p<.05).

Table 4. Result of correlation analysis to determine the prediction of child temperament and parent-child relationship on prosocial behaviors in the mother and father group.

Variables (Mother Group)	1	2	3	4	5	6
1. Prosocial Behavior	-					
2. Approach	.35**	-				
3. Persistence	.28**	-.04	-			
4. Rhythmicity	.23**	.04	.33**	-		
5. Reactivity	-.11*	-.11*	-.13*	-.20**	-	
6. Negative Relationship (Mother-child)	-.25**	-.05	-.36**	-.24**	.43**	-
Variables (Father Group)	1	2	3	4	5	6
1. Prosocial Behavior	-					
2. Approach	.18*	-				
3. Persistence	.42**	-.08	-			
4. Rhythmicity	.12	.037	.28**	-		
5. Reactivity	-.17	-.22**	-.30**	-.30**	-	
6. Negative Relationship (Father-child)	-.32**	-.01	-.26**	-.24**	.44**	-

**p<.05; **p<.01*

There is a low level of negatively significant relationship between prosocial behaviors and negative mother-child relationships (r=-.25, p<.01). Lastly, Pearson correlation analysis was conducted to determine the relationship between the prosocial behavior, child temperament and negative father-child relationship of the children in the father group. According to the results of the analysis, there is a low level of positive and significant relationship between prosocial behavior and approach (r=.18, p<.05), and a moderately positive significant relationship between prosocial behavior and persistence (r=.42, p<.01) was found. In addition, there is a moderate and negative relationship between the prosocial behavior and the negative father-child relationship (r=-.32, p<.01). On the other hand, no significant correlation was found with rhythmicity (r=-.12, p>.05) and reactivity (r=-.17, p>.05).

Table 5. Result of regression analysis to determine the prediction of child temperament and parent-child relationship on prosocial behaviors in the mother group.

Variables (Mother Group)	**B**	**SE**	**β**	**t**	**p**	**Binary r**	**Partial r**
Approach	.610	.086	.355	7.102	.000	.354	.376
Persistence	.391	.101	.214	3.867	.000	.287	.215
Negative Relationship	-.168	.069	-.143	-2.438	.015	-.252	-.138
Rhythmicity	.284	.122	.125	2.331	.020	.238	.132
Reactivity	.062	.084	.041	.732	.465	-.115	.042
R=.248	R^2=.236						
$F_{(4\text{-}308)}$ = 20.28	p=.000						

In Table 5, multiple linear regression analysis was conducted to reveal the relationships between temperament (approach, persistence, rhythmicity, and reactivity) and negative mother-child relationship which is thought to have an effect on the prosocial behaviors of 60–72-month-old children. According to the analysis results, approach, persistence, reactivity, rhythmicity, and negative relationship variables significantly predict children's prosocial behaviors (R=.248; R^2=.236; $F_{(4\ 308)}$ =20.28; p<.01). When these variables are evaluated together, they explain about 24% of the change in prosocial behaviors. According to the standardized regression coefficients, the effect sizes of the independent variables on prosocial behaviors are approach (β=.355), persistence (β=.214), negative mother-child relationship (β=-.143), rhythmicity (β =.125), and reactivity (β=.041).

Table 6. Result of regression analysis to determine the prediction of child temperament and parent-child relationship on prosocial behaviors in the father group.

Variable (Father Group)	B	Sh.	β	t	p	Binary r	Partial r
Persistence	.701	.148	.381	4.746	.000	.422	.395
Approach	.394	.141	.217	2.800	.006	.185	.246
Negative Relationship	-.283	.101	-.224	-2.806	.006	-.326	-.246
R=.274	R^2=.256						
$F_{(3-122)}$ = 15.35	p=.000						

In Table 6, multiple linear regression analysis was conducted to reveal the relationships between temperament (approach and persistence) and negative father-child relationship which is thought to have an effect on the prosocial behaviors of 60–72-month-old children. According to the analysis results, persistence, approach, and negative relationship variables significantly predict children's prosocial behaviors (R=.274; R^2 = .256; $F_{(3-122)}$=15.35; p<.01). When these variables are evaluated together, they explain about 26% of the change in prosocial behaviors. According to the standardized regression coefficients, the effect sizes of the independent variables on prosocial behaviors are persistence (β=.381), approach (β =.217), and negative father-child relationship (β=-.224).

DISCUSSION and CONCLUSION

The results obtained from the mothers in the study group revealed that approach, persistence, rhythmicity, and reactivity, which are the dimensions of child temperament, and negative mother-child relationship together significantly predicted children's prosocial behaviors. As for the results obtained from the father participants in the study group, it was found that approach, persistence, and negative father-child relationship, which are the dimensions of child temperament, together significantly predicted children's prosocial behaviors.

According to the results obtained from both mother and father groups, the approach increases prosocial behavior. There are some studies in the literature reporting a similar finding (Diener & Kim, 2004; Eisenberg et al., 2017; Laible et al., 2017; Mathieson & Banerjee, 2010; Yağmurlu et al., 2005; Yağmurlu & Sanson, 2009; Sanson et al., 2011). The longitudinal study conducted by Laible et al. (2017) examined children with high levels of approach for three years between the age of 4 and 7. The results showed that the 6-year-old children with high levels of approach display more prosocial behaviors such as cooperation and comfort when they become 7 years old. Eisenberg et al., (2006) also reported that approach and being sociable affect children's prosocial behaviors. Similarly, the study carried out by Song et al. (2018) showed that children with high levels of approach and who worry about others share more, make up for their mistakes, and defend those who are bullied. Acar (2013) also found that the approach highly correlates with increased prosocial behaviors when a child interacts with his peers.

Temperament affects a child's social development by determining how he perceives his nearby environment and how he reacts to the events (Rothbart & Bates, 2006; Qian, et al., 2020). Approach refers to how the child deals with new people and environments (Sanson et al., 2004), his sociability, and his adaptation to a different environment (Arabacıoğlu, 2019; Prior et al., 2000). The children with high levels of approach have better social skills (Kumru et al., 2005; Laible et al., 2017). A longitudinal study concluded that the approach strongly predicts social behaviors (Sanson et al., 2011). Children with high levels of approach experience social anxiety less. Similarly, sociable children with low social anxiety are more likely to help others (Diener & Kim, 2004). Also, the children with approach feel more comfortable and less anxious about using the skills required for prosocial behaviors when they notice people who need help, comfort, and sharing or similar situations (Akçay & Alabay, 2022). In addition, they are more successful in initiating and sustaining interaction with others and are more interested in other people and their needs. When considered in terms of prosocial

behaviors, it might be concluded that it would be easier for children who have high levels of approach and are more sociable to approach, help, share with, and comfort a troubled person.

Another finding obtained from both mother and father groups showed that persistence increases prosocial behaviors, which is a finding supported by some related research in the literature (Beceren & Özdemir, 2019; Laible et al., 2017; Youngblade & Mulvihill, 1998; Yağmurlu & Altan, 2010; Yağmurlu & Sanson, 2009; Yağmurlu et al., 2005). Beceren and Özdemir (2019), in their study, concluded that high levels of persistence temperament enhance children's empathy skills and predict social and emotional satisfaction. The intercultural study conducted by Yağmurlu and Sanson (2009) with 4-6-year-old Australian and Turkish children showed that persistence significantly predicts prosocial behaviors of children who are 5 and 6 years old. Also, according to the results of a similar intercultural study (Kumru et al., 2005) conducted with Australian and Turkish children (the mean age: 61 months), persistence increases prosocial behaviors. Persistence means employing cognitive processes that are required when one participates in a task, needs to focus his attention on the task and control his effect (Yağmurlu & Altan, 2010). Persistence affects a child's perception of his environment as a temperament feature related to attention and affects his social development since it allows him to determine how he will react to the situation. Yağmurlu and Altan (2010), in their study conducted with 4–6-year-old children, concluded that children with high levels of persistence have better emotion regulation skills. Persistence, which allows a child to focus his attention, is considered a necessity while employing required cognitive processes in order to control emotions (Laible et al., 2017). Persistent children can focus their attention on anything for a longer time and are more careful about the clues and messages received from others, and they can understand these clues and messages more effectively (Yağmurlu & Sanson, 2009). Children who can regulate their attention and are more skillful at focusing can notice others' needs and problems, develop their ability to develop new perspectives for situations, and in turn, increase their prosocial behaviors such as comforting, helping, and sharing so that they can solve others' problems (Teke & Şen, 2022).

According to the data collected from the mother participants, rhythmicity increases prosocial behavior. Rhythmicity refers to a child's regular activity patterns including eating and sleep order as well as the predictability of this pattern (Laible et al., 2017). The literature suggests that rhythmicity correlates with the social development of children (Laible et al., 2017; Sanson et al., 2004). Some studies report that rhythmicity correlates with the role of 5-6-year-old children in their relationships with their friends (Arı & Arat, 2018), social skills in preschool period (Yiğit et al., 2020), and self-regulation and play interactions (Özdemir & Budak, 2019). The study conducted by Kahraman and Yılmaz Irmak (2019) with 6–13-year-old children showed that high levels of rhythmicity lead to positive parenting behaviors and attitudes, which decreases problematic behaviors of children. Beceren and Özdemir (2019) reported that rhythmicity predicts social and emotional adaptation. In addition, when the effect of rhythmicity on children's prosocial behaviors is considered, it can be concluded that rhythmic children have a more regular life (Sanson et al., 2004). Having a regular and predictable life contributes to the development of more positive relationships. A child might feel more secure and calmer in a predictable world. When he feels secure, he focuses on the outer world more effectively and is more aware of troubled people around him, which in turn leads to increased prosocial behaviors.

The present study did not reveal any correlation between rhythmicity and prosocial behaviors in the data collected from the fathers in the study group. This lack of correlation might be due to the low predictability regarding the eating, sleep, and activity patterns of the children. As mentioned by Gryczkowski et al. (2018) mothers spend most of their time on their children's self-care activities while fathers often spend their time with children by playing games. When this relationship is interpreted within the framework of Turkish culture, the role of fathers in parenting has been more active and they spend more social time with their children than in the past since women have been involved in working life more and parents are now more conscious about parenting. Despite the increasingly active contribution of fathers to their children's social development in Turkish culture, they are not very active in their children's self-care as much as mothers yet. Therefore, fathers might

encounter problems in this issue since they spend time with their children only at specific times of the day, which can explain the lack of correlation in terms of rhythmicity for the fathers and correlation for the mothers in the study group.

Another result obtained from the data collected from the mothers in the study group indicates that reactivity significantly predicts prosocial behaviors together with persistence, approach, rhythmicity, and the negative mother-child relationship. However, due to the negative low significant correlation between reactivity and prosocial behaviors, it did not itself significantly affect prosocial behaviors when it was included in the analysis, which might imply that the effect of reactivity's order of importance is lower when compared to other types of temperament and mother-child relationship. Reactivity is defined as the reaction time to a situation or an event, and it is about a child's expressing his negative emotions by exhibiting negative behaviors (shouting, crying, throwing himself on the floor, etc.) (Sanson et al., 2004). Reactivity is often associated with anti-social or negative behaviors in the literature (Arı & Yaban, 2012; Diener & Kim, 2004; Gür, 2016; Obsuth et al., 2016; Yağmurlu et al., 2005; Yağmurlu & Sanson, 2009; Yağmurlu & Altan, 2010). There are also some studies reporting that a decrease in reactivity increases prosocial behaviors, which is consistent with the results of the present study (Arı & Yaban, 2012; Laible et al., 2017; Sanson et al., 2011). The children who tend to give negative reactions might feel distressed and avoid prosocial behaviors such as helping, comforting, and sharing. For instance, the longitudinal conducted by Laible et al. (2017) showed a significant decrease in helping behaviors of 6-year-old children with high levels of reactivity when they become 7 years old. Acar et al. (2019) and Rubin et al. (2003) reported that children with high levels of reactivity and low levels of self-regulation skills tend to behave more aggressively and impulsively during some social activities such as chatting and playing games. Therefore, it might be concluded that children with reactivity are at a great risk for social exclusion and maladjustment (Acar et al., 2019). While predicting prosocial behaviors, each temperament dimension interacts with each other rather than functioning separately. To illustrate, it is suggested that reactivity interacts with self-regulation in order to help the child to display prosocial behaviors. Children with high reactivity but high self-regulation tend to display prosocial behaviors more since they are able to control their negative emotions. However, those with high reactivity but low self-regulation is expected to display less prosocial behavior (Eisenberg et al., 2006; Sanson et al., 2011). Therefore, it might be concluded that reactivity itself is not enough to discriminate social behaviors while other temperament types and their characteristics significantly determine these behaviors and correlation for the mothers in the study group.

There was no correlation between reactivity and prosocial behaviors in the fathers' group. Accordingly, the results are consistent with each other despite the significant difference between the results obtained from the mothers and the fathers in the study group. In addition, the most common channel allowing parents to communicate with their children in many cultures is games (Buraeu et al., 2017; Robinson et al., 2021). Interaction during games is based on agreement, cooperation, and sharing (Robinson et al., 2021). Also, game activities are associated with high levels of parental sensitivity and a more cheerful relationship (Buraeu et al., 2017). When it is assumed that the father gets to know his child and establishes a relationship through games, the child might fail to observe and be aware of reactivity in a positive relation in an accurate and objective way.

According to another result of the study, a negative parent-child relationship decreases the prosocial behaviors of children. In other words, prosocial behaviors are negatively affected because of children's perception of parents as a source of punishment and criticism, frequent conflicts between parents and children, the insincere approach of parents towards their children, parents' feeling of burn-out and dissatisfaction in this relationship, and parents' failing to express their feelings and experiences. There are some studies in the literature which support the findings of the present study by reporting that negative mother-child relationship (Cornell & Frick, 2007; Deater-Deckard et al., 2001; Daniel et al., 2015; Knafo & Plomin, 2006; Padilla-Walker, 2015; Romano et al., 2005) and negative mother-child

relationship (Bureau et al., 2017; Robinson et al., 2021) negatively affect the social development of children.

The research focusing on the mother-child relationship showed that a positive relationship between mother and child increases social behavior (Daniel et al., 2015; Davidov & Grusec, 2006; Gross et al., 2017; Gryczkowski et al., 2017; Hastings et al., 2007; Kiang et al., 2004; Miklikowska et al., 2011; Newton et al., 2014; Newton et al., 2016; Ruiz-Ortiz et al., 2017; Pastorelli et al., 2016; Spinrad & Gal, 2018; Spinrad & Stifter, 2006; Sroufe et al., 2010; Taylor et al., 2013). A negative relationship, on the other hand, weakens children's empathy skills (Cornell & Frick, 2007). Children having a disciplined mother display less prosocial behavior (Romano et al., 2005). A consistently developing relationship between mother and child starting from infancy and based on love, affection, trust, sensitivity and sincerity and supported by positive relationship contributes to the positive social development in the following developmental phases of the child (Daniel et al., 2015; Kiang et al., 2004; Moreno et al., 2008; Newton et al., 2014; Spinrad & Stifter, 2006; Taylor et al., 2013). Another interesting finding of the study is that a negative and conflicting mother-child relationship influences social relationships more than a positive mother-child relationship. The studies show that a negative mother-child relationship predicts children's social relationships more strongly than a positive mother-child relationship (Acar et al., 2019; Shaw et al., 2004).

