WORK HARD, PLAY HARDER: EXPLORING BENEFITS OF MIXED-AGE FREE PLAY IN SCHOOL-AGE CHILDREN

MELYSSA MANDELBAUM, M.S.

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SPONSORING COMMITTEE:

Camilo Ortiz, Ph.D.	DATE
Hilary Vidair, Ph.D.	DATE
Jill Rathus, Ph.D.	DATE

Abstract

There are many benefits of free play for school-age children (Bergen & Mauer, 2000; Brussoni et al., 2015; Yogman et al., 2018). There are also documented benefits of mixed-age play and non-play interactions, such as conversing, teaching, and cooking (Gray, 2011b; Konner, 1976; Maynard, 2002; Stone & Christie, 1996). However, there is little research on the combination of mixed-age free play. In particular, there is a dearth of research on whether mixed-age free play has academic benefits. Using a quasi-experimental design, data, measuring tardies; absences; and reading and math standardized test scores, of children who participated in a once-weekly mixed-age free play group, (Play Club) were collected from the semester before and the semester during their participation in Play Club. In addition, the same data were collected for children who were on the waitlist to participate in Play Club. It was hypothesized that children who were participating in Play Club would have fewer tardies and absences than children who were not participating in Play Club. Additionally, it was hypothesized that, compared to the waitlist control group, standardized test scores in both math and reading would be higher for children who participated in Play Club. A significant relationship was not found between absences and tardies, and Play Club attendance. However, reading and math test scores were significantly higher for children who were enrolled in Play Club, compared to children who were not. This was the first study to assess academic benefits of mixed-age free play in school-age children, using a quasi-experimental methodology. These results could have implications for parents and educators, who may consider implementing Play Club, and for future research, to further assess academic benefits of Play Club.

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Work Hard Play Harder: Exploring Benefits of Mixed-age Free Play in School-Age Children

Play is fundamental in human mental and physical development (Bateson, 1972; Huizinga, 1955; Winnicott, 1971). While there is not an agreed-upon definition of play, scholars concur that play has a number of characteristics (Garvey, 1997; Yogman et al., 2018). Freedom is essential to play, as it allows players to enter new cognitive realms by breaking rules that exist outside of play (Millar, 1968). Because play is pretend, play theorists also agree that it is creative (e.g., Winnicott, 1971). Play is also an opportunity for self-expression due to the freedom of creativity that it provides (Dudek, 2005). Play allows for more flexibility and experimentation than reality, and it is voluntary and without material consequences (Huizinga, 1955). Scholars also agree that play is enjoyable (Garvey, 1997). The amount of structure in play can vary, with free play having particular benefits (Gray, 2011a). Free play is unstructured, self-directed, and intrinsically motivated (Dudek, 2005; Winnicot, 1971; Yogman et al., 2018). In the play literature, the terms play and free play have been used interchangeably.

Traditionally, play theorists have proposed several functions for play in humans (Berlyne, 1960; Groos, 1898; Hall, 1904; Lazarus, 1883; Mead, 1934; Piaget, 1962; Spencer, 1920; Vygotsky, 1967). Some classical theories postulate that play is related to physical energy (Lazarus, 1883; Spencer, 1895). For example, surplus energy theory (Spencer, 1920) explains that play is a means of releasing excess energy. Conversely, recreational theory (Lazarus, 1883) suggests that play is a means of restoring lost energy from more mentally taxing daily activities. Several theories propose that the function of play is to facilitate development. Recapitulation theory (Hall, 1904) conceptualizes play as a way of acting out unacceptable urges, and as a means of learning what could and could not be done in reality. Pre-exercise theory (Groos, 1898)

conceives of play as acting out socially acceptable and pragmatic skills that children will use throughout life. Another group of play theorists proposes that the function of play is to simulate real-life situations (Berlyne, 1960; Mead, 1934; Piaget, 1962; Vygotsky, 1967). Play was thought to be a method to: explore familiar objects and practice utilizing them (Berlyne, 1960); practice problem solving (Piaget, 1962; Vygotsky, 1967); and engage socially; learn norms (Mead, 1934); and develop skills for adulthood (Bateson, 1955).

While there has been disagreement on the function of play, there is more agreement on the benefits of play for children. Researchers have identified physical, academic, social, and emotional benefits of play in children (Sahlberg & Doyle, 2019). In terms of academic benefits, childhood development scholars posit that improved learning takes place when children are enjoying the learning process (Garvey, 1997). Play breaks help make the learning experience more enjoyable. Engaging in free play can also help children better develop oral and reading skills (Bergen & Mauer, 2000). Additionally, unstructured play has been associated with the development of creativity and imagination (Hirsh-Pasek, 1991). Because play is often unstructured and undirected, it promotes the development of executive functioning skills (Barker, et al., 2014) which are associated with better school performance (Yogman et al., 2018). More practically, free play time during the school day has been associated with increased ability to sustain attention (Brez & Sheets, 2017; Stapp & Karr, 2018), which can also positively affect school performance.

Play is also associated with social skills development (Ginsburg, 2007; Brussoni et al., 2015). Play provides children with the opportunity to resolve conflict on their own and learn to work with others to complete tasks (Ginsburg, 2007; Gray, 2004). Children can learn to advocate for themselves and develop leadership and independence skills through play (Ginsburg, 2007).

