



Cost-Effectiveness Analysis of Cross-Age Tutoring in the YMCA Afterschool Program

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This cost study addressed three research questions: 1) What resources are needed to implement Sound Partners with adult tutors and with cross-age tutors, and what is the total cost of these resources? 2) What is the cost per student of these resources? 3) What is the cost-effectiveness of Sound Partners with adult tutors and with cross-age tutors compared to business-as-usual after-school programs?

Methodology

Ingredients Method

We conducted this cost analysis using the ingredients approach (Levin et al., 2018). This approach involves listing all of the resources that were used to provide an education program and then determining the market price of each one. Resources were categorized as costs for personnel (e.g., cost of adult tutor time), facilities (e.g., space for the students to meet), materials and equipment (e.g., program materials), training (e.g., tutor training in the intervention), and other miscellaneous costs (e.g., travel costs). We determined the resources need for the Sound Partners program separately for the adult tutor sites and the peer tutor sites. We also sought to document the cost of the equivalent amount of business-as-usual (BAU) afterschool program time. However, given that the activities at the BAU sites varied, it was more difficult to determine the exact ingredients involved in BAU afterschool programming, despite our best efforts to do so.

We calculated the total cost of both Sounds Partners programs and BAU afterschool programming from a societal perspective, accounting for all costs to all parties, whether resources were purchased or provided to the project for free. Costs to develop the program and research-related expenses (such as for assessments used to assess the efficacy of the intervention) were not included in the total cost. Additionally, no opportunity cost was assigned to the cross-age tutors' time given that they were too young to earn income.

Cost Data Collection and Analysis

To catalogue the ingredients needed to implement Sound Partners and the quantity of each, we asked adult tutors to keep weekly logs that included information such as time spent preparing for and delivering instruction sessions, and the materials, equipment, and space used for Sound Partners sessions. Research staff completed event logs for tutor training sessions. The logs listed information such as who led the training, amount of time spent preparing for the training, where the training was held, number of attendees, and materials and equipment used. We also gathered program documentation, invoices, and budgets and interviewed research staff to clarify information as needed. We collected data on costs contemporaneous with program implementation during both cohorts for greater accuracy (Levin et al., 2018).

After compiling a complete list of ingredients for all three conditions, we assigned national prices to the ingredients using the Database of National Prices of Educational Resources (Chang & Head, 2022) and the Cost of Facilities Calculator (Wang et al., 2020). When prices for ingredients were not available from these sources, we based the price on the cost to obtain similar items. We used

national online shopping sites to obtain these prices. For ingredients provided at no charge or a reduced charge to the study, we calculated shadow prices based on opportunity cost when market prices were unavailable (Levin et al., 2018).

To complete the cost analysis, we entered ingredients and costs into the CAP Project Cost Analysis Template 1.3 (CAPCAT 1.3; Hollands, Pratt-Williams, Shand, Javier, & Benge, 2022). We costed out durable goods based on the proportion of the item's usable life that corresponds to its use in the intervention. All costs were transformed into 2024 values, adjusted for inflation and discounting, and rounded to the nearest dollar. Our results included cost per student and per site based on the number of students enrolled at each site.

Results

Personnel Costs

Personnel costs in the adult tutor condition mainly consisted of tutors' time to prepare and provide the Sound Partners intervention, as well as time spent in training. These costs comprised the majority of the total cost of Sound Partners, though the proportion differed by cohort. In the first cohort, 61% of the total cost were attributed to personnel, while in the second cohort, 82% of total cost was attributed to personnel. The cost per student also was higher in the second cohort, amounting to \$386 per student in this cohort compared to \$267 per student in the first cohort. It is not known whether this difference was due to more careful completion of time logs among Cohort 2 tutors or if these tutors spent more time preparing and providing intervention than the Cohort 1 tutors.

Personnel costs in the cross-age condition were similar in both cohorts, comprising 17% of the total cost for the first cohort and 23% of the total cost for the second cohort. The cost per student was \$18 in the first cohort, compared to \$10 per student in the second cohort. These costs were associated with the time spent by the afterschool program's staff supervising the students who participated.

The personnel costs for the BAU condition consisted of staff time spent supervising and providing programming to the participating students. The cost per student varied by cohort and amounted to \$61 per student in the first cohort (88% of the total cost) and \$30 per student in the second cohort (93% of the total cost). The second cohort had many more students in the BAU condition than the first cohort (66 vs. 119). The number of hours that afterschool program staff reported spending on the program was greater for Cohort 1 (203 hours) than for Cohort 2 (116 hours). It is unclear whether the staff participating in Cohort 1 actually spent more time working with students in that cohort or if they were more diligent in their time-keeping.