There are some studies in the literature reporting that a positive father-child relationship increases the prosocial behaviors (Bureau et al., 2017; Daniel et al., 2015; Ferreira et al., 2016; Gryczkowski et al., 2017; Hallers-Haalboom et al., 2014; Newton et al., 2014; Ruiz-Ortiz et al., 2017; Robinson et al., 2021). Increased mobility from infancy onwards, a desire for playful interaction, more exploratory behavior, improved communication skills, and reduced dependence on mothers for basic needs such as nutrition increase the father's involvement in the child's development (Buraeu et al., 2017; Robinson, et al., 2021**).** Interaction during play is consensual, cooperative, and collaborative (Robinson, et al., 2021). Play activities are also characterized by a higher level of parental sensitivity and a more joyful relationship, and these experiences are especially important in the early childhood years (Bureau et al., 2017; Gryczkowski et al., 2018). Lucassen et al. (2011) also found that fathers' play activities were related to child-father attachment. Fathers tend to be more physical, spontaneous, and playful in their play. Through play interactions, fathers can provide new experiences as a familiar and safe friend (Grossman et al., 2002). In addition, some studies concluded that fathers affect the social development of their children in preschool period more strongly than in other following developmental phases (Gryczkowski et al., 2018; Newton et al., 2014; Robinson et al., 2021). Robinson et al. (2021), in a systematic review of past research on play in the father-child relationship, found that the ages at which these interactions predicted children's social development at the highest level were in the preschool period and that these experiences were critical in the first six years of life. Another study assessing mother-child and father-child relationships together (Bureau et al., 2017) found that a negative father-child relationship increases social adaptation problems of the child and father-child relationship is a stronger predictor than mother-child relationship. Similarly, Ferraira et al. (2016), in their study conducted with children whose ages range between 3 and 6, examined the correlation between mother-child, father-child and teacher-child relationships and prosocial behaviors. They found that mother-child relationship indirectly predicts prosocial behaviors through teacher-child relationship while father-child relationship directly predicts children's prosocial behaviors, which remarkably indicates the importance of father-child relationship. The present study also found a moderate correlation between father-child relationship and prosocial behaviors while these behaviors had a low correlation with mother-child relationship. All these results provide clear evidence that father-child relationship in preschool period is crucial for the development of the child.

In conclusion, for the mother group approach, persistence, rhythmicity, and reactivity of child temperament and negative mother-child relationship together significantly predicted children's

prosocial behaviors. As for the results obtained from the father group, the approach and persistence of child temperament and negative father-child relationship, together significantly predicted children's prosocial behaviors. This study revealed that temperament and parent-child relationship together affect prosocial behaviors of 60-72 months-old children both in mother and father groups. The fact that this study was conducted in Aydın province, located in the west of Turkey, is a limitation in that the results of the study cannot be generalized to parents living in Turkey. Further studies might examine the correlation between prosocial behaviors and temperament and parent-child relationships in different cities in Turkey so that the results can be generalized and evaluated more effectively. In addition, the data in this study were obtained by only parents of 60-72-month-old children filling out the measurement tools. Obtaining child assessments only from the mother or father can be considered as a limitation. For further research, the data might be collected from the mother, father, and teachers of a child in order to evaluate his temperament and prosocial behaviors in a more consistent and reliable way together. The fact that this research is a cross-sectional study can also be considered as a limitation because it is important to evaluate the child in the process and to reveal the effect. Therefore, a longitudinal study might examine how prosocial behaviors, temperament, and parent-child relationship develop and differ between mother and father as of the infancy. All the children in the study group received preschool education for one or more years. Further studies might include children who did not receive preschool education or did not start taking this education and examine how their prosocial behaviors are affected accordingly. What is dominant in the child's temperament (e.g., persistence, approach/withdrawal) and the parent-child relationship (e.g., negative relationship) are related to the child's social behavior. Psychological counselors working with this age group in schools or psychological counseling centers should primarily evaluate the child's temperament in order to improve the child's prosocial behavior. For example, guidance activities that will support the child's positive temperament and harmonize the negative temperament with the social environment can be developed in preschool education institutions. In the content of the intervention programs to be created for the development of prosocial behaviors, interventions suitable for each child's temperament can be conducted. In addition, mother-child and father-child relationship significantly predict children's prosocial behaviors. Psychological counsellors might invite parents into intervention programs they prepare and offer intervention services to inform them about how conflicting parent-child relationship affects children's prosocial behaviors such as helping, sharing and comforting as well as the ways to increase quality of parent-child relationship. Especially in the prosocial behaviors of the child, the temperament of the child, how it can affect the child, and parental communication should be explained and guided to the parents also teachers.

Ethics and Conflict of Interest

This research is derived from the first author's master's thesis which is titled as "Temperament and Parent-child Relationship as Predictors of Prosocial Behavior of 60-72-month-old children" and the second author is a supervisor. The ethical approval was obtained from Yıldız Technical University Institute of Social Sciences with the decision numbered 2021.11 dated November 26, 2021. In addition, National Education approval was obtained from the Aydın Provincial Directorate of National Education with the decision numbered 2112070218 dated January 21, 2022. The authors of the study acted in accordance with ethical rules in all processes of the research and there is no conflict of interest between the authors.

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INVESTIGATION OF THE RELATIONSHIP BETWEEN PRIMARY SCHOOL STUDENTS' READING AND WRITING ANXIETY

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Abstract

This research examines the relationship between reading and writing anxiety of primary school fourth-grade students according to different variables. In this context, the research was carried out with the correlational research model, one of the quantitative research methods. The sample of the study consists of 402 students determined by convenient sampling. The data were collected using the Personal Information Form consisting of demographic variables, the Reading Anxiety Scale used to determine students' reading anxiety, and the Writing Anxiety Scale used to measure students' writing anxiety. SPSS 24 statistical software was used in the analysis of the data. In line with the purpose of the research, a t-test for gender ANOVA was used for parental education levels. Relationships between reading and writing anxiety were analyzed using Pearson Product-Moment correlation analysis and hierarchical regression analysis. In the findings obtained, it was determined that the student's reading and writing anxiety were moderate, there was a difference in reading anxiety according to gender, and education level of the parents, and a difference in writing anxiety according to the education level of the parents. It was determined that there was a positive and highly significant relationship between reading and writing anxiety. In addition, there is a significant predictiveness of reading anxiety in students' writing anxiety.

Keywords: Reading, writing, anxiety, predictiveness, primary school students.

INTRODUCTION

The four basic language skills are speaking, listening, reading, and writing. While reading is a language skill related to comprehension, writing is a telling skill. Reading and writing impact students' academic success and their future lives. Fellows (1994) states that in education, students learn more permanently by writing. Writing is a cognitive skill used to transfer feelings to others, explain thoughts, and take notes (Sofia et al., 2020; Turkben, 2021). Conversely, reading is a dynamic process of following the texts according to the rules, analyzing, and making sense of what you read (Akyol, 2020; Turkben, 2019). These features seem to emphasize the cognitive aspects of reading and writing. However, since reading and writing are cognitive, they were also included in affective features. One of these characteristics is anxiety.

Anxiety is defined as nervousness, fear of being evaluated, blood pressure changes, and worry in psychology (Piniel & Csizer, 2013). Everyone has experienced anxiety at least once in their life. Anxiety, frequently seen in students, can negatively affect their learning (Rasuan & Wati, 2020). Although the level of anxiety varies due to individual differences and environmental conditions, it is normal to experience anxiety. However, it is important to note that the anxiety level must be balanced.

When the level of anxiety, which has two types , constructive anxiety and debilitating anxiety (Scarcella & Oxford, 1992), is high or continues to rise, it can cause the individual to have problems in their work and avoid work. In this respect, as long as debilitating anxiety continues, it can negatively affect a person's life. Constructive anxiety, on the other hand, is a positive feature that activates the person, and enables him to concentrate and remember to complete his task when necessary (Melanlıoğlu, 2014). In fact, it is stated in psychology that this anxiety level should be placed in the individual. As there are

many situations where anxiety is experienced, anxiety can also be experienced in reading and writing skills.

Reading anxiety can be defined simply as a negative reaction to the act of reading. Having problems in gaining the habit of reading and developing this acquisition is also explained as reading anxiety (Dursun, 2018; Melanlıoğlu, 2014). Reading anxiety also negatively affects reading comprehension. It was determined that the reading comprehension levels of students increase with reading anxiety decrease (Altunkaya, 2017; Kuşdemir & Katrancı, 2016; Yamaç & Çeliktürk Sezgin, 2018). In addition, reading anxiety prevents the acquisition of reading habits (Melanlıoğlu, 2014). It can also negatively affect writing anxiety, which is another language skill.

Writing anxiety can be defined as the students' reaction to writing, as well as an effective feature that describes the anxiety situations accompanied by reactions such as sweating, avoidance of writing, and negative evaluations experienced by the student while performing a specific writing task (Daly & Miller, 1975; Sabti et al., 2019; Zorbaz, 2011). Writing is the most difficult and complex skill among language skills (Demirel, 1999; Kasi & Jayapalan, 2021). In research, it has been determined that students prefer test-type exams instead of written exams, students have difficulties in the writing process and avoid writing (Erdoğan et al., 2017; Kasi & Jayapalan, 2021; Tekşan & Söğümlü, 2018). Therefore, it is expected that such students experience writing anxiety. Sun and Fan (2022) emphasized that as writing anxiety decreases, writing performance increases and draws attention to the negative effect of anxiety on the writing process.

The relationship between reading and writing suggests that the anxiety experienced in reading may also be effective in writing. A strong vocabulary and making sense of information by reading play a role in the basis of good writing. Reading is a preliminary preparation for the writing process. Thanks to reading, students can write the information they have learned by taking the texts they read as an example (Yaman, 2010). As reading anxiety decreases as the students read (Tekdemir, 2019; Yıldız & Ceyhan, 2016), this decrease can also be seen in writing anxiety. Bozgün (2022) concluded that reading effectively reduces writing anxiety in fourth- and fourth-grade primary school students.

Reading and writing are two basic language skills that cannot be considered separately. As students develop their reading skills, they actually master their writing skills. Slavin (2015) emphasized the close relationship between reading and writing, stating that the vocabulary of children who read and write develops rapidly, reflecting these words to their social relations and contributing to their social development at the same time. This emphasis indicates that writing, reading, and writing can also play a role in learning and academic success. However, emotional processes such as motivation, anxiety, attitude, and self-efficacy play a role, as well as cognitive processes in reading and writing (Uçgun, 2016), requires the examination of the emotional characteristics of these skills.

In the literature, there are many studies examining the reading and writing anxiety of primary school students (Altunkaya, 2017; Bozgün, 2022; Çeliktürk & Yamaç, 2015; Katrancı & Temel, 2018; Kuşdemir & Katrancı, 2016; Temel & Katrancı, 2019; Turkben, 2021; Yamaç & Çeliktürk Sezgin, 2018; Yıldız & Ceyhan, 2010). In these studies, two skills were also examined according to different variables such as gender, mother's education level, father's education level, and the number of books read. In addition, in some studies, reading and writing concerns were handled separately, while in some studies, they were used to develop measurement tools. However, due to the cumulative progress of studies in reading and writing, re-examining reading and writing anxiety using demographic variables is worth investigating. In particular, the limited number of studies that determine the predictive role of reading and writing anxiety in the literature shows that this study will contribute to the literature.

The problem of this research is to question the predictor of reading anxiety in primary school fourth-grade students' writing anxiety by using different personal variables. This study aims to examine the relationship between reading and writing anxiety of primary school fourth-grade students by determining the predictor of reading anxiety in writing anxiety. In the sub-purpose of the study, the

differences in anxiety states according to gender, mother's education level, and father's education level were examined. In this direction, the sub-problems of the research were formed as follows:

• What are primary school fourth-grade students' reading and writing average anxiety scores levels?

• Do reading and writing anxiety differ by gender?

• Do reading and writing anxiety differ according to mother's education level?

• Do reading and writing anxiety differ according to father's education level?

• Does reading anxiety have a predictive role in the relationship between reading and writing anxiety?

METHOD

Research Model

This quantitative study in a correlational research model examines the relationship between primary school fourth-grade students' reading anxiety and writing anxiety. Correlational research is a model in which the researcher tries to determine the relationship's direction, degree, and level without affecting the existing situation (Cohen et al., 2018; Creswell, 2020). Since the relationship between reading and writing anxiety was examined as a predictor in the research, this design was preferred.

Sample

The research sample consists of 402 fourth-grade primary school students in three different primary schools in the city center of a city in the Southeastern Anatolia Region in the spring term of the 2021-2022 academic year. Participants were selected from the 420 students of the population using the convenient sampling method, a non-random sampling type (Fraenkel et al., 2012), which requires a description of the demographic characteristics of the participants. The common feature of the participants is that they study in the fourth grade of primary school. Of the students, 61.9% (n = 249) were girls, and 38.1% (n = 153) were boys. Although the ages of the students are close to each other because they are at the same grade level, they are distributed between 9-11 (*Mean* = 9.83; *Std.Dev.* = .63).

Measures

Personal Information Form: There are three variables: gender, mother's education level, and father's education level.

Reading Anxiety Scale: It was developed by Çeliktürk and Yamaç (2015) to determine the reading anxiety levels of primary and secondary school students. First of all, validity and reliability studies of the 42-item draft scale were carried out with the data collected from 410 students. Exploratory Factor Analysis (EFA), used to examine the construct validity, showed that the scale had a single-factor structure. The total variance explained by the scale is 55.87%. There are 29 items in the scale expressing reading anxiety. This study used a 3-point Likert-type rating consisting of "I agree, I am undecided, and I disagree" to answer the scale. The lowest score that can be obtained from the scale is 29, and the highest score is 87. As a result of Confirmatory Factor Analysis (CFA), it was determined that the fit index for the model was acceptable in the range of $\chi 2/df$ =2.25 / RMSEA=.076 / NFI=.95 / CFI=.97. While the Cronbach's alpha internal consistency coefficient of the scale was calculated as .95, it was determined as .91 for this study.

Writing Anxiety Scale: It was developed by Katrancı and Temel (2018) to determine the writing anxiety of primary school students. The 53-item draft form of the scale was reduced to 39 items after expert opinion. Data were collected from fourth-grade primary school students during the scale development process. After the data were collected, the construct validity was examined. As a result of EFA, the final form consisting of 20 items and four sub-dimensions was created. It was determined that the total variance explained by the scale was 58.39. The structure of the scale was confirmed by CFA. As a result of CFA, it was determined that the fit index for the model were acceptable ($\chi 2/df$=2.11 / NNFI=.91 / CFI=.92 / GFI=.94). RMSEA index was a perfect model range of .043. Reliability analyzes were

performed with test-retest and Cronbach's alpha internal consistency coefficients. The internal consistency coefficient, determined as .91 in the original study, was calculated as .80 for this study. The lowest 20 from the scale; maximum of 60 points can be obtained. With these results, it can be said that the scale is a valid and reliable measurement tool for primary school students. This study used a 3-point Likert-type rating consisting of "I agree, I am undecided, and I disagree" to answer the scale.

Procedures

In this study, data were collected from primary school fourth-grade students. The questionnaires were distributed to students using a paper and pencil survey. The research was conducted by observing ethical rules, and the data were collected in the spring semester of the 2021-2022 academic year in line with the permission obtained from the Social Sciences Ethics Committee of Amasya University. Students were informed about the purpose of the study and ethical rules. It was also stated that the participation was voluntary and that they could leave whenever they want. It was observed that the application time lasted around 20 minutes.

Data Analysis

In this study, SPSS 24 program was used for data analysis. In order to check the accuracy of the data, the minimum-maximum values were examined, and it was seen that they were within the expected value ranges. In addition, univariate and multivariate outliers in the data set without missing values were examined; Participants whose z scores were outside the range of ±3.29 and were found to be outliers in the Mahalanobis distance values were excluded from the data set (Tabachnick & Fidell, 2014). It was observed that the skewness and kurtosis values of the data were between ±2, and histogram graphs showed a distribution close to normal. In Pearson correlation and hierarchical regression analyses, in addition to the assumption of normality, scatter diagrams were checked, and it was seen that the data showed positive linear and negative linear relationships among themselves. Furthermore, it was observed that the regression errors showed a distribution close to normal. By examining the scatter diagrams, it was found that the covariance was satisfied. In order to examine the multicollinearity assumption, VIF, and tolerance values were examined, and values close to 1 indicate that the multicollinearity problem does not occur (Tabachnick & Fidell, 2014). As a result, the initial analyses showed that the data were suitable for the planned analysis.

Whether the students' reading and writing anxiety scores differ according to gender, with the t-test for independent samples one-way analysis of variance (ANOVA) was used to determine whether there was a significant difference according to the parents' education levels. Tukey HSD test was used to determine between which groups there was a significant difference as a result of ANOVA analysis. In all statistical analyzes, the level of significance was evaluated at $p<.05$.

RESULTS

Table 1 shows the frequency and percentage values of the variables.