Play has also been found to have emotional benefits. For example, increase in free play has been associated with decreased levels of both depression and anxiety (Barnett & Storm, 1981, Barnett 1984; Burdorf et al., 2017; Brussoni et al., 2017). Increased risky play has been significantly associated with decreased depressive affect, antisocial behavior (Brussoni et al., 2017), and decreased vulnerability to developing anxiety (Burdorf et al., 2017). Toddler studies have also demonstrated that free and imaginative play are associated with lower levels of anxiety (Barnett & Storm, 1981, Barnett 1984).

Free play involving physical risk has also been found to help children develop emotional resilience (Brussoni, et al., 2015; Ginsburg, 2007; Gray, 2020). This skill could develop as children have the opportunity to practice fear-inducing activities. Children who play in an environment that is seen as risky were found to have a higher level of emotional resiliency and physical health than their peers who played in less risky environments (Brussoni, et al., 2015; Sandseter & Kennair, 2011). Risky play prepares children to take risks in the real world (Ginsburg, 2007).

Researchers have theorized that there are particular benefits of *mixed-age* free play (Gray & Feldman, 1997, 2004; Gray, 2011b; Konner, 1976; Maynard, 2002; Stone & Christie, 1996), that go beyond the benefits of regular free play. Mixed-age play may contribute to deeper learning, development of prosocial behaviors, and development of leadership skills. There is ethnological evidence, such as with monkeys and Steller sea lions, that mixed-age play is the most “natural” of play configurations in mammals (Gentry, 1974; Konner, 1976). Human hunter-gatherer units also consisted of children across different ages who played together (Sutton-Smith & Roberts, 1971). Children in *current* hunter-gatherer units also largely play in mixed-age

groups. Data collected from anthropologists who have lived in hunter-gatherer societies indicate that most play groups consist of children ages 4 to 11 or 9 to 15 years old (Gray, 2009).

More academic gains and problem-solving skills may be realized in a mixed-age play setting than those realized in a same-age play setting (Gray & Feldman, 2004; Stone & Christie, 1996), though few studies have been conducted in this area. For example, academic benefits of social learning were revealed in a study, in which kindergarteners who were in a classroom with first and second graders, used more pretend literacy in their play (e.g., reading cookbooks or bedtime stories) than did children in a kindergarten-only classroom (Stone & Christie, 1996). Additionally, in a mixed-age school, children were found to engage in activities that were beyond their expected maturity level, based on their age. For example, children played organized card games that required greater skill than the level that was expected from the participants (Gray & Feldman, 2004). Additionally, younger children were often found observing older children, which could help them develop skills and attributes that the older children demonstrate (Gray & Feldman, 2004).

The older members of a mixed-age play group also benefit. Sibling studies have demonstrated academic and cognitive benefits of age-mixing for the older participants (Maynard, 2002; Zukow-Goldring, 2002). Studies have found that older siblings who care for their younger siblings obtained higher achievement scores and balanced their own and others' needs better than did peers who were not sibling caretakers (Maynard, 2002; Zukow-Goldring, 2002). An example of siblings benefitting from bidirectional learning was found in a study on Mayan older siblings who look after younger siblings. On average, they used more advanced teaching skills than did average children their age. The group of older caregiver siblings demonstrated higher explanatory and verbal skills than other children their age (Maynard, 2002).

On average, more prosocial behavior is found in mixed-age interactions than with same-age interactions (Dearden, 1998; Ember, 1973; French, 1984; Gorrell & Keel, 1986; Gray, 2004; Whiting & Whiting, 1975). Developmental psychologists have found that older children elicit more prosocial behavior in a mixed-age setting than in a same-age setting, and that spending time with younger children can cause them to acquire these prosocial behaviors (French, 1984; Whiting, 1983; Whiting & Whiting, 1975). For example, it was found that adolescent boys from Kenya who were assigned household tasks, including childcare, engaged in more prosocial behaviors and less dominance than their peers who were not given these responsibilities (Ember, 1973). Also, older children in a mixed-age setting were found to be more affectionate, less competitive, and more creative with younger children than with peers (Dearden, 1998; Gray & Feldman, 2004).

Children who engage in mixed-age play have been found to, on average, exhibit prosocial behaviors at a younger age than children who do not engage in mixed-age play (Bailey et al., 1993; Derscheid, 1997; Howes & Farver, 1987; Konner, 1976). For example, Howes & Farver (1987) found that when 2-year-olds were paired with 5-year-olds, they were more likely to participate in cooperative, social-pretend, and dyadic play, than 2-year-olds who played with same-age children. A study examining toddlers and preschool children assigned to play in either a mixed-age group or same-age group, found that fewer negative behaviors, such as whining and negative physical contact, were recorded among younger children in the mixed-age play group, than what was found in the same-age play group (Bailey et al., 1993).

Research on leadership skills in mixed-age play suggests that older children tend to display more advanced leadership skills when in a mixed-age setting than in a same age setting (Howes & Farver, 1987; Markell & Asher, 1984; Stright & French, 1988). For example, when 2-

year-olds and 5-year-olds were either paired with a child from their own age group or the alternate age group, the older children engaged in more teaching behaviors when paired with younger children (Howes & Farver, 1987). Another study examining mixed-age groups found that older children organized and encouraged younger children rather than dominating them (Markell & Asher, 1984).

The benefits of mixed-age play can be explained by several psychological theories, including social learning theory (Bandura & Walters, 1977); scaffolding theory (Vygotsky, 1978; Wood et al., 1976); bidirectional learning theory (Scrimsher & Tudge, 2003; Vygotsky, 1978), and labeling theory (Becker, 1963). Social learning theory posits that learning can be acquired via observing others (e.g., parents and siblings) engaging in a behavior (Bandura & Walters, 1977). In hunter-gatherer societies, children learn largely through mimicking their parents and older siblings, rather than through formal teaching methods (Odden & Rochat, 2004; Sutton-Smith & Roberts, 1971). In mixed-age play, younger children have the opportunity to observe older children engaging in behaviors to which the younger children would not otherwise be exposed (Gray & Feldman, 2004; Gray, 2011b).

The benefits of mixed-age play can also be understood via scaffolding theory (Vygotsky, 1978; Wood et al., 1976). Scaffolding is the process by which a more experienced member can help their novice counterpart complete a certain task (Vygotsky, 1978; Wood et al., 1976). Scaffolding does not involve the person teaching, completing the task on behalf of the person learning. Rather, it involves the teacher aiding the student in task completion, just enough for the student to learn to complete the task on their own (Vygotsky, 1978; Wilson & Devereux, 2014; Wood et al., 1976). Scaffolding is also theorized to apply when older children are helping younger children with tasks (Gray & Feldman, 2004; Gray, 2011b; Konner, 1976). It has been

observed in a mixed-age play setting that younger children often approach older children for help and that older children generally acquiesce (Gray & Feldman, 2004).

The outcomes of mixed-age play appear to work bidirectionally. The term bidirectional learning is used to describe an environment where a teacher learns from the student, in addition to the student learning from the teacher (Vygotsky, 1978). Research has demonstrated that older children also benefit in a mixed-age play setting (Cohen et al., 1982; Gray, 2011b; LeBlanc & Bearison, 2004; Moll, 2000; Scrimsher & Tudge, 2003; Vygotsky, 1978). By having the older children explain and verbalize concepts, the concepts become crystallized and clarified (Gray, 2011b). Academic gains for the tutor have been demonstrated in peer tutoring studies (Cohen, et al., 1982; Gorrell & Keel, 1986). A meta-analysis of studies on peer tutoring found that tutors gained a better understanding of the subject and developed more positive attitudes toward it, than did their non-tutor peers (Cohen, et al., 1982). Several research studies have examined bidirectional cognitive gains of mixed-age play in toddlers (Bailey et al., 1933; Brownwell, 1991; Howes & Farver, 1987). For example, results from a mixed-age toddler study found that older toddlers who were paired with younger toddlers used more complex and longer means of engaging their partner than what was used by the older toddlers who were paired with same-age children (Brownwell, 1991). In this case, even though their partners were at a lower cognitive level, they worked harder to engage with their partners than they would have with a same-age partner. Due to these advantages, cognitive and academic improvements for older children may be seen in mixed-age play.

Labeling theory (Becker, 1963) can also be used to explain the benefits of mixed-age play. Labeling theory predicts that if one is labeled in a particular way, one may internalize the attributes that pertain to that label (Becker, 1963). It suggests that the responsibility that older

children feel to care for younger children is based on societal expectations that older children are helpers and younger children are the beneficiaries. Several studies suggest that it is common for children to assign labels to other children (Balaban, 1991; French 1984; Katz, 1990). For example, in a study where researchers showed images of same-age, younger, and older children to first and third graders, younger children perceived older children as leaders and helpers, while older children perceived younger children as needing guidance and instruction (French, 1984). During mixed-age play, older children are often expected to help their younger counterparts, therefore older children are often labeled by adults as helpers. They may internalize this label and become further motivated to help their younger friends (Stright & French, 1988).

Despite the many putative benefits of free play, the occurrence of free play has declined precipitously over the past century, both in the home and in school (CDC, 2018; Chudacoff, 2007; Hofferth & Sandberg, 2001; Walker, 2015). The decline of free play has been accompanied by a corresponding decline of mixed-age free play (Gray, 2011b). During the second half of the twentieth century, play has become more structured, age-segregated, and adult-guided (Chudacoff, 2007; Gray, 2011a).

The literature has focused on three reasons for the decline of free play (Belknap & Hazler, 2014). The first is the increased opportunity to engage in technology-related activities (Rideout & Robb, 2020; Clements, 2004; Frost, 2010; Gray, 2011a; Rideout, 2016). As of 2020, children ages 5 to 8 years old spend an average of over 3 hours a day on screens, with approximately 73% of that time accounted for by watching television or videos and approximately 4% spent on reading and homework (Rideout & Robb, 2020). In a 2004 survey asking mothers to assess why their children spend limited time outdoors, 85% of participants reported that watching television and playing computer games subsumed the time that the

children could be playing outside (Clements, 2004). In a more recent survey assessing mothers' perceptions of their children's screen time, almost half of the participants reported that they believe that screen time negatively affects their children's physical activity (Rideout & Robb, 2020).

A second hypothesized reason for the decline in free play is that an increasing number of parents believe it unsafe to allow their children to play outdoors, where most free play occurs, despite dramatic decreases in crime nationwide over the past 30 years (Finkelhor et al., 2010; Lee et al., 2021; Parent et al., 2020). For example, a survey examining the barriers to outdoor free play found that parental perception of danger, due to fear of traffic or crime, was inversely correlated with the amount of time that children played outside (Bringolf-Isler et al., 2010). This fear in parents decreases opportunity for free play and increases opportunity for technology use or parent-initiated activities (Bringolf-Isler et al., 2010; Clements, 2004; Gray, 2011a).