Table 1. Descriptive statistics.

	n	%
Gender		
Male	249	61.9
Female	153	38.1
Mother education level		
Elementary school and below	207	51.5
Secondary school	97	24.1
High school and above	98	24.4
Father education level		
Elementary school and below	111	27.6
Secondary school	92	22.9
High school and above	199	49.5

n= 436

According to Table 1, 61.9% (n = 249) of the students were girls; 38.1% (n = 153) were male. It was found that 51.5% (n = 207) of the mothers of the students were primary school and below level graduates, 24.1% (n = 97) were secondary school graduates, and 24.4% (n = 98) were at least high school level. It was found that 27.6% (n = 111) of the students' fathers were primary school and below-level graduates, 22.9% (n = 92) were secondary school graduates, and 49.5% (n = 199) were at least high school level. Table 2 shows the results of the independent samples t-test, which was carried out to test whether there is a significant difference in the students' reading and writing anxiety scores according to gender.

Table 2. For gender t-test results.

	Mean	Std.Dev.	df	t	p
Reading Anxiety					
Female	61.15	12.81	400	3.56	.001***
Male	65.86	13.00			
Writing Anxiety					
Female	40.66	9.63	400	1.92	.55
Male	42.65	10.75			

p<.01**

In Table 2, as a result of the independent samples t-test, it was found that there was no significant gender difference between the writing anxiety scores of boys and girls ($t_{(400)}$ = 1.92, p>.05). In other words, the writing anxiety levels of girls and boys are similar. However, it was found that there was a significant difference between the reading anxiety scores ($t_{(400)}$ = 3.56, p<.01) in favor of men according to gender. This finding indicates that boys have more reading anxiety than girls. Table 3 shows the ANOVA results of the students' reading and writing anxiety scores according to the mother's education level.

Table 3. One-way ANOVA results for the mother's education level.

	Mean	Std.Dev.	df_1, df_2	F	p	Post hoc
Reading Anxiety						
Elementary school and below (1)	64.61	13.12	2 399	4.65	.01**	1-3
Secondary school (2)	62.56	13.10				
High school and above (3)	59.80	12.46				
Writing Anxiety						
Elementary school and below (1)	43.06	10.38	2 399	7.25	.01**	1-3
Secondary school (2)	40.87	8.63				
High school and above (3)	38.48	10.23				

p<.01**

According to the findings in Table 3, it was found that there was a significant difference in scores between the groups as a result of the ANOVA test performed regarding the mean scores of students' reading anxiety ($F_{(2, 399)}$ = 4.65, p<.01) and writing anxiety ($F_{(2, 399)}$ = 7.25, p<.01) according to the educational level of the mother. In addition, as a result of the post-hoc Tukey tests conducted to determine the source of the difference, the reading anxiety mean score of the students whose mothers graduated from primary school and below level (Mean = 64.61) is significantly higher than the reading anxiety mean score of the students whose mothers have at least high school education (Mean = 59.80). In addition, the writing anxiety mean score of the students whose mothers graduated from primary school and below level (Mean = 43.06) is significantly higher than the mean score of the students whose mothers have at least high school education (Mean = 38.48). Table 4 shows the ANOVA results of students' reading and writing anxiety scores according to father's education level.

Table 4. One-way ANOVA results for father education level

	Mean	Std.Dev.	df_1, df_2	F	p	Post hoc
Reading Anxiety						
Elementary school and below (1)	67.05	13.82	2 399	13.22	.001***	1-3
Secondary school (2)	64.90	12.19				
High school and above (3)	59.74	12.26				
Writing Anxiety						
Elementary school and below (1)	44.14	11.36	2 399	8.35	.001***	1-3 2-3
Secondary school (2)	42.33	9.33				
High school and above (3)	39.48	9.31				

p<.001***

As a result of the ANOVA test performed in Table 4, it was found that there was a significant difference in scores between the groups as a result of the ANOVA test performed regarding the mean scores of students' reading anxiety ($F_{(2, 399)}$ = 13.22, *p*<.001) and writing anxiety ($F_{(2, 399)}$ = 8.35, *p*<.01) according to the educational level of the father. As a result of the post-hoc Tukey tests, the reading anxiety mean scores of the students whose fathers graduated from primary school and below level (Mean = 67.05) are significantly higher than those of the students whose fathers are at least high school (Mean =59.74). In addition, the writing anxiety mean scores of students whose fathers graduated from primary school and below level (Mean = 44.14) and secondary school (Mean = 42.33) were significantly higher than the mean scores of students whose fathers had at least high school education (Mean =39.48). The results of the Pearson Product-Moment Correlations analysis carried out to test whether there is a significant relationship between the students' reading and writing anxiety scores are given in Table 5.

Table 5. Pearson's product-moment correlations.

	1	2	3	4	5
Writing Anxiety (1)	-				
Reading Anxiety (2)	0.67**	-			
Mother's education level (3)	-0.19**	-0.15**	-		
Father's education level (4)	-0.20**	-0.25**	0.39**	-	
Gender (5)	0.09	0.18**	-0.08	-0.04	-
Mean	41.42	62.94	1.73	2.21	1.38
Std.Dev.	10.10	13.07	0.83	0.85	0.49

p<.01**

As seen in Table 5, the dependent variable of writing anxiety scores has a relationship with reading anxiety (*r* = .67, *p*<.01) positive and high levels; negative and low correlation with mother's education level (*r* = -.19, *p*<.01) and father's education level (*r* = .20, *p*<.01). No relationship was found between gender and writing anxiety (*r* = .09, *p*>.05). These findings reveal that as students' reading anxiety levels increase, their writing anxiety scores also increase. In the hierarchical regression analysis, which was carried out to determine the variables that best predicted the writing anxiety scores, the mother's and father's education levels related to the writing anxiety scores were entered as dummy variables in the first step. The second step included the students' reading anxiety scores in the regression equation. Gender was not included in the regression analysis because it was not related. Hierarchical regression analyses change statistics are shown in Table 6, and hierarchical regression analysis results are shown in Table 7.

Table 6. The change statistics of hierarchical regression analyses.

Model	*R*	R^2	Adj R^2	*SE Est.*	Change Statistics				
					ΔR^2	ΔF	df_1	df_2	*p*
Model 1	0.20	0.04	0.04	9.91	0.04	8.68	2	399	0.001***
Model 2	0.67	0.45	0.45	7.49	0.41	300.65	1	398	0.001***

p<.001***

Table 7. The results of hierarchical regression analyses

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
		B	*SE*	β		
Model 1	(Constant)	44.66	.97		46.22	.001***
	Mother education level	-2.78	1.18	-.12	-2.36	.02*
	Father education level	-2.54	1.05	-.13	-2.41	.02*
Model 2	(Constant)	10.45	2.10		4.97	.001***
	Mother education level	-0.28	.90	-.01	-.3	.76
	Father education level	-1.57	.80	-.08	-1.96	.051
	Reading Anxiety	.51	.03	.66	17.34	.001***

SE: Standart error, $p<.05$, $p<.001$***

As seen in Table 6, the hierarchical regression analysis was completed in two steps. Mother's and father's education, included in the regression equation at the first stage, explain approximately 4% of the change in writing anxiety scores. This change is significant ($F_{(2, 399)} = 8.68$, $p<.001$, $\Delta R^2 = .04$). The first model shows that writing anxiety increases as the education levels of the parents decrease. Reading anxiety scores entered in the second step of the hierarchical regression analysis explain 41% of the variation in writing anxiety scores in addition to the mother and father education level variables ($F_{(1, 398)} = 300.65$, $p<.001$, $\Delta R^2 = .41$). The final model has a high effect size (Cohen, 1992) and reading anxiety scores ($\beta = .66$, $t_{(399)} = 17.34$, $p<.001$) are significant predictors. According to Table 7, the parents' education level is not significant in the last model. In other words, when the effect of other variables in this sample is controlled, students with high reading anxiety have high writing anxiety scores.

DISCUSSION, CONCLUSION, and SUGGESTIONS

This research examines the relationship between reading anxiety, which negatively affects the performance and habits of primary school fourth-grade students, and writing anxiety, which negatively affects the writing process. In the sub-purpose of this study, which aims to examine the predictor of reading anxiety in students' writing anxiety, it is aimed to examine the anxiety according to some variables. An examination was made about the differences in reading and writing anxiety according to gender, mother's education level, and father's education level for fourth-grade primary school students.

According to the results of the first sub-problem, it was found that the reading anxiety of the fourth-grade primary school students was at a moderate level. Likewise, students' writing anxiety average scores were at a moderate level. In their study, Yıldız and Ceyhan (2016) determined that the reading and writing anxiety of fourth-grade primary school students was moderate and reached similar results to these findings. Other studies determine that students' reading anxiety (Taşdemir & Taşdemir, 2020) and writing anxiety (Kırmızı & Dağdeviren Kırmızı, 2015) moderate. Reducing reading anxiety is one of the effective ways to reduce writing anxiety (Bozgun, 2022). Low anxiety positively affects the responsibility and willingness to complete the task. However, moderate and high levels of anxiety can negatively affect the student's success and decrease the student's performance. This type of anxiety is known as debilitating anxiety. It is not expected that the anxiety will be as high as nothing. It must be measurable according to moderate levels (Tekindal, 2015). While the students in this study were expected to have low reading and writing anxiety levels, they were found to have moderate anxiety. This anxiety may have been caused by factors such as the fact that reading and writing are affected by affective processes and that reading and writing are difficult according to other language skills.

According to the results of the second sub-problem, students' reading anxiety differs according to gender. It was determined that this difference favored boys, who experienced more reading anxiety than girls. Accordingly, it can be said that male students avoid reading or are afraid. The rate of reading books may also have affected this situation. Dilbaz (2019) stated that girls read more books than boys and emphasized that girls have reading habitsthat girls read more books than boys and that girls have

more common reading habits. Since reading skill is an activity that develops with reading books, the fact that girls experience less reading anxiety can be explained by this.

Contrary to these findings, Taşdemir and Taşdemir (2020) determined that reading anxiety did not change according to gender. Uçgun (2016) determined that female students have more reading anxiety than males. It was found that there was no difference in the writing anxiety of the students according to gender. There are studies supporting these findings in the literature (İşeri & Ünal, 2012; Karakaya & Ülper, 2011; Özsoy, 2015; Temel & Katrancı, 2019; Yaman, 2010). Some studies determined that writing anxiety varies according to gender and reading anxiety does not support the findings of this study (Yıldız & Ceyhan, 2016).

According to the results of the third sub-problem, it was determined that the reading anxiety of the fourth-grade students differed according to the mother's education level. The reading anxiety of the students whose mothers are educated at the university level is lower than those whose mothers are educated at the primary school level or below. Studies supporting these findings are available in the literature (Taşdemir & Taşdemir, 2020; Uçgun, 2016). Contrary to these results, some studies determined that reading anxiety does not change according to mother's education level (Karakaya & Ülper, 2011; Yıldız & Ceyhan, 2016). It was determined that students' writing anxiety also differed according to the mother's education level. This difference favors students whose mothers are educated at the university level. That is, as their mothers' education level increases, students' writing anxiety decreases. Temel and Katrancı (2019) determined that writing anxiety changes according to the parents' education level. These results show that anxiety can decrease as the level of education increases. Therefore, it can be said that mother education plays an important role in reducing the writing anxiety of the child (Özsoy, 2015; Yaman, 2010). As parents, mothers can support their children not only with their care but also with their school work. Especially as the level of education increases, the effort of the child to reach her level even higher increases. For this reason, the reading and writing anxiety of the students in this study may have decreased as ir mothers' education level increased.

According to the results of the fourth sub-problem, it was determined that the reading and writing anxiety of the students differed according to the father's education level. Students whose fathers are educated at the high school level have lower reading anxiety than those who are educated at the primary school level or below. Studies supporting these findings are available in the literature (Taşdemir and Taşdemir, 2020; Uçgun, 2016). Contrary to these results, some studies determined that reading anxiety does not change according to father's education level (Karakaya & Ülper, 2011; Yıldız & Ceyhan, 2016). The writing anxiety of students whose fathers are educated at the university level is lower than students whose fathers are educated at the primary and secondary school levels. These results show that the students' writing anxiety decreases as their fathers' education level increases. Fathers as parents generally have a higher level of education than mothers in our society. This situation may enable children to make more efforts by forming the idea that they should receive a good education by taking their fathers as role models. For this reason, the reading and writing anxiety of the students in this study may have decreased as the education level of their fathers increased. Contrary to the findings of this study, some studies found that anxiety did not change according to the educational level of the father (Karakaya & Ülper, 2011; Temel & Katrancı, 2019; Yıldız & Ceyhan, 2016).

According to the results of the last sub-problem, it was determined that there was a high level and positive direction of correlation between the reading and writing anxiety of fourth-grade primary school students. In the first step of the regression analysis, which was carried out to determine to what extent and in what direction the reading anxiety predicted the students' writing anxiety, the parents' education level explained 4% of the co-writing anxiety. Accordingly, as the parents' education level decreases, writing anxiety increases. Reading anxiety added to the analysis in the second step explained 41% of writing anxiety. According to these results, students' reading anxiety significantly predicts their writing anxiety. Students' writing skills also depend to some extent on their reading skills. Factors such as increasing vocabulary as you read and changing perspective can be effective in writing. Anxiety in reading can also cause negative emotions in writing. Baki (2020) determined that reading has a 35%

effect on writing in primary school students and reached similar results to this study. He also determined that the predictive level of reading and writing for female students was 41%. Yıldız and Ceyhan (2016) state that there is a relationship between primary school students' reading and writing anxiety. As Polatcan et al. (2019) stated, an increase in anxiety causes anxiety disorder. This may be one of the underlying reasons why individuals who experience anxiety in reading also experience anxiety in writing.

In conclusion, this study provides evidence for primary school students' reading and writing skills by examining the predictive role of reading anxiety in the relationship between primary school fourth-grade students' reading anxiety and writing anxiety according to different variables. In the study, it was found that reading anxiety should be reduced to prevent cognitive and affective negative processes experienced in the writing process. In addition, training that can effectively reduce reading and writing anxiety at a moderate level can be organized. First, reading anxiety can be overcome by gaining the habit of reading (Tekdemir, 2019; Yıldız & Ceyhan, 2016) and then writing anxiety. Early childhood is one of the critical periods in the formation of reading and writing anxiety. In particular, early reading and writing exercises, unconscious interventions, insufficient visual acuity, and immaturity in language skills can cause reading and writing difficulties (Ayaş & Köksal, 2017). Such reasons can also lead to the formation of reading and writing anxiety. Reading anxiety can be reduced by employing books that loved to read, stories and novels left to own choice, and activities that will gain the habit of reading. Factors such as presenting texts from easy to difficult and the appropriateness of the readability level of the texts according to age (Kanik Uysal & Akyol, 2019) can be taken into account in eliminating reading anxiety. However, the first thing to do about reading anxiety is to get an idea about the reason for the emergence of anxiety (Melanlıoğlu, 2014). It is thought that it will be important for researchers to conduct future experimental studies on this subject. In addition, informative training can be given to increase parents' awareness, taking into account the effect of their parents' education level on their reading and writing anxiety. One of the limitations of this research is working with fourth-grade primary school students. In addition, considering only the anxiety dimension of reading and writing is another limitation. In future studies, examining variables such as reading and writing anxiety, reading comprehension, reading habits, writing habits, and writing motivation is recommended.

Ethics and Conflict of Interest

It was confirmed that this study's author has contributed sufficiently to the research. He also confirmed that it acted in accordance with ethical rules at all stages of the research as stated in the approval granted by the Ethics Committee of Amasya University (Date:06.04.2022, number: E-30640013-108.01-65616).

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PROMOTING PRESCHOOL CHILDREN'S SOCIAL-EMOTIONAL LEARNING SKILLS THROUGH CREATIVE DRAMA INTEGRATED MUSIC ACTIVITIES

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Abstract

This study investigates the progression of social-emotional learning skills in children by integrating music activities into creative drama. The research was executed employing a pre-and post-test control group research design. The research cohort consisted of 40 five-year-old participants, separated into two groups of 20 each, experimental and control. An 8-week comprehensive music education program was implemented exclusively for the experimental group to enhance their social-emotional proficiencies. A personalized information questionnaire was also employed to gather demographic information about the children and their respective parents. The "Vineland Social-Emotional Early Childhood Scale" (VSEECS) and the "Expression of Emotions Test" (EET) were applied as pre-and post-tests to determine children's social-emotional behaviors. The results of this investigation revealed a statistically significant difference in the EET pre-and post-test scores within the experimental group. Conversely, comparing both study groups, no statistically significant difference in EET scores was observed. The lack of a significant difference could be attributed to social-emotional learning activities in the curriculum that were carried out at school. This result may positively affect the control group's emotional expression and social skills. The analysis revealed that no statistically significant difference was observed in the mean scores of the (VSEECS) between the two groups at both the pre-test and post-test scores. In the context of forthcoming research, it is advisable to procure data through systematic observation, interviews, and the implementation of longitudinal investigations to elucidate the impact of music education on the development of children's social-emotional learning skills.