Finally, there is evidence that school work and school-related activities have become more highly valued over time by parents and educators (Frost, 2010). The early twenty-first century marked an increase in academic pressure, partially due to poor academic achievement results in the United States, compared to other countries (Amrein & Berliner, 2003). In 2002, the No Child Left Behind Act was signed into law "to ensure that every student can read at grade level or above not later than the end of grade 3" (No Child Left Behind Act of 2001). This increased the frequency of standardized testing to ensure that schools would maintain these standards (Hart et al., 2015). By 2015, students in grades K through 12 took an average of eight standardized tests per year, in addition to numerous non-standardized assessments (Hart et al., 2015). The increase in standardized testing causes many teachers and students to feel pressure to perform well on these tests (Moon et al., 2007). Because the expectations for good standardized

test scores are high for teachers, many spend a significant amount of class time preparing students for these assessments, devoting less time to recess or unstructured learning (CDC, 2018; Glass & Berliner, 2012). This concern may contribute to children spending more time completing school assignments or engaging in class than engaging in free play (Gray, 2011a).

As free play has decreased, so has mixed-age free play (Gray, 2011b). During the first half of the twentieth century, when play was less structured, there was more opportunity to play with children of different ages (Chudacoff, 2007). During this time, it would be typical for children to come home from school and play with neighbors of different ages or watch their younger siblings and their friends. Now that parents have become more involved in structuring play (Chudacoff, 2007), children have less opportunity than they used to, to play freely outdoors with other-age children (Gray, 2011a). Additionally, during recess, children used to have the opportunity to see children from other grades on the playground. Now that recess time is declining because of the increased emphasis on academics, children have less opportunity to play with children of other ages (Sahlberg & Doyle, 2019).

The literature has documented a number of benefits of free play in elementary school age children, but it remains unclear whether there are benefits specific to *mixed-age* free play in this group. To date, only three studies have assessed mixed-age free play in elementary school-aged children, all of which are observational (Gray & Feldman, 1997, 2004; Parrot & Cohen, 2020). Gray and Feldman (1997) assessed patterns of age mixing (i.e., in which age groups and settings there were more age mixing) in a mixed-age school, and found that age mixing was less common in conversation than it was in other interactions. Gray and Feldman (2004) conducted another study in the same school, where they assessed behavioral patterns in mixed-age interactions. They found that younger children engage in more mature tasks when playing with older children,

and that older children explicated implicit knowledge, and engaged in more creativity and leadership skills when playing with younger children (Gray & Feldman, 2004). Parrot and Cohen (2020) assessed activities during mixed-age free play in addition to teacher and child perceptions of the mixed-age free play group. They found that children played more spontaneous games in longer mixed-age free play periods, than standard recess. They also found that the majority of students observed that engaging in an additional hour of mixed age free play improved friendships and the majority of teachers observed that an additional hour of mixed-age free play improved children's focus (Parrot & Cohen, 2020). Mixed-age free play in elementary school aged children has not been assessed using an experimental or quasi-experimental methodology. Additionally, the academic effects of mixed-age free play have not previously been studied. While academic gains have been found to be a benefit of free play in general (Bergen & Mauer, 2000; Garvey, 1997; Hirsh-Pasek, 1991; Yogman et al., 2018), it is possible that there will be stronger academic gains in mixed-age free play than in same-age, free play because the older children model (Bandura & Walters, 1977) more complex means of problem-solving and using higher level vocabulary, scaffold (Vygotsky, 1978; Wood et al., 1976) more mature behaviors for younger children, and explicate implicit knowledge, therefore learn through bidirectional learning (Vygotsky, 1978). Understanding whether mixed-age free play has academic benefits could have a number of theoretical and practical implications. Findings that more mixed-age free play is associated with better academic outcomes would support several psychological theories, including social learning theory, scaffolding theory, and bidirectional learning theory (Bandura & Walters, 1977; Scrimsher & Tudge, 2003; Vygotsky, 1978). Additionally, if the results show increased test scores for those who participated in Play Club, this would reveal the false dichotomy that less play is needed for better test scores. Implications would include parents and

school personnel advocating for mixed-age free play time built into the school day. This could improve children's attitudes toward school, and allay concerns that more play time could lead to lower test scores.

Study Purpose and Rationale

The goal of the current study was to quantitatively examine the benefits of an additional hour per week of mixed-age free play on academic outcomes in school-age children, using a quasi-experimental design. We conceptualized the construct of academic outcomes broadly, since this is a first attempt to evaluate them in this age group. In addition to examining changes in standardized math and reading test scores, we examined attendance and tardiness. The current study had three aims. The first aim was to examine whether an additional hour of mixed-age free play, one morning a week, was associated with higher reading and math standardized test scores than those of children who engaged only in same-aged play in school. This hypothesis is based on literature that found that mixed-age play and free play are associated with academic growth and improved school performance, as reviewed above (Bergen & Mauer, 2000; Garvey, 1997; Hirsh-Pasek, 1991; Yogman et al., 2018). Specifically, it was hypothesized that reading scores would improve because younger children would be exposed to more mature language and sentence structures (Bandura & Walters, 1977). It was also hypothesized that math scores would specifically improve because executive functioning skills are crucial for success in math, and the literature has linked free play with improvement in executive functioning skills (Yogman et al., 2018). The second and third aims were to examine whether this intervention was associated with less tardiness and fewer absences than those of children who engaged only in same-age play in school. It was hypothesized that tardies, absences, and test scores would improve more for children who engage in an additional hour of mixed-age free play once weekly for one school

semester compared to those who did not. These hypotheses are based on findings that children enjoy an additional hour of mixed-age free play (Parrot & Cohen, 2020), and that children show more school engagement when they participate in extracurriculars, as with extracurriculars, children also spend more time in school (Darling, 2005; Ghasemi et al., 2018). The current study was the first to attempt these associations through analyzing data from a school that has offered a play group (i.e., Play Club) consisting of an additional hour of mixed-age free play weekly.