Keywords: Creative drama, integrated music activities, preschool children, social-emotional learning skills.

INTRODUCTION

Substantial developments and unpredictable changes in the 21st century critically impact the new generation of today's society. With the rise of technological advancements and the challenges in our world, such as climate change and socio-political, economic, and educational divisions, children are increasingly confronted with uncertainties regarding their prospects (Stephenson, 2023). As the social structure and socioeconomic conditions change, the type and number of problems awaiting children in the future also increase. Therefore, nurturing children with social-emotional skills is essential to cope with these challenges (Ozturk, 2017).

The initial six years of early childhood constitute a crucial phase in the holistic development of children. In this period, children acquire experiences that can affect their entire lives. Brown (2017) emphasizes early childhood as "the magic years." Living harmoniously in society as healthy individuals depends on acquiring developmental characteristics and skills during these first 'magical' years of life. In this context, early childhood social-emotional skills development is vital to support children in regulating and managing their social acceptance and emotions in society (Koc, 2022). Social-emotional skills are

capable of being imparted and gained through suitable educational methods. In recent times, educators, policymakers, and researchers have shifted their attention towards facilitating the cultivation of children's social-emotional competencies within the educational setting (Gresham, 2015).

The social-emotional skills that individuals should acquire through their lives are defined as self-control, taking responsibility, perseverance, stress tolerance, emotion control, optimism, being energetic, being social, self-confidence, empathy, adaptability, confidence, curiosity, creativity, flexibility, self-efficacy, and motivation to succeed (OECD, 2019). Acquiring social-emotional skills enables individuals to regulate their emotions, manage stress, and think clearly while facing problems or difficulties through the psychological resilience they have gained from an early age (Kankaraš & Suarez-Alvarez, 2019).

Theoretical Background of the Research

The early childhood years assume a pivotal role in cultivating social-emotional learning skills (SEL). During this period, we can observe the emergence of competencies in children's social-emotional development. Deficits in these skills during early childhood can manifest in various challenges later in life, including problem behaviors, feelings of isolation, communication difficulties, and academic struggles among children (Hukkelberg et al., 2019). Social-emotional skills collectively contribute to forming social-emotional competence, a comprehensive assessment of a child's capacity to effectively navigate their environment's social-emotional demands (Low et al., 2015). Social skills encompass comprehending and engaging effectively with others, facilitating successful interaction and performance within specific social settings. These skills are closely linked to educational achievement, psychological adaptation, coping mechanisms, and employment prospects (Padhy & Hariharan, 2023). In a study performed by Leme et al. (2015), it was disclosed that empathy, self-regulation, civility, social adaptability, pragmatic orientation, and evaluations of social support from peers and family members emerged as the foremost predictors of psychological well-being among adolescents.

Emotional skills involve understanding and expressing one's feelings and the ability to grasp the emotions of others and manage external emotional reactions such as anger and fear (Chernyshenko et al., 2018). Recognizing, valuing, and responding appropriately to children's emotions are essential for holistic development, as emotions play a fundamental role in forming social connections and bonds. Hence, social-emotional competencies can be characterized as the cognitive processing of emotional data to augment interpersonal proficiency (Lane & Smith, 2021).

The findings of meta-analysis research show that education programs that focus on developing students' social-emotional skills increase students' academic success and improve their social-emotional competencies (Bahcuvanoglu, 2019; Mahoney et al., 2021). The social-emotional skills lead to many important life outcomes for students. Many studies argue that education does not adequately prepare children for the challenges in life and meet their needs and expectations. Vitally, curriculums are inefficient in preparing children for the future to be competent with life skills (Váradi, 2022). Children face numerous social-emotional challenges that affect their daily functioning. Numerous researchers indicated that after implementing activities in an educational program aimed at improving children's social-emotional skills, the social-emotional skill averages of the experimental group differed positively compared to those who did not receive any education (Kim et al., 2011; Ceylan & Omeroglu, 2012; Pears et al., 2015; Uysal & Kaya Balkan, 2015; Širvinskienė et al., 2022; Ezmeci & Akman, 2023).

The Effects of Creative Drama on Social-Emotional Learning Skills

Many children aged 5-7 often grapple with a wide range of emotions and sometimes find it challenging to comprehend and convey these feelings. In order to facilitate the development of emotional recognition, expression, and management in these children, it becomes crucial to create a secure and nurturing environment at home and in the classroom. Such an environment encourages children to explore various emotions and learn strategies to manage them (Darling-Churchill & Lippman, 2016). In this context, creative drama is a safe and effective way to develop social and emotional skills. Studies reveal creative drama's positive effect on children's early childhood social-emotional behaviors (Degirmenci, 2020; Kilic & Namdar, 2021; Gao et al., 2022). Creative drama brings children's life

experiences into the classroom so they can reflect on real-life situations by improvising and role-playing within creating scenes. The important thing is that they gain a dramatic understanding at the end of this learning process. Therefore, creative drama effectively develops children's critical thinking skills in early childhood (Stephenson, 2023). The creative drama opens different and colorful windows for children. By looking through these windows, children can express their imaginations, feelings, and thoughts in a dramatic universe they create in the classroom with the teacher's help. In this way, they discover their potential as well. Creative drama is a powerful teaching method with multidimensional interrogative and problem-solving processes. Social skills such as taking responsibility, cooperation, assertiveness, harmony, self-control, initiating and maintaining a relationship, conducting a task with a group, expressing emotions, planning and problem-solving can be developed through creative drama in early childhood (Ceylan & Omeroglu, 2012). In addition, many skills can be developed, such as sharing, helping others, waiting for one's turn, obeying the rules, establishing friendships, empathy, kindness, and communicating with others. Oztug and Ciner (2017) stated that behavioral rehearsal, one of the methods used in social-skills education, and role-playing is a valuable technique for both the student who plays the role and the students who observe when applied in a group.

The Importance of Creative Drama Integrated Music Teaching and Learning in Promoting SEL

Creative drama integrates theatrical elements to improve students' cognitive, physical, social and emotional skills and education. Furthermore, creative drama encompasses various techniques involving physical movement, vocal expression, musical awareness, and mental focus. In this respect, creative drama is a close correlation with music, dance, and movement (Toivanen et al., 2013). According to Pellitteri (2005), social-emotional learning and music education are naturally complementary. There exist five noteworthy points of compatibility between social-emotional learning and music education. These include: (a) The utilization of music as an emotive catalyst, capable of evoking and modulating emotional responses. (b) The incorporation of music as a vehicle for facilitating aesthetic experiences, engendering appreciation and comprehension of artistic and emotional nuances. (c) Leveraging music for relaxation and mental imagery, harnessing its potential for fostering emotional well-being and visualization. (d) The manifestation of music making as a conduit for individual self-expression, enabling learners to articulate and convey their emotional states and inner experiences. (e) The role of music making as a collective endeavor, fostering group interactions and shared emotional experiences within a social context.

Children can share their feelings and thoughts through music, dance-movement and drama without verbal communication, even using gestures and facial expressions. Moving and dancing with music and play allow the child to gain satisfying social experiences and to relax emotionally. Therefore, teachers should provide children with learning environments, including creative drama-integrated music activities that will support children's social-emotional skills (Altinkaynak et al., 2012). At the same time, creative drama provides endless possibilities for implementing child-centered music activities to develop children's social-emotional competencies and musical knowledge, skills, and attitudes. Moreover, music and musical games serve as conduits through which preschool-aged children acquire cooperative and spontaneous behavioral skills, facilitating social connections with their peers, as evidenced in the study (Jucan & Simion, 2014). However, recently, research on the effects of teaching emotional skills on musical development has not been sufficient (Campayo-Muñoz & Cabedo-Mas, 2017). The importance of teacher competence in addressing students' social-emotional requirements holds substantial implications for music educators. This situation is primarily attributed to the fundamental role teacher-student relationships play in the classroom (Edgar, 2013). Considering teachers' roles in music and drama activities enhances a child's creativity and imagination, allowing them to express themselves and develop versatile thinking. The perspectives and ideas of teachers on this matter become even more significant. One of the issues that preschool and music teachers indicate as a deficiency is the lack of instruction for classroom activities in the music curriculum. Additionally, the most emphasized subject by teachers is the need for more examples of integrated activities for creative and innovative music learning (Sungurtekin, 2021). Nonetheless, various studies propose that conventional school education may not adequately equip children to navigate the challenges they will

encounter in their future endeavors and expectations. Furthermore, the existing curriculum often needs to improve its capacity to cultivate essential life skills that enable students to succeed in adulthood (Fodor & Korényi, 2019; Friedlander et al., 2019; Varadi, 2022).

Kaspar and Massey (2023) identified the favorable outcomes of implementing a social-emotional learning curriculum within elementary schools. The scholars emphasized the importance of equipping children with strategies to effectively manage moments of emotional overwhelm during their studies. Because teachers are confronted with the dynamics of social-emotional interactions within their classrooms, they entail balancing long-term, mandated educational objectives with students' requirements and capabilities (Jennings & Frank, 2015). In this context, creative drama is significant in preparing children for their future lives. Therefore, curriculum development within integrated music activities to support children's social-emotional learning skills and musical knowledge, competencies and attitudes seems evident.

The current research accentuates the need for innovative, creative teaching and learning in schools through an integrated approach where creative drama meets music. The curriculum of integrating drama into music activities aims to provide students with aesthetic, creative, and imaginative experiences while practicing social-emotional skills. These integrated curricula can direct preschool teachers to introduce social-emotional learning within creative drama-based music activities and consider them valuable educational methods so that preschool children improve their social-emotional competencies in different ways. This research will contribute to the field by providing creative drama-integrated music activities that educators can readily employ within their classroom settings. These activities are designed to facilitate children's acquisition of social-emotional learning skills. Furthermore, there are limited studies on the effectiveness of music activities integrated with creative drama in the field (Kosokabe et al., 2021), and this deficiency may be eliminated with this research.

The current research examines the effects of integrated music activities within "creative drama" on social-emotional skills development in early childhood. For this purpose, the research questions are as follows;

1) Is there a significant difference between the experimental group's emotional expression pre-and post-test scores?

2) Is there a significant difference between the experimental and control group's emotional expression post-test scores?

3) Is there a significant difference between the experimental and control group's social-emotional skills pre-and post-test scores?

4) Is there a significant difference between the experimental and control group's social-emotional skills post-test scores in sub-dimensions of interpersonal relationships, play-leisure time, and adaptability?

METHOD

Research Design

The research was conducted through an experimental design within a pre-post-test and a control group. A control or comparison group design is usually necessary to account for the possible effects on post-test scores (Marsden & Torgerson, 2012). A control group without any intervention was included during the research data collection. The control group received only their teacher's routine music teachings (singing, listening, circle dances). The pre-test procedure (for children and parents) was undertaken before the integrated music education program started. The post-test was applied after eight weeks. The dependent variable in this research design was the "social-emotional behaviors" of five-year-old children attending kindergarten, and the independent variable whose effect on the social-emotional behaviors of the children was integrated music activities within creative drama.

Study Group

The children and parents were selected with the convenient sampling method. In this method, the researcher tries to reach the target sample number starting from the immediate surroundings (Buyukozturk et al., 2008). Therefore, the preschool was one of the teaching practice schools for preschool teacher candidates, and the researchers were this practicum's instructors. The research group consisted of 40 five-year-old children (experimental group: 20, control group: 20) attending a state preschool. The demographic characteristics of children are shown in Table 1.

Table 1. Demographic characteristics of children.

Demographic Characteristics		Experimental Group		Control Group	
		(f)	(%)	(f)	(%)
Gender	Girl	11	55	9	45
	Boy	9	45	11	55
	Total	20	100	20	100
Siblings	Single child	4	20	5	25
	2 sister/brother	13	65	14	70
	3 sister/brother	3	15	1	5
	Total	20	100	20	100
Birth Order	First child	10	50	8	40
	Second child	8	40	11	55
	Third child	2	10	1	5
	Total	20	100	20	100
School Experience	Yes	8	40	6	30
	No	12	60	14	70
	Total	20	100	20	100

Table 1 shows eleven children in the experimental group were girls, and nine were boys. Four children had no siblings, most had two siblings, and half of the experimental group was the family's first child. The twelve children had no previous school experience at all. Nine girls and eleven boys were in the control group; most children had two siblings, and eleven were the parents' second children. Likewise, most children in the control group had no previous school experience.

Table 2. Demographic characteristics of parents.

Demographic Characteristics		Experimental Group				Control Group			
		Mother		Father		Mother		Father	
		(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Age (years)	26-29	6	75	1	100	2	25	-	-
	30-34	7	46.7	8	61.5	8	53.3	5	38.5
	35-39	5	50	7	53.8	5	50	6	46.2
	40-45	2	28.6	2	20	5	71.4	8	80
	46- …	-	-	2	66.7	-	-	1	33.3
Graduation	Illiterate	-	-	-	-	2	100	1	100
	Primary school	11	68.8	10	50	5	31.3	10	50
	Secondary school	1	100	-	-	-	-	1	100
	High school	6	37.5	8	47.1	10	62.5	9	52.9
	University	2	100	2	100	3	60	-	-

Table 2 (Continued). Demographic characteristics of parents.

Demographic Characteristics		Experimental Group				Control Group			
		Mother		Father		Mother		Father	
		(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Occupation	Unemployed	3	60	1	2.5	2	40	1	100
	Worker (Laborer)	-	-	8	50	2	100	8	50
	Officer (public service)	4	66.7	5	71.4	2	33.3	2	28.6
	Self employed	1	33.3	4	57.1	2	66.7	3	42.9
	Other	4	50	3	33.3	4	50	6	66.7
	Housewife	8	50	-	-	8	50	-	-
	Total	**20**	**100**	**20**	**100**	**20**	**100**	**20**	**100**

As is seen in Table 2, most of the mothers were between the ages of 30-39 (62.5%), graduated from high school/university (80%), and most of them were housewives (52.5%). The fathers were between the ages of 30-39 (65%), most graduated from high school/university (92.5%), and 40% were laborers. It was determined that the parents of the children in the control and experimental groups had similar ages, educational status, and professional characteristics.

Research Instruments and Data Collection

At the beginning of the research, a personal information form was used to obtain socio-demographic data about the children and their parents. The *'Vineland Social-Emotional Early Childhood Scale'* (VSEECS), developed by Sparrow et al. (1998) and adapted to Turkish culture by Ceylan et al. (2019), was applied to the parents as a pre-test in order to determine children's social-emotional behaviors. Accordingly, to determine whether children can express their emotions to related situations, an *'Expression of Emotions Test'* (EET) was applied by individually interviewing the children (both control and experimental groups).

The *Expression of Emotions Test (EET)* was developed by Yildirim-Dogru (1999) and later readapted by Ergin (2003) based on validity and reliability studies. The test was related to four basic emotions: happiness, sadness, anger, and surprise. The test included three items for each emotion and consisted of 12 items. The internal reliability coefficient of the test was found to be .82. All items were asked to the children in person, singly and in a mixed order. The lowest score was calculated as "1", and the highest as "12". It was determined that students who correctly completed eight or more items had a high ability to express their emotions.

The *Vineland Social-Emotional Early Childhood Scale (VSEECS)* was developed by Sparrow et al. (1998) and adapted into Turkish by Ceylan et al. (2019). The scale aims to evaluate children's social and emotional development from birth to 4 years and 11 months (including five years old). The scale consists of three parts (subscales): interpersonal communication skills, play and leisure time, and adaptability. It has 62 items in total, and all items are related to children's daily social-emotional behaviors. The internal consistency coefficients of the scale were found to be .70 in the Interpersonal Relations Subscale, .74 in the Play and Leisure Subscale, and .80 in the Coping Skills Subscale for children aged four and over. The scale is administered individually to the parents, who know the child's behavior well and takes an average of 25-30 minutes. Scoring on the scale is calculated based on how often the child performs the appropriate behavior. In the scale, "usually does" receives 2 points, "sometimes or partially does" receives 1 point, and "never does" receives 0 points.