Method

Participants

The sample was composed of 40 girls, 38 boys, and one child whose sex was not recorded, all who were enrolled in kindergarten through fourth grade in a rural South Carolina elementary school. The children's ages ranged from 5 to 11years old, (Mean = 8.5 SD = 1.7). Sixty-three children were white, nine were multiracial, six were African American, two were Hispanic, and one child's ethnicity was not recorded. The experimental group consisted of children who participated in a mixed-age free play group in the Fall 2019 semester. There were 17 boys and 12 girls in the experimental group, with a mean age of 9.5 years old. In this group there were 23 white, four multiracial, and two African American children. The control group consisted of the children who were on the waitlist to participate in a mixed-age free play group during the Fall 2019 semester. There were 21 boys and 28 girls in the waitlist control group, and one child with unrecorded sex, with a mean age of 7.9 years old. In this group there were 38 white, seven multiracial, and four African American children (Table 1).

Table 1

Demographic Data

Variable	*n*	*%*

Grade		
Kindergarten	6	7.59
1st	13	16.46
2nd	12	15.19
3rd	19	24.05
4th	12	15.19
5th	17	21.52
Sex		
Female	40	50.63
Male	38	48.10
Not recorded	1	1.27
Lunch		
Free	27	34.18
Reduced	13	16.46
No accommodation	38	48.10
Not recorded	1	1.27
Ethnicity		
White	63	77.22
African American	6	7.59
Multiracial	9	13.92
Hispanic	2	1.58
No data	1	1.27

Note. Due to rounding errors, percentages may not equal 100%.

Measures

Attendance records

Children's daily attendance and tardies were gathered from teacher attendance records from the Fall 2019 semester. Children were marked absent if they did not attend school at all that day. Children were marked tardy if they arrived at any point after 8:00 AM.

Measure of Academic Progress (MAP) Growth

MAP Growth tests are computer-adaptive achievement tests that are available for reading, math, language, and science, developed by NWEA in 2000. NWEA is a not-for-profit organization that has been developing standardized tests for over 40 years, for grades Pre-K through twelfth grade. The questions posed to each student vary and are dynamic. Students' responses to each question influence how easy or difficult the next question will be. By the end of the test, it is expected that each student would answer approximately half of the questions correctly, earning higher scores for more difficult questions. The goal of this test is to inform teachers what students know and what they are ready to learn. This assessment is meant to be given yearly and can therefore track a students' individual growth. The scores range from 130 to 300. Test-retest correlations fell between .628 and .915 for math, reading, and language tests for grades 2-10. Most values fell between .7 and .9 (NWEA, 2009). Concurrent and predictive validity indices exceeded .7 for both math and reading, when compared to state standardized tests (He et al., 2021). MAP scores were correlated with means and standard deviations of MAP tests from Fall of 2020 and Fall of 2019 (Table 2). Participants' reading and math MAP percentiles and scores from September of 2019 and September of 2020 were also gathered from school records.

Table 2

MAP 2020 Means and Standard Deviations by Grade

Grade	Reading Mean / SD	Math Mean / SD
Kindergarten	136.65 / 12.22	139.56 / 12.45
1st	155.93 / 12.66	160.05 / 12.43
2nd	172.35 / 15.19	175.04 / 12.98
3rd	186.62 / 16.65	188.48 / 13.45
4th	196.67 / 16.78	199.55 / 14.40
5th	204.48 / 16.38	209.13 / 15.19

Mixed-age Free Play Intervention

The *Let Grow Play Club* is a mixed-age free play group that occurs for 1 hour, once weekly after school. Children are encouraged to engage in creative play without adult instruction and without the structure of traditional toys, board games, art projects, etc. Play Club usually takes place in a school playground or gymnasium, as open space is crucial to allow children space to run around and spread out. Loose or old parts, such as cones or tires are also often available. While fresh air is preferred, the school must have a contingency plan for inclement weather. The maximum number of children who could join Play Club is based on each facility's capacity; more children playing together is preferred. Play Club is voluntary. The number of required supervisors is determined by each state or district. Any volunteer could supervise; supervisors are not limited to schoolteachers.

Parents are invited to sign up children at the beginning of the school year. Before Play Club, children are asked to pledge that they will play respectfully, inform an adult before leaving the play area, and listen to adults if they intervene. Before Play Club, parents are asked to pledge that they understand that not all children will be happy at all times; adults will not intervene in disagreements; if their child physically harms another child, they will need to take a break; and that this is an opportunity for their children to increase resilience, resourcefulness and maturity. Both children and parents are asked to pledge that they will allow children to solve their own problems, make smart choices, and work well with other children. At the Elementary School at which data were collected, the grades involved are Kindergarten through fourth grade.