Research Implementation (Creative Drama Integrated Music Activities)

The researchers conducted integrated music activities within creative drama with the experimental group once a week. Each session lasted approximately 90 minutes. According to the curriculum, the kindergarten teacher conducted the music lessons in the control group. The implementation of the research lasted eight weeks. Afterward, VSEECS (for parents) and EET (for children) were applied as post-tests. The sessions of each of the activities are listed below:

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Session 1-Ice-Breaking Games/Warm-Ups: In the first week, some ice-breaking games and warm-up exercises were carried out to get to know each other and develop interaction between the researchers and children. The 'Hello' and 'Good Morning' songs were sung together in a circle. After singing in the circle, the group danced with the 'Seven Steps Music,' aiming to raise awareness and socialization among the children by using body and gestures freely. Introducing oneself accompanied by body percussion and emotional expressions were performed by each child.

Session 2-Emotions and Facial Expressions: Some emojis made from cardboard reflecting different emotions were shown to children. Children were asked to imitate facial expressions of related emotions. Afterwards, discussions were held on which situations in their daily lives might have caused them to feel these feelings. (Figure 1). Then, the children were asked to choose life situations they might encounter to show and animate their facial expressions with the "Emotion Window" game (Figure 2). Songs were performed with body percussion accompanied by different emotions. Evaluation activities were carried out in which children could express their feelings verbally.

Figure 1. Discussion on emotions in daily life.

Figure 2. Playing "Emotion Window" game.

Session 3-Storytelling "A Day with the Pink Rabbit": This workshop was based on a story about a rabbit living in the forest. Children played roles as characters in the story and improvised the scenes encountered by the rabbit and its emotions. The Pink Rabbit song was sung with the Orff Instruments. Afterward, questions were asked, such as 'Which instrument resembled each character and its emotions? Why?', 'How can we express emotions with these instruments? At the end of the session, children draw pictures about the story of the *Pink Rabbit* (Figure 3).

Figure 3. Children's drawings about the "Pink Rabbit Story".

Session 4-The Nutcracker: Children listened to Tchaikovsky's famous "The Nutcracker - March." Then, they were asked about their moods/emotions towards the piece. Some conversations were held about how the music made them feel. Afterward, dances and movements were performed following the

musical phrases of the piece (Figure 4). Children included their ideas using body movements and facial expressions in each phrase. Next, children listened to the story of the Nutcracker, followed by dramatizations. Children worked in groups and created some scenes through role-playing and improvisation about what could happen differently at the end of the story (Figure 5). Later, discussions were made about the different endings they had created, and children were asked about their emotions. Children expressed their emotions verbally.

Figure 4. Dancing with "The Nutcracker-March".

Figure 5. Creating scenes to the related music.

Session 5-The Island of Emotional Statues: After singing the "Heyya Molla" song, an imaginary ship was built in the classroom. The teacher said they would go on a sea voyage with this ship. The whole class dramatized it by singing the song simultaneously (Figure 6). On their journey, improvisation activities were carried out, and a dramatic universe was created where they lived on a deserted island where sculptures suddenly reflected different emotions (Figure 7). Finally, some evaluation activities were carried out to share thoughts and feelings.

Figure 6. Dramatizing a ship journey by singing.

Figure 7. Improvisations about living on island.

Session 6-Storytelling "The Giant Who Understands Politeness": Based on the story, scenes about the rules of politeness and social behaviors in society were created and improvised with Orff Instruments. After dancing to the instrumental piece "Giants and Dwarfs," children worked in groups for songwriting and composing activities resembling the story. Each group performed in front of the class, and some conversations were made to get feedback.

Session 7-Vivaldi, 'Four Seasons': Children listened to some parts of Vivaldi's 'Four Seasons.' Accordingly, creative dance and improvisation activities were performed together to express their feelings during the music. Children were asked what impressed them the most about the music and their improvisations/performances.

Session 8-Narrative, 'The Unhappy King without Dreams': The teacher (researcher) told the narrative. Based on this narrative, discussions were made about how the story's music would sound (how can unhappiness be reflected in the music?), talking about the elements in music (rhythm, beat-sound, dynamics, speed). Simple composing activities were created with the Orff Instruments. The reasons for being "unhappy" were discussed using the character 'The Unhappy King.' Each character in the narrative was analyzed, and the fiction was improvised with Orff Instruments according to the

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little pieces they created. Some children improvised through a dance drama with the help of the teacher. In the end, children were asked to draw pictures related to the narrative (Figure 8).

Figure 8. Children's drawings about the "The Unhappy King without Dreams".

Data Analysis

Normality tests were employed to assess the congruence of the data under examination with a Gaussian distribution. Among the array of methodologies frequently employed to gauge the extent of departure from normality in the data, the Kolmogorov Smirnov (KS) test, elucidated by Drezner et al. (2010), is particularly prominent. The KS test is a pivotal tool for ascertaining whether a given sample can be inferred to have emanated from a population adhering to a predefined continuous distribution. As delineated by Drezner et al. (2010), in instances where the KS test, applied under the specified parameters, still exhibits significant deviations from the normal distribution, the inference is drawn that the data in question is likely to have been drawn from a distribution that deviates from the Gaussian. Consequently, normality tests were employed to elucidate the dataset's presence or absence of typical distribution characteristics. The normality test for *the Expression of Emotions Test (EET)* is given in Table 3.

Table 3. Normality test for the *EET*

	Kolmogorov-Smirnov (a.)			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pre-test Total	.209	40	<.001	.928	40	.014
Post-test Total	.243	40	<.001	.838	40	<.001

a.Lilliefors Significance Correction

Table 3 presents compelling evidence indicating a non-normal distribution of the data under consideration. Consequently, non-parametric statistical tests were judiciously employed to rigorously assess the presence of a statistically significant disparity among the mean values. The normality assessment on the "Vineland Social-Emotional Early Childhood Scale" (VSEECS) is meticulously presented in Table 4 for a comprehensive reference.

Table 4. Normality test for *VSEECS*

	Kolmogorov-Smirnov (a.)			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre- test						
Sub-scale dimensions						
Interpersonal relations	.111	40	.200	.955	40	.114
Play and leisure time	.094	40	.200	.958	40	.139
Adaptation	.103	40	.200	.970	40	.367
Post- test						
Sub-scale dimensions						
Interpersonal relations	.126	40	.111	.966	40	.264
Play and leisure time	.128	40	.097	.959	40	.158
Adaptation	.088	40	.200	.972	40	.426

a.Lilliefors Significance Correction

The normality tests in Table 4 show a normal distribution. Therefore, parametric tests were utilized to determine whether the mean values of the data showed statistically significant differences. For demographic characteristics, descriptive statistics were included as frequency and percentage values. For the statistics of the mean scores, t-tests for independent samples and dependent sample t-tests were performed. The Wilcoxon Signed Rank and Mann-Whitney U tests were employed as statistical methodologies for analyzing non-parametric data distributions.

RESULTS

In the study, the Expression of Emotions Test (EET) and Vineland Social-Emotional Early Childhood Scale (VSEECS) were applied as pretest-posttest to examine the effect of creative drama-integrated music activities on students' social-emotional skills. The lowest and highest values of the children from these tests are given in Table 5.

Table 5. The minimum and maximum values of the experimental and control group's pre-and post-test results.

Sub-Scale Dimensions	N	Group	Minimum	Maximum
EET Pre-test	20	Experimental	6.00	12.00
	20	Control	3.00	12.00
EET Post-test	20	Experimental	6.00	12.00
	20	Control	4.00	12.00
VSEECS Pre-test	20	Experimental	61.00	123.00
	20	Control	66.00	114.00
VSEECS Post-test	20	Experimental	71.00	118.00
	20	Control	61.00	116.00

When Table 5 is analyzed, according to the pre-test score results of the EET test, the experimental group had the lowest 6, the highest 12, while the control group had the lowest 3, the highest 12 scores. The EET test post-test scores were the lowest 6, highest 12 values in the experimental group, and the lowest 4, highest 12 scores in the control group. In addition, when the VSEECS test pre-test scores were analyzed, it was found that the experimental group had the lowest 61, the highest 118 scores, while the control group had the lowest 66, the highest 114 scores. When VSEECS test post-test scores were analyzed, it was found that the experimental group had the lowest 71, the highest 123 scores, while the control group had the lowest 61, the highest 116 scores.

The *Expression of Emotions Test* was applied as a pre-and post-test to see the effect of the creative drama and music-integrated education program, which aimed to support social-emotional development in the experimental group. Due to the non-parametric nature of the data, the Wilcoxon Signed Rank test was administered to ascertain the presence of a statistically significant disparity between the pre-test and

post-test values observed within the experimental group. The outcomes of this analytical procedure are shown in detail in Table 6.

Table 6. Wilcoxon signed rank test results of pre-and post-test of the experimental group on the *EET*.

		N	Mean Rank	Sum of Ranks	Z	p
Pre-test	Negative Ranks	0[a]	.00	.00	-3.400[b]	.001*
Post-test	Positive Ranks	14[b]	7.50	105.00		
	Ties	6[c]				
	Total	20				

*p<.05

Table 6 shows a statistically significant distinction within the pre-and post-test values of the experimental group (p = .001, p<.05), wherein positive test scores exhibited a marked superiority over negative ones. Particularly noteworthy was the observation that post-test scores surpassed their corresponding pre-test counterparts. In essence, the interventions employed in this study fostered the enhancement of emotional expression skills within the experimental group. Subsequently, the Mann-Whitney U test was harnessed to rigorously scrutinize whether a notable divergence existed between the experimental and control groups' post-test scores of the *Expression of Emotions Test* (EET), with comprehensive results documented in Table 7.

Table 7. Mann Whitney U test results of EET post-test in the experimental and control groups.

	Group	N	Mean Rank	Sum of Ranks	U	p
Post-test	Experimental	20	23.43	468.50	141.500	.104
	Control	20	17.58	351.50		
	Total	40				

*p<.05

Table 7 reveals no statistically significant disparity between the post-test values of both groups, specifically in the *Expression of Emotions Test* (EET) context. It was noteworthy that while statistical significance was not achieved, the mean value within the experimental group (Mean = 23.43) exhibited a notably higher value than the mean score within the control group (Mean = 17.58). The comparative analysis of pre-and post-test values within the context of the *Expression of Emotions Test* for both the experimental and control groups is graphically depicted in Figure 9.

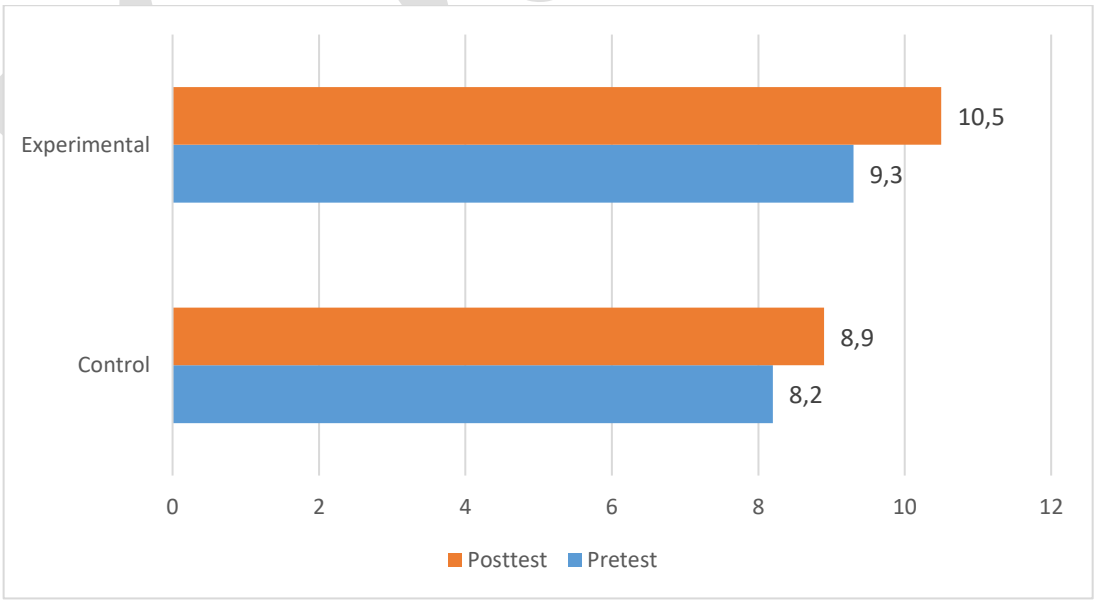

Figure 9. Comparison of the averages of the pre-and post-test *(EET)* of the experimental and control groups.

Figure 9 visually represents the augmentation observed in children's social-emotional development within both research groups. Nevertheless, it was discernible that the experimental group, which underwent the prescribed training regimen, achieved higher scores on the assessment. This outcome led to a plausible inference that the integrated music activities contributed to a discernible enhancement in the social-emotional aptitude of the experimental group.

To rigorously evaluate the significance of the observed changes, a Paired Samples t-test was performed, comparing the pre-and post-test values of the Vineland Social-Emotional Early Childhood Scale (VSEECS) between the children in the experimental and control groups. The comprehensive results of this analysis are meticulously documented in Table 8.

Table 8. Paired samples t-test results of experimental and control group's VSEECS scores.

Group	Test	N	Mean	Std. Deviation	df	t	p
Experimental	Pre-test	20	94.10	17.87	19	-.762	.455
	Post-test	20	96.00	13.91			
Control	Pre-test	20	90.05	12.91	19	-.392	.699
	Post-test	20	91.30	14.70			

**p<.05*

In Table 8, it is evident that no statistically significant difference (p = .455, p< .05) was discernible when comparing the pre-and post-test values of the experimental group despite the observed positive increment. Similarly, the analysis for the control group revealed no statistically significant difference (p = .699, p<.05) between their pre-and post-test values. These results highlighted the stability of scores within both groups over the evaluation period.

The distribution of the sub-scale dimensions and the overall total values of the Vineland Social-Emotional Early Childhood Scale (VSEECS) are presented in Table 9. Notably, these scores were derived from responses provided by participating families.

Table 9. Distribution of experimental group's *VSEECS* scores by sub-scale dimensions.

Sub-Scale Dimensions	N	Minimum	Maximum	Mean	Std. Deviation
Pre- test					
Interpersonal relations	20	16.00	35.00	27.25	5.81
Play and leisure time	20	12.00	26.00	18.65	4.46
Adaptation	20	33.00	62.00	47.85	9.05
Post- test					
Interpersonal relations	20	18.00	38.00	28.65	4.76
Play and leisure time	20	14.00	26.00	19.00	3.75
Adaptation	20	31.00	60.00	48.70	8.59
Total	20	71.00	116.00	96.00	13.91

**p<.05*

As seen in Table 9, the lowest score was reached in the pre-and post-test in the "play and leisure" sub-scale dimension (Mean =18.65; Mean=19.00), and the highest score in the "adaptation" (Mean=47,85; Mean=48,70) sub-scale dimension.

The statistical analysis employed the t-test for independent samples as a means to investigate the presence of a statistically significant distinction among the post-test values obtained from the *Vineland Social-Emotional Early Childhood Scale* (VSEECS) instrument across its sub-dimensions encompassing interpersonal relationships, play and leisure, as well as adaptation. The relevant findings are given in Table 10.

Table 10. Independent samples t-test results according to the VSEECS post-test scores (experimental-control groups)

Sub Dimensions Post test	Group	N	Mean	Std.Dev.	df	t	p
Interpersonal relations	Experimental	20	28.65	4.76	38	1.08	.320
	Control	20	27.20	4.32			
Play and leisure time	Experimental	20	18.80	3.75	38	-0.11	.907
	Control	20	18.65	4.31			
Adaptation	Experimental	20	48.70	8.59	38	1.18	.243
	Control	20	45.30	9.51			
Total	Experimental	20	96.00	13.91	38	1.03	.306
	Control	20	91,30	14.70			

*$p<.05$

As indicated in Table 10, it is evident that while the experimental group exhibited higher post-test mean values relative to the control group, a statistical examination did not reveal any statistically significant difference between these two groups ($p>.05$).