Procedure

This study was a nonequivalent groups, quasi-experimental, and within-groups design, with pretest and posttest measures. There was no random assignment, as some children signed up

for Play Club before others, securing their spot. Within the first few weeks of school, teachers sent home a list of extracurriculars options, one of which was Play Club. Parents sent the form back with their child indicating whether their child would like to participate in Play Club. Once the maximum number of children in Play Club was met, the rest of the children who requested to join Play Club were placed on a waitlist for the following semester. The researcher contacted the person who runs Play Club in this South Carolina school. This school representative was able to access necessary data of children who had previously been in Play Club and on a waitlist for Play Club. Before the study began, the International Review Board (IRB) of Long Island University-Post deemed the study exempt from IRB approval. All data were gathered through approved school personnel at the elementary school, de-identified, and sent to the researcher.

Play Club consisted of 29 children in the elementary school playground, playing with loose parts (e.g., old tires, boxes), balls, hula hoops, chalk etc. in an open field. After school, all children gathered in a classroom, and together with the teacher they walked to the playground. Before playing, children drank juice and had a snack for approximately 5 minutes. They then proceeded to play for approximately 55 minutes. There were two supervisors present for Play Club who observe the children, generally without intervention. It was reported that supervisors had intervened only once throughout the three years of Play Club in this school.

Results

An analysis of covariance (ANCOVA) was conducted to examine whether there were significant differences between children in Play Club and children in the waitlist condition on 2020 math scores while controlling for 2019 math scores.

The assumption of normality was assessed by plotting the quantiles of the model residuals against the quantiles of a Chi-square distribution (DeCarlo, 1997). The assumption of

normality was met. Homoscedasticity was evaluated by plotting the residuals against the predicted values (Bates et al., 2014; Field, 2017; Osborne & Walters, 2002). The assumption of homoscedasticity was met. To identify outliers, Studentized residuals were calculated, and the absolute values were plotted against the observation numbers (Field, 2017; Pituch & Stevens, 2015). One outlier was found; therefore, the data were rerun after that outlier was removed and changes in results were minimal. The assumption for homogeneity of regression slopes was assessed by rerunning the ANCOVA, but this time including interaction terms between each independent variable and covariate (Field, 2017; Pituch & Stevens, 2015). None of the covariates interacted with the independent variables and the assumption of homogeneity of regression slopes was met. An ANOVA was conducted for each pair of numeric covariates and independent variables to assess independence (Field, 2017). There were significant models for the following pairs of independent variables and covariates based on an alpha of 0.05, indicating the assumption of independence between covariates and independent variables was not met (pairs are formatted as covariate-IV): 2019 math score-Waitlist ($\chi^2(1) = 21.79$, $p < .001$).

The mean of 2020 math scores for Play Club participants was 203.99 with a standard deviation of 18.26. The mean of 2020 math scores for the waitlist control group was 177.92 with a standard deviation of 21.61. The results of the ANCOVA were statistically significant, $F(2, 74) = 188.60$, $p < .001$, indicating that, on average, 2020 math scores among the Play Club condition were higher than 2020 math scores among the waitlist conditions. The eta squared was 0.10, indicating that attendance in Play Club explained approximately 10% of the variance in 2020 math score.

Another ANCOVA was conducted to examine whether there were significant differences in 2020 reading score by Play Club or waitlist condition, while controlling for 2019 reading score.

The assumption of normality was met. The assumption of homoscedasticity was met. Outliers were identified as having a Studentized residual greater than 3.20. One outlier was found; therefore, the data were rerun after that outlier was removed and results were almost identical. The assumption of homogeneity of regression slopes was met. In terms of the assumption of independence between covariates and independent variables, there were significant models for the following pairs of independent variables and covariates based on an alpha of 0.05, indicating the assumption of independence between covariates and independent variables was not met (pairs are formatted as covariate-IV): 2019 reading score-Waitlist ($\chi^2(1) = 24.37$, $p < .001$).

The mean of 2020 reading scores for Play Club participants was 204.24 with a standard deviation of 18.50. The mean of 2020 reading scores for the waitlist control group was 177.94 with a standard deviation of 20.85. The results of the ANCOVA were statistically significant, $F(2, 74) = 254.64$, $p < .001$, indicating that, on average, 2020 reading scores among the Play Club condition were higher than 2020 reading scores among the waitlist conditions, when controlling for 2019 scores. The eta squared was 0.09, indicating waitlist condition explains approximately 9% of the variance in 2020 reading score.

A two-tailed independent samples *t*-test was conducted to examine whether the mean of the change in 2019 and 2020 math scores was significantly different between the waitlist and Play Club groups. Given that the assumption of independence was violated for the above ANCOVAs, the function of the *t*-test was to further assess whether there was statistical

significance in the change scores between 2019 and 2020. The Shapiro-Wilk test was significant for both the non-waitlist and waitlist categories, indicating the normality assumption is violated. The assumption of homogeneity of variance was met.

The result of the two-tailed independent samples *t*-test was not statistically significant based on an alpha value of .05, $t(75) = 0.89$, $p = .376$. This finding suggests the mean of the change in 2019 and 2020 math scores was not significantly different between the waitlist and Play Club categories.

Another two-tailed independent samples *t*-test was conducted to examine whether the mean of the change in 2019 and 2020 reading scores was significantly different between the waitlist and Play Club groups. The Shapiro-Wilk test was significant for both the non-waitlist and waitlist categories, indicating the normality assumption is violated. The assumption of homogeneity of variance was met.

The result of the two-tailed independent samples *t*-test was not significant based on an alpha value of .05, $t(75) = 0.05$, $p = .962$,. This finding suggests the mean of the change in 2019 and 2020 reading scores was not significantly different between the waitlist and Play Club categories.