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

This study was conducted within the pre-and post-test control group research design scope. The findings indicated a significant difference between the *Expression of Emotions Test* pre-and post-test values in the experimental group participating in creative drama-integrated music activities. It may be construed that children's (experimental group) ability to express their feelings has improved at the end of the training. Moreover, children learned different forms of expression by playing roles and improvising during the animations, and they became more comfortable with improvisations as time progresses. In addition, the application of creative drama-integrated music activities given to the experimental group also led the children to develop spontaneous behaviors. This finding echoed Kirschner and Tomasello's (2010) statements that preschool children develop cooperative and spontaneous behaviors that enable them to establish social relations with their peers through creative drama-based music activities and musical games. During the implementation of the music activities, children showed actions such as clapping, dancing, walking, and singing with music played in the background and while singing songs. This spontaneity can arouse different emotions, which was evident in the classroom. Interestingly, some children were in a different mood than the week before. The reasons for these emotional changes were unclear and were not examined in this research. Besides, emotions evoked by music may also depend on the context in which the person (child) is at that moment (Jucan & Simion, 2015). Furthermore, it is noteworthy that children must engage in systematic practice and educational activities to develop the capacity for transmitting and receiving emotional signals that are advantageous to their well-being and that of others (Gao et al., 2022). According to this aspect, it is possible that children in the experimental group quickly expressed their feelings to the questions asked about their role-plays and after the songs and music pieces. These actions reflected positively on the *Expression of Emotions Test*, which was applied as a post-test and parallels Koelsch's (2014) argument that indicates music's social and emotional power. Koelsch claims that musical activity (such as singing) represents a multifaceted field of experiences. This is aligned with the current research's implementation, where children experienced and expressed various emotions. Furthermore, this finding is similar to Gao et al. (2022) research results indicating that creative drama may improve social-emotional learning competencies in preschool classroom settings with children from different cultural backgrounds. In line with that, the activities in this current research were carried out with children from different socio-economic and cultural demographic characteristics (see Table 2). Besides, one child's parents had hearing impairments and one's father was in jail. However, according to the normality tests, the study group of parents showed normal distribution.

Music helps children create their own emotions, but it can also enable them to communicate their and others' emotions. Children can communicate with music pieces that evoke different emotions and these emotions felt in the inner world are expressed in the outer world with gestures and different bodily movements. Furthermore, they can reflect different content and styles, and in this way, their emotional world can be enriched (Liu, 2015). According to this, in the current study, it was observed that children were comfortable reflecting the characters' emotions in the dramatic fiction of Tschaikowsky's Nutcracker ballet suite by dancing and moving with the music. Because the musical activities were carried out with creative drama in this research, children experienced verbal and bodily expression possibilities in a dramatic universe. In the evaluation phase of the creative drama process, the children were allowed to express their feelings verbally. In line with the statement mentioned earlier by Liu (2015), during the creative drama-integrated music activity adapted for the piece "The Nutcracker Ballet", the children in the experimental group gained several experiences of understanding the piece by improvising and role-playing and feeling the piece musically. With similar experiences, children can learn famous musical pieces in a dramatic learning environment, shaping their musicality; as Otacioglu (2008) stated, this would encourage children to express themselves musically and will lead them to strengthen their capability as musicians and future. However, there was no statistical difference in the EET values between both groups; the average values of the experimental group were higher than the control group, although not at a 'significant level'. The lack of a significant difference may be because the social-emotional learning activities included in the preschool core curriculum were carried out at school. Teachers may include various SEL activities in the classroom, positively affecting children's emotional expression skills in the control group. However, as teachers stated, their SEL activities in the classroom were not integrated with music and creative drama. No statistically significant difference was found in comparing the control and experimental groups' pre-and post-test mean values of the *VSEECS*. However, the experimental group's scores of the "adaptation" sub-scale dimension were high. A long-term study must be conducted to examine and understand the phenomenon in the context of integrated music teaching and learning that can support the growth of dramatic experiences. Along with this, creative drama not only improves the child's ability to communicate socially but also enables them to learn about the world and their place, sometimes through informal learning in the classroom. Integrating creative drama in the music lessons would give music-making opportunities rooted in creative choices and personal expression, a type of informal music learning (Derges, 2022). The fact that these two disciplines were applied with an integrated approach through activities was observed to be effective in children's adaptation skills. In this respect, it paralleled Ceylan's (2009) research findings. Ceylan's study indicated a significant difference between the post-test average values according to the experimental and control groups' Adaptation Sub-Scale dimension pre-test average values. Eventually, the creative drama-integrated music activities carried out with the experimental group were adequate. Although the general sub-scale dimensions post-test scores (interpersonal relationships, play and leisure time and adaptation) of the experimental and control groups were higher for the benefit of the experimental group, no statistically significant difference was found.

This research's creative drama-integrated music activities positively impacted preschool children's social interaction and self-expression in the classroom. This finding echoes Jones and Bouffard's (2012) description: social-emotional learning is recognizing and managing emotions, showing empathy for others, and building and maintaining functioning social relationships. Learning environments that create positive emotions should be prepared in schools because positive emotions keep students open and creative. Moreover, positive emotions and social behaviors encourage students to explore while learning and help them overcome difficulties. Thus, positive emotions are produced due to the success experienced and music education aims to ensure the personality development of individuals through emotional sensitivity and to enrich them as much as possible (Varadi, 2022). Therefore, it can be argued that creative drama-integrated music activities within the focus of SEL can improve musical skills early. For instance, awareness of emotions in listening, performing, and improvising might improve future musicianship and social interaction in orchestra/ensemble playing (Edgar, 2013). Therefore, including specific and explicit music activities integrated with creative drama in the music curriculum may help

teachers implement good classroom practices. A recent consensus report issued by the National Commission on Social, Emotional, and Academic Development in the United States has delineated a set of recommendations concerning incorporating social-emotional learning (SEL) within educational contexts. One such proposal entails the adoption of an evidence-based SEL curriculum for the explicit instruction of social-emotional competencies (Thierry et al., 2022).

Limitations and Recommendations for Future Research

This research was conducted with 40 preschool children aged five and their parents. The same study can be applied with a larger sample group. Another limitation was that the school was located in a high socio-economic neighborhood. For further studies, it is recommended to collect data from children and parents of rural areas with middle/low socio-economic demographics. In this context, the essence of the research questions would be how these children from different backgrounds, ages and class levels (pre-primary) express their emotions, respect others' emotions and interact with peers and groups in the music learning process. Therefore, collecting data through observation and interviews with children, parents, and teachers is essential for further mixed-methods research.

Additionally, to get an in-depth understanding of the phenomenon, longitudinal studies with qualitative design should be conducted to determine the effects of creative drama-integrated music activities to promote children's social-emotional learning and skills development. Another limitation was that, although the EET test was applied to children individually, the VSEECS scale was applied only to families. Parents rated how often the child performed the appropriate behaviors using this scale. Nevertheless, developing semi-structured observation forms might be more effective in determining children's social-emotional competencies.

Music teachers must know students' social-emotional needs and be well-prepared to cope with social-emotional challenges (Edgar, 2013). Therefore, there is a substantial need for classes in higher teacher education prepared with quality content that can establish connections between SEL, music education and creative drama. Within the creative integrated music courses offered in educational faculties, preschool and music pre-service teachers are expected to specialize in field knowledge/experience that can improve their students' social-emotional skills in the future. Studying music curriculum development within an integrated approach for SEL in music teaching and learning is recommended for further research. Pre-service music and preschool teachers need to be competent in music pedagogy at a level where they can integrate music and creative drama into their classrooms by addressing SEL. Thus, social-emotional skills development in all life periods seems critical for academic and life success, including well-being. Future researchers could delve deeper into designing interdisciplinary music activities for developing children's social-emotional skills through systematic assessments.

Despite all these limitations, the current research will give educators, researchers, and curriculum designers a different perspective on innovative and creative teaching and learning through an integrated approach where music meets creative drama. Working with drama techniques using high-quality children's books and stories in the music lessons will enable an emotional stimulus that leads to an aesthetic experience and a form of self-expression.

In conclusion, this research articulates examples of meaningful music education where students can create an imaginative environment to make their own stories, pieces of music and more. These illustrations show the benefits of promoting student's social-emotional learning skills in preschool.

Ethics and Conflict of Interest

Before conducting the applications, participants were duly apprised of the research's objectives and scope, with an explicit declaration of adherence to ethical standards. Consequently, the Bursa Uludag University Social and Human Sciences Research and Publication Ethics Committee granted ethical approval for this study, as per Decision No. 2022/02, dated February 25, 2022. All requisite research ethics guidelines were meticulously followed during the study's execution. Furthermore, the authors affirm that no conflicts of interest exist among them about this article's research, publication or authorship.

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EXAMINATION OF DIAGRAMMATIC REPRESENTATION AND VERBAL PROBLEM-SOLVING REPRESENTATIONS OF PRIMARY SCHOOL STUDENTS

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Abstract

This study aimed to examine the diagrammatic representation skills and problem-solving performances of students according to their problem-solving representations. A cross-sectional survey design using quantitative methods was used in this study. The sample consisted of 31 second-grade and 41 third-grade students from a public primary school in Turkey. The Diagrammatic Representation Test and Mathematical Operations Test were used in this study. The data were analyzed with descriptive statistical analysis, the chi-square test, the independent samples t-test, discriminant analysis and logistic regression analysis. The findings indicated that while the preferred types of representations for solving verbal problems and problem-solving performance did not vary significantly based on grade level, scores obtained from the diagrammatic representation test exhibited significant differences. It was observed that students' problem-solving performance and diagrammatic skills could predict their preferred types of representations for solving verbal problems. Consequently, students who possess knowledge regarding effective representation preferences, as well as the ability to construct and utilize them, are more likely to generate appropriate and high-quality representations, leading to accurate problem-solving outcomes. This, in turn, enhances their performance in diagrammatic representation tasks.

Keywords: Diagrammatic representation, pictorial representation, schematic representation, symbolic representation, verbal problem solving.

INTRODUCTION

People use various mechanisms to understand reality, including representing their understanding of it in their mind or a non-mind environment. Representations are a means of simplifying, reducing, and making complex concepts more understandable. They provide opportunities to support and monitor one's thinking and help others understand how information is processed. In this context, representations become a significant structure to demonstrate what students think and know (Diezmann & Lowrie, 2009).

Representation is a crucial skill for students learning mathematics, as it is one of the mathematical processes defined in the primary school mathematics curriculum, along with problem-solving, reasoning and proof, and communication. Therefore, in mathematics lessons, teachers are expected to guide students to integrate meanings across verbal, visual-spatial, embodied, and symbolic representations (Tytler et al., 2023). Students should be encouraged to choose representations to solve problems, switch between representations, and use multiple representations to develop representation skills (Lowrie, 2020). Studies have shown that the types of representations used to solve a problem can affect problem-solving success and provide insights into the effectiveness of internal (imagery-based) and external (diagrammatic and analytical-based) representations (e.g., Blazhenkova & Kozhevnikov,

2009; Kozhevnikov et al., 2005). External representations are particularly useful in problem-solving when a new problem is encountered.

The Role of Diagrams in Problem-Solving:

External representations, such as diagrams, can be a valuable strategy for solving word problems in mathematics. More importantly, diagrams allow students to think and solve problems in new ways. A diagram does more than visualize a problem; it is an essential tool for solving it. Creating diagrams to solve mathematical problems can help students in various ways (Stylianou, 2010). Early in the process, diagrams can be used to record information about the problem during the resolution process. Once the student begins conceptualizing the problem, diagrams can be a tool to explore alternative ways of understanding the problem. Even if a solution is found, diagrams can monitor and evaluate the solution. Traditionally, verbal analysis has been the primary method of solving mathematical problems. However, diagrams offer a new perspective that can lead to a deeper understanding and alternative problem-solving strategies.

Accurately and flexibly representing diagrams and other visual representations is critical to success in problem-solving, as pointed out by Lowrie (2020). Additionally, research has shown that adding diagrams related to the problem can improve learning and have cognitive benefits, as highlighted by studies by Mayer (1989, 2005). However, it is important to note that forming various diagrammatic reasoning theories and using diagrams depends on the problem at hand and the ability to solve it, according to Acevedo Nistal et al. (2009). Unsuitable representations presented to the student may not support the cognitive processing required to solve the problem, which is unlikely to help the student. Therefore, it is crucial to choose appropriate representations while solving problems to increase problem-solving success. Studies suggest that diagrams play a crucial role in problem-solving by enabling students to record information, explore alternative ways of understanding the problem, and evaluate their solutions, as demonstrated by Gültekin & Altun (2022) and Ertuna & Toluk-Uçar (2021). To summarize, diagrams play a key role in problem-solving, allowing students to visualize complex concepts and explore alternative solutions. Hence, educators should encourage using diagrams and other visual representations in problem-solving activities to promote deeper understanding and enhance students' cognitive abilities.

Diagrammatic Representations in Mathematics Teaching:

In mathematics teaching, diagrams are a frequently used tool in Singapore (Beckmann, 2004) and Japan (Murata, 2008), two countries known for their superior mathematics achievement compared to global standards (National Centre for Education Statistics, 2003; Lowrie, 2020). The purpose of diagrams is not to assist students in performing operations but to aid in selecting which operations to use and to comprehend why they are conceptually appropriate (Beckmann, 2004). Using diagrams at an early age helps students solve more complex problems later on and enhances their problem-solving abilities (Booth & Koedinger, 2012).

Teaching activities that incorporate diagrammatic representations in problems support young children who may struggle with representing problems accurately and independently or those who have low problem-solving skills (Booth & Koedinger, 2012). The use of diagrams plays a vital role in problem-solving activities, enabling students to visualize complex concepts, explore alternative solutions, and evaluate their solutions.

Using diagrams in mathematics teaching is an effective way to engage students in problem-solving activities and enhance their cognitive abilities. Moreover, research in cognitive science literature suggests that mental imagery and gestures also play a crucial role in problem-solving similar to diagrams (Tian et al., 2017). Incorporating diagrams in mathematics teaching can help students decide which operations to use, understand the conceptual basis of mathematical concepts, and solve more complex problems. Therefore, educators should encourage using diagrams and other visual representations in mathematics teaching to help students develop a deeper understanding of mathematical concepts and improve their problem-solving skills (Hatisaru, 2020).

The ability to produce accurate and effective diagrammatic representations is a significant skill for students, especially in the early stages of mathematical learning. Using concrete experiences and visual representations, primary school students can better understand abstract mathematical concepts. Research suggests that students who can produce correct visual-schematic representations are more likely to successfully solve verbal problems (Hegarty & Kozhevnikov, 1999; Lowrie & Kay, 2001). In contrast, students who use poorly constructed schematic or pictorial representations are more likely to produce incorrect solutions to verbal problems (Boonen et al., 2014). Therefore, it is crucial for students to be exposed to various diagrams and different forms of representation in their early years of education (van Garderen et al., 2013). It is recommended to focus on developing diagrammatic representation skills in primary school students to enhance their problem-solving abilities and deepen their understanding of mathematical concepts. This study is crucial because it highlights the role of diagrams and visual representations in helping students understand and solve mathematical problems. Studies have shown that the use of diagrams and other visual representations can enhance students' cognitive abilities and improve their problem-solving skills (Surya et al., 2013; Davenport et al., 2008). By encouraging students to use diagrams to represent mathematical problems, educators can help them develop a deeper understanding of mathematical concepts and approach problems in new ways. Moreover, studies suggest that students who can produce correct diagrammatic representations are more likely to solve verbal problems successfully, underscoring the importance of acquiring these skills at an early age (ex: van Garderen et al., 2013). Thus, this study emphasizes the significance of incorporating diagrams and visual representations into mathematics teaching and problem-solving activities. By doing so, educators can help students become more confident and successful problem solvers, which is critical for their academic and future professional success. It is important to conduct this study as it can provide valuable insights into the relationship between diagrammatic skills, problem-solving performance, and preferred representation types among early childhood education students. This information can be used by educators and policymakers to develop more effective teaching methods and learning materials that can enhance students' cognitive abilities and problem-solving skills. This study can contribute to the existing literature on the importance of diagrammatic representations in mathematics and problem-solving education.

This study aims to examine the diagrammatic representation skills and problem-solving performances of primary school second and third-grade students according to their problem-solving representations. This study seeks to answer the following research questions:

- ✓ What types of representations and diagrammatic representation skills are preferred by second and third-grade students?
- ✓ Do the types of representations students prefer differ according to their grade levels?
- ✓ Do students' problem-solving performances and diagrammatic skills predict the types of representation students prefer to solve verbal problems?
- ✓ Do students' preferred representation types, problem-solving performances, and diagrammatic test scores predict their grade level?