Another two-tailed independent samples *t*-test was conducted to examine whether there was a significant difference in tardies based group assignment to either the waitlist or Play Club group.

The result of the Shapiro-Wilk test for tardies in the Play Club category was significant based on an alpha value of 0.05, $W = 0.61$, $p < .001$, indicating the normality assumption is violated. Levene's test was conducted to assess whether the variance of tardies was equal between the non-waitlist and waitlist groups. The result of Levene's test for tardies was not

significant based on an alpha value of 0.05, $F(1, 77) = 1.62$, $p = .207$ indicating the assumption of homogeneity of variance was met.

The result of the two-tailed independent samples *t*-test was not statistically significant based on an alpha value of 0.05, $t(77) = 1.27$, $p = .207$ (Table 3). This finding suggests the mean number of tardies was not significantly different between the Play Club and waitlist groups.

Table 3

Samples t-Test for Tardies by Group

	Play Club		Waitlist				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Tardies	2.86	5.25	1.66	3.17	1.27	.207	0.28

Note. N = 79. Degrees of Freedom for the *t*-statistic = 77. *d* represents Cohen's *d.*

Another two-tailed independent samples *t*-test was conducted to examine whether the mean number of absences was significantly different between the non-waitlist and waitlist categories.

The Shapiro-Wilk test was significant for both the non-waitlist and waitlist categories, indicating the normality assumption is violated. The assumption of homogeneity of variance was met.

The result of the two-tailed independent samples t-test was not statistically significant based on an alpha value of 0.05, $t(77) = 0.00$, $p = .996$ (Table 4). This finding suggests the mean of absences was not significantly different between the non-waitlist and waitlist categories.

Table 4

Samples t-Test for Absences by Group

	Play Club		Waitlist				
Variable	M	SD	M	SD	t	p	d

Absences	4.08	4.19	4.08	4.22	0.00	.996	0.00

Note. N = 79. Degrees of Freedom for the t-statistic = 77. d represents Cohen's d.

Several Chi-square Tests of Independence were conducted to determine whether there participation in Play Club was independent of the following variable: sex, lunch status, and ethnicity. The assumptions of the Chi-Square test were violated so Fisher's Exact Tests were conducted. The results of the Fisher exact test were not significant based on an alpha value of .05, $p = .280$, suggesting that sex and participation in Play Club could be independent of one another. The results of the next Fisher exact test were also not significant based on an alpha value of .05, $p = .811$, suggesting that lunch status and participation in Play Club could be independent of one another. The results of the last Fisher exact test were not significant based on an alpha value of .05, $p = 1.000$, suggesting that race and participation in Play Club could be independent of one another. This implies that the observed frequencies were not significantly different than the expected frequencies

An analysis of variance (ANOVA) was conducted to determine whether there was a significant difference in age, based on whether participants were in the waitlist or Play Club conditions. All assumptions were met.

The mean age of Play Club participants was 9.5 years old. The mean age of waitlist participants was 7.93 years old. The ANOVA was examined based on an alpha value of .05. The results of the ANOVA were significant, $F(1, 77) = 19.86$, $p < .001$, indicating that the mean age in the Play Club condition was significantly higher than the mean age in the waitlist condition. The eta squared was 0.21 indicating Waitlist explains approximately 21% of the variance in Age.

Discussion

The purpose of the current study was to assess whether there are academic benefits to mixed-age free play. Specifically, this study assessed whether an additional weekly hour of

mixed-age free play was associated with an increase in standardized test scores, and a decrease in tardiness and absences. This was one of the first studies to assess benefits of mixed-age free play in an elementary school-aged population using a quasi-experimental methodology. Two previous study assessed mixed-age interactions in a mixed-age school (Gray & Feldman, 1997, 2004). Another previous study assessed play content and student and teacher perceptions of an additional hour of mixed-age free play weekly (Parrot & Cohen, 2020). Neither of these studies assesses academic benefits of mixed-age free play. While there is previous research on the many benefits of free play (Bergen & Mauer, 2000; Brussoni et al., 2015; Yogman et al., 2018), and mixed-age interactions (Gray & Feldman, 2004; Konner, 1976; Maynard, 2002; Stone & Christie, 1996) among elementary school-aged children, the limited literature assessing benefits of *mixed-age* free play is overwhelmingly limited to preschool aged children (Bailey et al., 1993; Goldman, 1981; Stone & Christie, 1996). Given the proposed benefits of both free play and age mixing, the current study sought to assess academic benefits of mixed-age free play.

We found evidence that an additional hour of mixed-age free play weekly was positively associated with higher standardized test scores in both math and reading. This is consistent with the literature that indicates that free play is associated with better academic outcomes (Barker, et al., 2014; Stapp & Karr, 2018; Yogman et al., 2018). This is also in line with the few studies done on age mixing that suggest that mixed-age play could facilitate academic growth (Gray & Feldman, 2004; Stone & Christie, 1996).

The current study did not find a significant relationship between Play Club attendance and absences or tardies. While existing literature indicates that students who participate in extracurricular activities show increased school engagement (Darling, 2005; Ghasemi et al., 2018), in the current study both groups showed interest in Play Club. Therefore, this likely

reflects heightened school engagement for both groups and is not surprising that their absence and tardy records were similar. The relatively low occurrence of Play Club (once weekly) may also account for the lack of significance found between the two groups on tardies and absences. Participation in Play Club more frequently may have yielded bigger effects. For example, several other studies assessing play that have found significant results looked at play daily or several times weekly (Ng-Knight et al., 2021; Stapp & Karr, 2018; Stone & Christie, 1996). Therefore, it is encouraging that with only one hour of play weekly the current study found some evidence for the effectiveness of mixed-age free play on academic outcomes.

The current study did not find significant differences in sex, lunch status, or race between Play Club and waitlist groups. There was a significant difference in age between the two groups, as the mean age of the Play Club group was significantly higher than the mean age of waitlist group. Given that Play Club participation is determined on a first-come-first-served basis, this difference may be indicative of the initiative that older children take to sign up for Play Club.

The results of the current study should be interpreted with caution given that there was a significant association between test scores from before children were enrolled in Play Club (the covariate) and whether children were in the waitlist or Play Club groups (the independent variable). This may be indicative of an external factor that affected both test scores and whether children join Play Club. Being in Play Club may be associated with other variables that also contribute to higher scores. For example, it is possible that the families of children who achieve higher test scores are also better organized and more able to enroll in Play Club earlier. There was also no significant difference found between change in 2019 to 2020 math or reading scores in Play Club or waitlist groups, strengthening the explanation that there may be an external factor that affected these results.

Another limitation of this study is that data were collected from school personnel, based on school records, rather than being compiled by the researcher. Therefore, data could have been subject to human error. For example, transcription errors could have been made in entering the data. Additionally, because the researcher did not have access to school records no fidelity checks were possible. While it would have been ideal to have had fidelity checks, the school representative who was collecting the data was blind to the hypothesis of the study. Therefore, the data would not be affected by his expectations. Additionally, given that he obtained the information from official school records, the records are likely accurate.

Some directions for future research are worth noting. Given the finding that higher test scores and Play Club enrollment were positively associated, one future direction could be conducting a component analysis to determine which specific aspects of Play Club are associated with academic achievement. This could be done by isolating all components of Play Club, including the mixed-age factor, *free* play factor, increased exercise factor, and spending time outdoors factor. Previous research has indicated that mixed-age play could be associated with academic success (Maynard, 2002; Zukow-Goldring, 2002). Existing literature also indicates that free play could be associated with academic success (Yogman et al., 2018). Additionally, physical activity is associated with improved executive functioning skills (Ng-Knight, 2021; Best, 2010), which is associated with improved academic outcomes (Best et al., 2009). Given that there is evidence that several components of Play Club might be responsible for increased academic success, it would be beneficial to separate these components and systematically determine which Play Club factor plays the biggest role in improved academic outcomes.

Another question that remains unanswered is what specifically occurs in Play Club. Only three studies (Gray & Feldman, 1997, 2004; Parrot & Cohen, 2020) look specifically at what

elementary school-aged children are doing while age mixing. None of these studies assess for adherence to Play Club protocols. It would be important to assess specifically, what occurs during Play Club, to gain a clear understanding of how it could differ in different settings, and whether these differences are consequential in terms of intervention. While there is a protocol for how Play Club is intended to be conducted, it is possible that Play Clubs may deviate from this protocol. Previous research has demonstrated that even standardized interventions differ based on several factors, such as setting, experience of the person implementing the intervention, and resources (Waller, 2009; Wisniewski et al., 2018). For example, in a study assessing dialectical behavior therapists' intervention on eating disorders, approximately half of the therapists responded that they did not follow the manual to maintain fidelity. Here, clinicians with more dialectical behavior therapy (DBT) experience followed the DBT treatment expectations more closely (Wisniewski et al., 2018). So too with Play Club, there are many external factors that could influence the way that it is run, including when Play Club occurs, for example. While Play Club was originally intended to occur before school, the school evaluated in the current study holds Play Club after school, for pragmatic purposes. It is possible that this timing could affect children's day-to-day school performance, whether they have physical activity before, versus after school. Additionally, Play Club might look different in different geographical locations. While the current study took place in South Carolina, where Play Club occurs outdoors almost every week, Play Clubs in New York are more bound by weather and are forced to hold Play Club in an indoor gymnasium. School financial resources could affect how often Play Club occurs and how many children could participate. Lastly, school resources could also affect the content of the play, if some schools have more formal activities in their playgrounds, while others may have more loose parts.

Another future direction would be to assess other school-related benefits of Play Club, including attitude toward school. Previous research has shown that participation in extracurricular activities (Darling, 2005; Ghasemi et al., 2018), increased playtime in kindergarten (Seçer & Çeliköz, 2018), and increased time outdoors during the school day were associated with better attitudes toward school (Kenney, 2021). Given that Play Club is an extracurricular activity that involves extra play time and time spent outdoors, it would be reasonable to speculate that Play Club might also facilitate children having better attitudes toward school.

In an effort to improve academic outcomes, free play time has gradually eroded. With the decrease of free play time, mixed-age play has also decreased over the past decade. There are several documented benefits of both free play and mixed-age play. There are also some documented benefits of mixed-age free play. The current study suggests that one of these benefits may be academic in nature. This would imply that decreasing free play time may be detrimental to academic outcomes. This indicates a need to further investigate the benefits that may accrue from mixed-age free play. These results also could prompt parents and educators to consider increasing mixed-age free play time in the school day. While the decline of free play was, in part, due to increased academic concern, the results from the current study may indicate that academic gains and mixed-age free play are not mutually exclusive. Rather, academic gains could be made through a means that kids enjoy and that promotes social and emotional success.

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