METHOD

This study aimed to investigate the impact of diagrammatic skills and problem-solving performance on preferred representation types and grade levels among second and third-grade students in early childhood education at the start of primary school. For this purpose, a cross-sectional survey model, which is a quantitative method, was utilized. In such models, the data collection process is carried out once, and data collection is similar to taking pictures of the participants at any given moment (Metin, 2014). In this regard, this current study is limited with data quantitative in nature and conducted as a quantitative cross-sectional survey study (Fraenkel & Wallen, 2003).

Participants

The research data were collected in Turkey in the autumn term of the 2021-2022 academic year when face-to-face education resumed after the distance education period. This was a crucial period for students to adjust to being back in school, particularly as many parents were hesitant to send their children to school due to the pandemic. Consequently, obtaining consent from teachers, parents, and principals proved challenging, resulting in a limited sample size. To ensure accessibility and ease of participation, a convenience sampling method was used, meaning that participants were chosen based on availability and proximity to the researchers. No other criteria were considered, except for the school's willingness to participate in this study. Therefore, the socio-economic background of the school may not necessarily align with the researchers' preferences, although it is significant to note that the participating school had a middle socio-economic status. It is also worth noting that students with different mother tongues were in separate classes and did not participate in this study, thereby ensuring that students' reading-writing levels and reading comprehension development were age-appropriate. The study included 31 second-grade students (17 girls and 14 boys) and 41 third-grade students (25 girls and 16 boys) from two randomly selected branches in each grade. The students' ages ranged between seven and eight years, with an average age of seven years and seven months.

The decision to conduct this study with 2nd and 3rd-grade students has been based on several factors. Firstly, at this age, children are expected to have developed basic diagrammatic representation skills and problem-solving abilities, which can be further developed with appropriate instruction and practice. Secondly, younger children may be more receptive to learning new skills and strategies, making it easier for them to learn and apply new diagrammatic representations to solve problems. Finally, by focusing on two grades, the researchers may be to more closely examine the developmental progression of diagrammatic representation skills and problem-solving abilities over time. Research has shown that early mathematical skills are strong predictors of later academic success, and these skills are developed during the early elementary school years. Second and third-grade students are at an age where they are developing their diagrammatic representation skills and are becoming more aware of their preferred problem-solving representations (Newcombe & Frick, 2015). Therefore, studying these students can provide insight into how they use these representations and how their problem-solving performance is related to their diagrammatic representation skills. The 4th grade was not included because the researchers wanted to focus specifically on the early stages of diagrammatic representation and problem-solving development, and the 4th grade was considered beyond that scope.

Data Collection Tools

The diagrammatic representation test used in this study consisted of 24 questions and was originally developed by Frick and Newcombe (2015) for the 4-8 age group. The test assesses students' ability to manipulate and understand visual-spatial information and includes geometric objects, geometric objects with straight black lines drawn on their edges, and color photographs of the drawings created by following the borders. The test is designed as horizontally aligned, four-choice cards centered at the top of the letter-size sheet (four lines of 21.6 cm) presented in the horizontal orientation. In this study, the test was administered to the students in its original form (Figure 1).

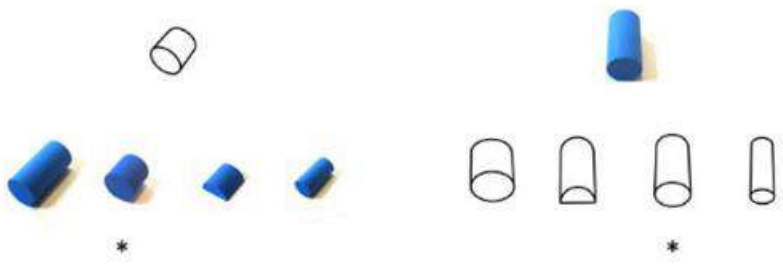

Figure 1. Example of diagrammatic representation test questions.

The Mathematical Operations Test (MIT), developed by Suwarsono (1982), consists of 10-word problems selected according to students' levels. The test has been used in many studies to evaluate the effectiveness of external representations with different age groups, including studies by Lowrie & Clements (2001), Lowrie & Kay (2001), Boonen et al. (2013), and Boonen et al. (2014). The solution choices in the test were classified into two categories: diagrammatic (pictorial, schematic) and analytical. Two coders were hired to classify the solutions, and the inter-rater reliability coefficient was calculated as .90 for all solution options throughout the test. This method of coding student solutions has been used in the research literature for over 30 years. Examples of questions in MIT are given below.

Mathematical Operations Test (MIT)

- Ahmet is taller than Meryem and shorter than Jale. Who is the tallest?
- The flying balloon first rose 20 meters from the ground. Then it moved 10 meters to the right, then fell 10 meters down. It then advanced 5 meters to the right and finally fell flat to the ground. How far is the balloon from the starting point?
- In an athletics competition, Ahmet is four steps ahead of Ayşe, and Ali is three steps behind Ahmet. How far ahead of Ayşe is Ali?

Data Collection

Before administering the tests to the students, preliminary preparations were made. For instance, a sample problem similar to those in the Mathematical Operations Test was presented to the students, and they were instructed to read the problem statement carefully. They were then asked to complete a table with the problem's purpose, estimation of the result, components, and given and requested information and provide solutions in their own words.

During the actual test, students were not given any instructions about whether or not they should use external representations. This allowed researchers to observe students' comprehension, reading and writing skills and problem-solving abilities.

Similarly, before administering the diagrammatic representation test, sample questions were studied to ensure that all students understood the task. A picture of a house and a child drawing the same house on paper was shown to the students. They were told that the child's name was Ali and that he enjoyed drawing. Next, the students were shown four different drawings of a ball and asked to choose which one they thought was drawn by Ali.

All of these activities helped ensure that the students understood the questions and were able to perform their best. This study, including the tests, preliminary information, and exercises, took two weeks to complete.

Data Analysis

When the data collected were transferred to Excel, the examination process began by coding the data obtained from the diagrammatic test as true or false and entering the scores obtained from the test. Then, the data obtained from the Mathematical Operations Test were coded as pictorially correct, pictorially incorrect, schematically correct, schematically incorrect, symbolically correct, and symbolically incorrect. These data were analysed using the Crosstab function in the SPSS 22 program. The students' correct answer rates in the diagrammatic test were analysed according to their grade level and the representation types they preferred. The students' preferred representation types were reduced to three groups (pictorial, schematic, and symbolic) using the dispersion interval method of Sevimli (2013), Taşova (2011), Krutetski (1976), and Galindo-Morales (1994). The distribution interval is the difference between the highest and lowest scores obtained from the test divided by the number of groups. Students' answers to the questions were coded as 0, 1, or 2 points, depending on the type of representation used (pictorial, schematic, or symbolic). The maximum score on the test was 20, and the minimum score was 0. According to the distribution range, those with 0-6 points were coded as using pictorial representation, 7-13 points were coded as using schematic representation, and 14-20 points were coded as using symbolic representation. The students' preferred types of representation

were then examined according to their grade level using the chi-square test. The independent samples t-test was used to analyse whether the students' scores from the diagrammatic representation test and their problem-solving performance changed according to their grade level. Discriminant analysis was conducted to determine how well students' problem-solving performances and diagrammatic skills predicted the types of representations they preferred to solve verbal problems. Logistic regression analysis was conducted to determine how much students' preferred representation types and their problem-solving performances and diagrammatic test scores predicted their grade levels (being a member of a second or third-grade cluster).

RESULTS

What types of representations and diagrammatic representation skills are preferred by second and third-grade students? To answer this question, descriptive statistics were calculated and the Crosstabs data results were examined. Table 1 shows the correct answer rates for the diagrammatic test according to students' grade levels and preferred representation types.

Upon examination of Table 1 according to the problems in the Mathematical Operation Test, the frequency distributions of the number of correct responses and the preferred representation types in the diagrammatic representation test of second and third-grade students are shown. In this regard, for the first problem, it was observed that out of a total of 43 students, 40 students used pictorial representation (with 40 correct and three incorrect answers), six students used schematic representation (with six correct answers), and 23 students used symbolic representation (with 17 correct and six incorrect answers).

In the pictorial representation category, for the 9-14 correct answer range, there was one student from the second grade, for the 15-19 correct answer range, there were eight students from the second grade and five students from the third grade. For the 20-24 correct answer range, there were seven students from the grade and 19 students from the third grade. In the pictorial representation category, for the 15-19 correct answer range, there were three students from the third grade who provided incorrect answers. In the schematic representation category, there were no students who provided correct answers in the 9-14 correct answer range, and for the 15-19 correct answer range, there were two students from both the second and third grades. For the 20-24 correct answer range, there was one student from both the second and third grades. There were no students who provided incorrect answers in the schematic representation category.

In the symbolic representation category, for the 9-14 correct answer range, there were four students from the second grade. For the 15-19 correct answer range, there were four students from the second grade and five students from the third grade. For the 20-24 correct answer range, there were four students from the third grade. In the symbolic representation category, for the 9-14 correct answer range, there were four students from the second grade who provided incorrect answers. For the 15-19 correct answer range, there was one student from the third grade. For the 20-24 correct answer range, there was one student from the third grade.

In general, when examined, it was observed that students who scored high on the diagrammatic test (with a score range of 20-24) generally solved the problems using pictorial and schematic representations. In addition to the fact that the number of symbolic incorrect responses was higher than the incorrect responses in other representation types, these students were seen to be in a moderate score range in the diagrammatic test. It can be stated that, according to the grade level, pictorial and schematic representations were more frequently used, and these students were the ones who scored high on the diagrammatic test.

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Table 1. The rate of correct answers to the diagrammatic test according to students' grade levels and preferred representation types.

Problem Representation Types		Pictorially Correct			Schematically Correct			Symbolically Correct			Pictorially Incorrect			Schematically Incorrect			Symbolically Incorrect		
Diagrammatic test correct answer range		9-14 Correct	15-19 Correct	20-24 Correct	9-14 Correct	15-19 Correct	20-24 Correct	9-14 Correct	15-19 Correct	20-24 Correct	9-14 Correct	15-19 Correct	20-24 Correct	9-14 Correct	15-19 Correct	20-24 Correct	9-14 Correct	15-19 Correct	20-24 Correct
Problem 1	2nd Gr	1	8	7	0	2	1	4	4	0	0	0	0	0	0	0	4	0	0
	3rd Gr	0	5	19	0	2	1	0	5	4	0	3	0	0	0	0	0	1	1
	Total	1	13	26	0	4	2	4	9	4	0	3	0	0	0	0	4	1	1
Problem 2	2nd Gr	0	5	3	0	0	1	1	4	2	3	1	2	1	0	0	3	3	0
	3rd Gr	0	2	0	0	0	2	0	7	13	0	1	3	0	0	1	0	8	4
	Total	0	7	3	0	0	3	1	11	15	3	2	5	1	0	1	3	11	4
Problem 3	2nd Gr	2	8	4	0	0	1	1	1	3	4	5	1	0	0	0	2	0	0
	3rd Gr	0	5	14	0	0	1	0	2	1	0	7	6	0	0	0	0	2	3
	Total	2	13	18	0	0	2	1	3	4	4	12	7	0	0	0	2	2	3
Problem 4	2nd Gr	0	3	1	1	8	6	2	1	1	0	0	0	4	0	0	2	2	0
	3rd Gr	0	1	3	0	8	17	0	5	3	0	0	0	0	1	0	0	1	2
	Total	0	4	4	1	16	23	2	6	4	0	0	0	4	1	0	2	3	2
Problem 5	2nd Gr	0	2	3	0	0	0	0	4	4	0	4	4	2	2	0	4	3	0
	3rd Gr	0	1	7	0	1	2	0	3	7	0	2	3	0	0	2	0	9	4
	Total	0	3	10	0	1	2	0	7	11	0	6	7	2	2	2	4	12	4
Problem 6	2nd Gr	0	4	5	0	2	1	2	3	1	2	2	0	2	1	1	3	2	0
	3rd Gr	0	4	13	0	1	1	0	4	3	0	5	5	0	1	1	0	2	1
	Total	0	8	18	0	3	2	2	7	4	2	7	5	2	2	2	3	4	1
Problem 7	2nd Gr	0	1	0	0	3	7	0	0	0	1	5	0	2	4	1	4	1	0
	3rd Gr	0	0	1	0	3	8	0	0	0	0	3	3	0	5	9	0	5	4
	Total	0	1	1	0	6	15	0	0	0	1	8	3	2	9	10	4	6	4
Problem 8	2nd Gr	0	0	2	0	6	3	0	1	0	1	1	3	3	4	0	3	1	0
	3rd Gr	0	0	3	2	17	0	0	0	0	0	2	1	0	5	1	0	7	3

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	Total	0	0	5	2	23	3	0	1	0	1	3	4	3	9	1	3	8	3
Problem 9	2nd Gr	0	4	2	0	0	4	0	0	0	2	0	1	0	6	1	4	4	0
	3rd Gr	0	1	9	0	4	3	0	0	0	0	7	8	0	1	1	0	3	4
	Total	0	5	11	0	4	7	0	0	0	2	7	9	0	7	2	4	7	4
Problem 10	2nd Gr	0	1	1	0	2	5	0	1	1	0	0	0	2	6	1	2	4	0
	3rd Gr	0	0	3	0	3	8	0	3	2	0	3	3	0	4	4	0	3	5
	Total	0	1	4	0	5	13	0	4	3	0	3	3	2	10	5	2	7	5
General	2nd Gr	3	36	28	1	23	29	10	19	12	13	18	11	16	23	4	31	20	0
	3rd Gr	0	19	72	2	39	43	0	29	33	0	33	32	0	17	19	0	41	31
General Total		3	55	100	3	62	72	10	48	45	13	51	43	16	40	23	31	61	31

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In total, based on the answers provided by the students, 720 verbal problem representation data points were obtained. Figure 2 provides a general distribution of these representations by grade level.

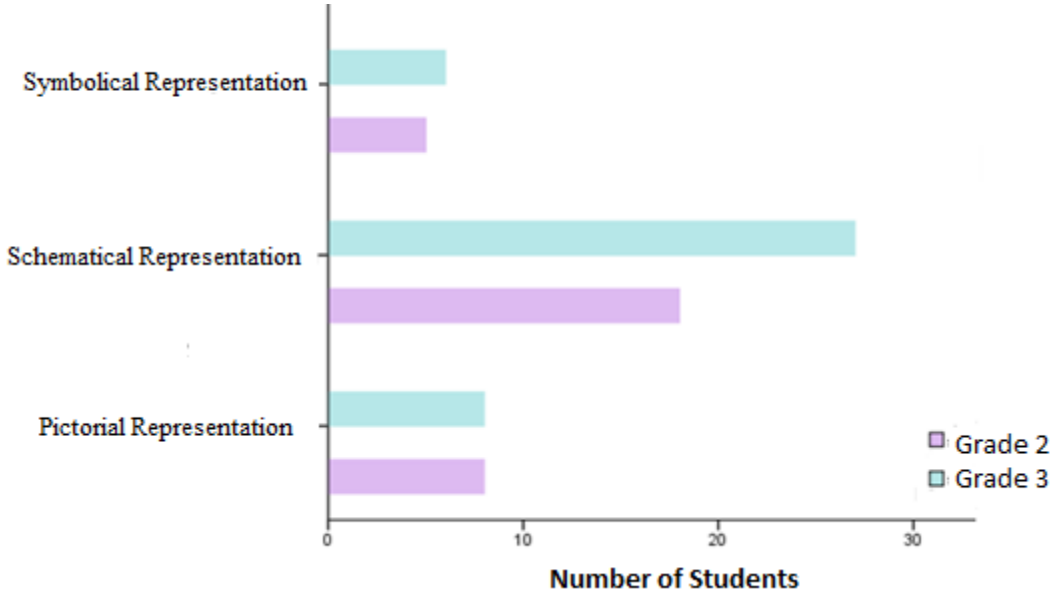

Figure 2. Types of representation preferred by students according to grade levels

Based on the data presented in Figure 2, it can be observed that second and third-grade students tended to use schematic representation more frequently than other types of representation. However, the frequency of using schematic representation by third-grade students was higher than that of second-grade students. Both grade levels used pictorial representation almost equally. It was seen that symbolic representation was less preferred than other types of representation. However, it can also be said that third-grade students used it more frequently than second-grade students. Table 2 presents the results of the chi-square test conducted to determine if there was a significant difference in the types of verbal problem representations preferred by second and third-grade students based on their grade levels.

Table 2. Chi-square test results regarding grade level and preferred representation types.

Variables	Pearson Chi-Square	df	p
Grade Level x Preferred Representation Type	.512	2	.774

As shown in Table 2, there was no significant difference in the types of representation preferred by students according to their grade level [χ^2 (2) = .512, p > .05]. Considering the number of students in this study and the distribution of their preferred types of representation, it can be concluded that the student's preference for a particular type of representation did not change based on their grade level. Table 3 shows the results of the independent sample t-test regarding whether the students' scores obtained from the diagrammatic test differed according to their grade levels.

Table 3. Students' diagrammatic test scores according to their grade levels

	Grade	N	Mean	Std.Dev.	t	df	F	p
Diagrammatic test	2	31	16.58	3.931	-4.367	70	3.610	.000*
	3	41	20.05	2.810				

p<.05*

As shown in Table 3, there was a significant difference between the diagrammatic representation test scores of second and third-grade students, with third-grade students scoring higher on average (Mean $_{\text{second-grade}}$ = 16.58; Mean $_{\text{third-grade}}$ = 20.05; $t_{(70)}$ = -4.367, p<.001). However, no significant difference was found between the mean scores of the two grades regarding problem-solving performance (Mean $_{\text{second-grade}}$ = 9.48; Mean $_{\text{third-grade}}$ = 9.63; $t_{(70)}$ = -163, p>.05). Furthermore, a significant negative correlation was found between the students' problem-solving performances and the scores they received from the diagrammatic representation test, indicating that students who performed better in the diagrammatic test tended to have lower problem-solving performances (Correlation = -.464; p<.001).

Discriminant analysis was conducted to determine the extent to which students' problem-solving performance and diagrammatic skills predicted the types of verbal problem representations they preferred. This study met the necessary assumptions for conducting the analysis, including having at least 30 samples for the three independent variables. Seventy-two students participated in this study, and the independent variables showed a multivariate normal distribution (Kolmogorov-Smirnov p>.01). Homogeneity of variance-covariance matrices is required for conducting discriminant analysis. The homogeneity of matrices in this study was tested with the Box M test ($F_{(6\text{-}5.390)}$ = .841, p>.05), which determined that they were homogeneously distributed. Extreme values were not observed, and there was no multicollinearity problem in this study. The eigenvalue of this study was 2.93, which is considered a good value (Kalaycı, 2005) with a score higher than .40. The canonical correlation between the groups formed by the dependent variable and the discriminant function was examined, and it was.863. The higher the value of the canonical correlation is, the stronger the relationship between the groups and the discriminant functions is. The model explains 75% of the change in the dependent variable, which is the square of the canonical correlation.

Discriminant analysis was conducted to determine the extent to which second and third-grade students' preferred representation types, problem-solving performances, and diagrammatic skills scores could differentiate them. Specifically, the analysis aimed to predict the types of representations preferred by the students based on their grade level, problem-solving performances, and diagrammatic skills scores. This study included 72 participants, and the necessary assumptions for conducting discriminant analysis were met, such as a multivariate normal distribution for the independent variables and homogeneity of variance-covariance matrices, which were tested using the Box M test.

The results of Wilks' Lambda (Λ = .251, χ^2 = 94.787, p<.001) indicated that the model, which included two predictive variables, significantly separated the three groups based on their preferred representation types (i.e., schematic, pictorial, and symbolic). The standardized function coefficients and the relationships between the discriminant and independent variables are presented in Table 4.

Table 4. Standardized function and structure matrix (correlation) coefficients of variables.

Independent (predictor) variables	Standardized function coefficients		Structure Matrix (correlation) coefficients	
	1	2	1	2
Diagrammatic Test	-.131	1.007	.992	.129
Problem Solving Performance	.969	.301	-.297	.955

Based on Table 4, the highest correlation with the discriminant function was observed for problem-solving performance in the first function. On the other hand, the second function was mostly related to diagrammatic skills. This suggests that problem-solving performance has a stronger impact on the first function, while diagrammatic test scores have a greater influence on the second function. Moreover, according to the structure matrix coefficients, students' scores on the diagrammatic test were utilized to name the first function, whereas their problem-solving performance was used to name the second function. Figure 3 provides a graphical representation of the functions' points in each group (i.e., pictorial, schematic, and symbolic) based on their numerical values.

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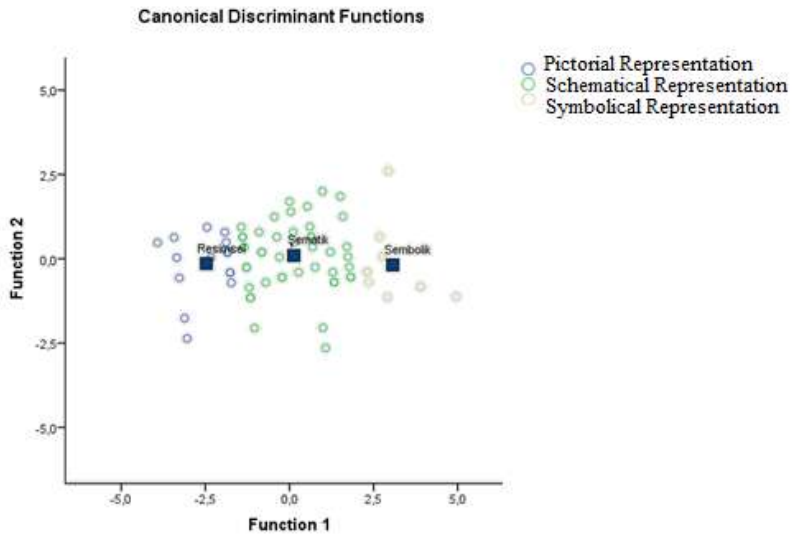

Figure 3. The place of each group in functions.

Based on Figure 3, both function 1 and function 2 effectively differentiate between the types of representations that students prefer. Table 5 provides the classification results, demonstrating the number of participants who were correctly assigned to their respective groups based on the functions.

Table 5. Discriminant analysis classification results.

Group	Pictorial		Schematic		Symbolic		Total	
	f	%	f	%	f	%	f	%
Pictorial	16	100	0	.0	0	0	16	100
Schematic	0	0	45	100	0	0.	45	100
Symbolic	0	.0	0	.0	11	100	11	100

Total Correct Classification Percentage: 100

Table 5 shows the results of the classification, which indicates the number of students placed in each group. All 16 students (100%) who preferred pictorial representation were correctly classified, as were all 45 (100%) students who preferred schematic representation, and all 11 students who preferred symbolic representation (100%) were correctly classified. The overall correct classification rate for the discriminant function was 100%.

A logistic regression analysis was also conducted to determine the extent to which students' preferred representation types, problem-solving performances, and diagrammatic test scores predicted their grade levels (i.e., whether they were in the second or third grade). The results indicated that all the independent (predictive) variables significantly predicted the grade level (χ^2 = 25.932, df = 3, N = 72, p<.001). Together, the predictive variables accounted for approximately 40% of the grade-level variance (Nagelkerke R2).

Table 6 presents the odds ratios [Exp (β)] of individual students, which show the degree to which their diagrammatic skills and problem-solving performances predict their grade level.

Table 6. Logistic regression rates for predicting grade level of students' diagrammatic skills and problem-solving performance.

Variable	B	Standard Error	Wald	df	P	Exp(β)
Diagrammatic Test	.522	.138	14.341	1	.000	1.685
Problem Solving Performance	.170	.162	1.109	1	.292	1.186
Representation Type	.868	.896	.939	1	.333	2.382
Constant	-11.732	3.386	12.006	1	.001	.000

As shown in the results in Table 6, if a student's diagrammatic test score is known, it is likely to predict that they belong to the third-grade cluster with a probability of 68.5% (I1- 1.186I x100). In other words, an increase of one unit in the diagrammatic test score leads to a 68.5% increase in the odds of being a member of the third-grade cluster.

DISCUSSION, CONCLUSION, and SUGGESTIONS

The development of student's ability to solve verbal, mathematical problems is considered important in mathematics education (NCTM, 2000). Over the years, many learning approaches and strategies have been developed to improve this, including the use of diagrams. Studies have shown that using diagrams has many benefits, including helping students succeed in problem-solving (Cheng, 2004; Mayer & Massa, 2003; Stenning & Oberlander, 1995). This study aimed to determine the use of diagram representation, problem-solving performance, preferred representation types, and problem-solving representation types of students at different age levels based on their ability to use diagram representation and their problem-solving performance. While most studies focus on problem-solving strategies (Cooper et al., 2018), this study is unique in its approach to student development and its association of representation types preferred by children in early childhood in primary school with diagrammatic representation skills.

When primary school third-grade students used schematic and pictorial representations and solved the problem correctly, they were observed to be in the group with a high rate of correct answers on the diagrammatic test. Similarly, if they used schematic representation and solved the problem correctly in the second grade, they were also in the high correct answer rate group on the diagrammatic test. On the other hand, when they used pictorial representation and solved the problem correctly, the correct answer rate on the diagrammatic test was moderate, despite pictorial diagrams being known as ineffective diagrams in the literature. Pictorial diagrams are usually used to describe the visual appearance of the variables in verbal problems or to make drawings that do not help solve the problem. However, in this study, it was seen that students who drew pictures and answered the question correctly had higher scores in the diagrammatic representation test. This is because pictorial representations are considered a step toward transitioning to more advanced schematic representations, which are known to be effective.

Using pictorial representations, a person describes the visual appearance of the variables in verbal problems (van Garderen & Montague, 2003) (for example, a one-to-one drawing of a cat in a verbal problem) or makes drawings that will not help solve the problem (Presmeg, 2006). However, in this study, it was seen that the students who both drew pictures and answered the question correctly had higher scores in the diagrammatic representation test. This is because pictorial representations are thought to be a step toward transitioning to more advanced schematic representations. After all, schematic diagrams are known to be effective. With schematic representation, the student goes beyond visualizing the objects in the problem; they represent the content of the problem, use graphs, diagrams, and meaningful tables, and depict relational information by employing more metacognitive skills (van Garderen, 2007).

With schematic representation, students go beyond visualizing the objects in the problem, represent the content of the problem, use graphs, diagrams, and meaningful tables, and depict relational information by employing more metacognitive skills. According to Zahner and Corter (2010), schematic diagrams or schematic representations are extremely useful for verbal problems in mathematics, and this benefit transfers to other areas of mathematics learning, such as geometry and probability. Rellensman et al. (2016) also noted that both pictorial and schematic representations positively affect modeling performance and problem-solving performance, emphasizing that such representations are central to abstraction and generalization in mathematics.

Interestingly, when third-grade students solved the problem using symbolic representation and answered incorrectly, they scored low on the diagrammatic test, while second-grade students received a moderate score on the diagrammatic test. This finding contradicts Lowrie's (2020) study, which suggests that students may not need diagrammatic representation when problems are easy, as they can use computational and analytical methods to generate solutions. However, according to this study, if the problems in which the students used symbolic representations were easy, the students should not have answered these problems incorrectly. In other words, it was observed that students at both levels who incorrectly answered the problems they solved without using diagrams were not successful in the test of diagram representation skills.

In this study, it was found that there was no significant difference in the types of verbal problem representations preferred by third and second-grade students based on their grade levels. It was observed that both groups preferred schematic representation over other types of representation. Moreover, there was no significant difference in the problem-solving performance of students between the two grade levels, which contradicts the findings of Cooper et al. (2018). These researchers reported that students with higher mathematical skills are more likely to use visual representation to solve problems and that students' skills, interests, attitudes, and motivation toward mathematics also affect their use of diagrams.

This study also revealed that there was a significant difference in diagrammatic representation test scores between students of different grade levels. It was observed that third-grade students were more successful in the diagrammatic test, suggesting that diagrammatic representation skills develop as age progresses. This finding is consistent with the work of Frick and Newcombe (2015), who reported that children's diagrammatic representation skills improve until the age of eight and that they can achieve near-perfect performance only above the age of 8.

It has been found that students' problem-solving performances and diagrammatic representation skills can predict the types of representations that students prefer to solve verbal problems. According to Johnson-Laird's (1983) mental models theory, people construct representations or models in their minds while solving problems, and the underlying cognitive processes can influence these representations. Therefore, it has been emphasized that the decision to use pictures or diagrams in problem-solving representations may be related to the person's underlying cognitive processes. Hence, this theory supports the results of this study.

The study findings suggest that successful problem-solving and the level of diagrammatic representation skills can affect the types of representations students use. Murayama (2003) also revealed that the use of representations in problem-solving can be influenced by cognitive processes. In Rellensmann et al.'s (2016) study with high school students, the types of representations used by students were found to affect their problem-solving performance and mathematical modeling skills, and the use of schematic representation, a mathematical drawing, was associated with successful problem-solving. In Van Garderen et al.'s (2012) study with different age groups, the findings showed that students who used schematic diagrams were more likely to solve the problem correctly than those who used picture diagrams.

Uesaka et al. (2010) suggested that the use of diagrams in problem-solving does not come naturally and requires exposure and experience. Therefore, it can be inferred that students who have more

opportunities to use diagrams in their learning, through either teacher instruction or real-life experience, are more likely to have stronger diagrammatic representation skills. This study also found that students' diagrammatic test scores were a significant predictor of their grade level (second or third grade), while their problem-solving performance and preferred types of representation were not. Booth and Koedinger's (2012) study found no significant differences in verbal problem-solving performance among sixth, seventh, and eighth-grade students but noted significant developmental differences when these problems were supported with diagrams. They also suggested that diagrams can help transition to more abstract, symbolic representations depending on age and mathematics skills. As children get older, they may be better at making connections between different elements of a problem, but it is essential to relate these connections to other areas of mathematics and problem-solving. Student guidance may be necessary to facilitate these connections and increase awareness.

The study's findings highlight the importance of diagrammatic skills and problem-solving performance in predicting students' grade levels. Specifically, the results indicate that students who perform better on diagrammatic tests are more likely to be in the third-grade cluster. This study shows that preferred representation types, problem-solving performances, and diagrammatic skills are important factors in predicting students' grade levels.

The study's focus on early childhood and primary school students' problem-solving and representation skills is particularly relevant for mathematics education. By identifying the factors that contribute to students' problem-solving abilities and representation preferences, educators can develop more effective strategies for teaching mathematics. Moreover, the study's findings suggest that diagrammatic representations can be a powerful tool for helping students improve their problem-solving skills. As such, educators can use diagrams as a way to support students' learning and development in mathematics. Overall, it is important to prioritize the development of diagrammatic representation skills in students, as it has been shown to significantly impact their problem-solving performance. Classroom practices should be designed to help students improve their skills, and teachers should be knowledgeable in this area to provide guidance and support to students. Additionally, students should be taught how to construct and use different types of representations effectively. By doing so, they will be better equipped to generate appropriate representations and use them to solve problems accurately. Teachers should also be mindful that pictorial representations should serve as a stepping stone toward understanding abstract mathematical problem structures. Encouraging the use of schematic representations as students' diagrammatic and mathematical skills develop can be a helpful strategy in this regard.

Limitations of the Research

This study aims to examine the diagrammatic representation skills and problem-solving performances of primary school second and third-grade students according to their problem-solving representations. The data obtained from the students were analyzed using descriptive statistics without manipulating any variables that could influence their mental processes, such as prior knowledge, guidance, or hints. The purpose was to determine the current situation of the students by observing their problem-solving strategies. However, this study has an important limitation, as it lacks experimental and causal interpretations. While trying to determine the representations preferred by the students in problem-solving, the researchers coded the students' representations based on their initial choices. However, it is possible that students may mentally create schematic representations before choosing a pictorial representation or solve the problem symbolically in their minds. This is a critical limitation that researchers cannot control.

Ethics and Conflict of Interest

This study was designed in accordance with ethical rules, and the necessary approvals were obtained, including parent consent forms, school board information forms, and university ethics board report [45346595 – Date: 05/07/2021 No: 131383]. Students were informed that their responses would be kept confidential and used for research purposes only, and they were told that they could withdraw from this study at any time. The authors declare that they have no competing interests.

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