Facilities Costs

Facilities costs in all three conditions consisted of space used to conduct the tutoring sessions. In the adult tutor condition, meeting space for training also was included as a facilities cost, leading to a higher total cost for facilities for this condition: \$17 per student for Cohort 1 and \$21 per student for Cohort 2. These costs comprised 4% of the total cost in each cohort. The total facilities cost

for the cross-age tutoring condition was \$5 per student in Cohort 1 and \$1 per student in Cohort 2, comprising 5% and 2% of total costs for each cohort. For the BAU condition, the facilities cost was \$8 per student in Cohort 1 and \$2 per student in Cohort 2, comprising 12% and 7% of the total cost for each cohort. Costs varied by cohort due to differences in the number of students and the number of hours spent on the program, as described above.

Materials and Equipment Costs

The materials and equipment costs for Sound Partners included office supplies, printed materials, small white boards, and student incentives. These costs were equivalent across the adult and cross-age tutoring conditions, but amounted to twice the cost per student in the adult tutoring condition (\$154 per student in Cohort 1 and \$64 per student in Cohort 2) than in the cross-age condition (\$86 per student in Cohort 1 and \$32 per student in Cohort 2) because the student tutors in the cross-age condition were included in the total student count. Materials and equipment comprised a much larger percentage of the total cost of the cross-age tutoring condition (78% in Cohort 1 and 76% in Cohort 2) than in the adult tutoring condition (35% in Cohort 1 and 14% in Cohort 2) given that the cross-age condition had lower personnel costs than the adult tutoring condition. No information was available on the materials and equipment costs for the BAU condition.

Total Cost

Table 1 contains the costs by ingredient category and in total for the adult tutoring and cross-age tutoring Sound Partners programs and for the BAU afterschool program for each student and overall. The total cost per student to implement the adult tutoring condition of Sound Partners was \$460, while the total cost for the cross-age condition was \$63 per student, and the total cost for the BAU afterschool program was \$46. The incremental cost per student, calculated as the difference in cost between Sound Partners and the BAU afterschool program, was \$414 for the adult tutoring condition and \$17 for the cross-age tutoring condition. The incremental cost per student, calculated as the difference in cost between Sound Partners adult tutoring and cross-age tutoring conditions, was \$397. Table 2 breaks out the cost by cohort.

Table 1. Cost to Implement Sound Partners and the BAU Afterschool Program

	Adult Tutoring		Cross-Age Tutoring		BAU Afterschool	
	Total	Per Student	Total	Per Student	Total	Per Student
Personnel	\$69,327	\$348	\$4,657	\$12	\$7,621	\$41
Facilities	\$3,912	\$20	\$792	\$2	\$825	\$4
Materials	\$18,351	\$92	\$18,351	\$48	-	-
Total Cost	\$91,590	\$460	\$23,800	\$63	\$8,447	\$46

Table 2. Cost Per Student to Implement Sound Partners and the BAU Afterschool Program by Cohort

	Adult Tutoring		Cross-Age Tutoring		BAU Afterschool	
	Cohort 1	Cohort 2	Cohort 1	Cohort 2	Cohort 1	Cohort 2
Personnel	\$267	\$386	\$18	\$10	\$61	\$30
Facilities	\$17	\$21	\$5	\$1	\$8	\$2
Materials	\$154	\$64	\$86	\$32	-	-
Total Cost	\$438	\$470	\$110	\$43	\$69	\$33

Cost-Effectiveness Analysis

To calculate the incremental cost effectiveness ratio (ICER), we divided the incremental cost per student by the standardized mean difference effect size (Hedges's g) for the average treatment effect (ATE) observed in the efficacy study of Sound Partners. Some reading outcomes (including letter-word reading, oral reading fluency, and reading comprehension) had effect sizes very close to 0; ICERs were not calculated for these outcomes. Table 3 presents the ICERs for the three largest effects comparing adult tutoring to the BAU afterschool program. The ICERs were quite large, ranged from \$2,178 per student for a one standard deviation gain on the phonemic decoding measure to \$4,140 per student for a one standard deviation gain on the spelling measure, as a result of the small effects. Table 4 includes the ICERs for the largest effects for tutors and tutees comparing cross-age tutoring to the BAU afterschool program. The ICERs for these comparisons were relatively small, \$74 for tutors and \$188 for tutees, indicating that the benefits of Sound Partners when implemented with cross-age tutors can be realized for a minimal investment of resources. The effect sizes for the comparison of the adult tutoring and cross-age tutoring conditions were all very small and not significantly different from 0, indicating that cross-age tutoring is less costly than adult tutoring yet equally effective.

Table 3. Incremental Cost-Effectiveness per Student for the Sound Partners Adult Tutoring Condition Compared to the BAU Afterschool Program

Measures	Effect Size with 95% Confidence Interval	ICER Per 1 SD Improvement
WJ-IV Spelling	0.10 [-0.06, 0.27]	\$4,140
TOWRE Sight Words	0.19 [-0.02, 0.40]	\$2,178
TOWRE Phonemic Decoding	0.18 [-0.05, 0.41]	\$2,300

Table 4. Incremental Cost-Effectiveness per Student for the Sound Partners Cross-Age Tutoring Condition Compared to the BAU Afterschool Program

Measures	Effect Size with 95% Confidence Interval	ICER Per 1 SD Improvement
WJ-IV Spelling (tutees)	0.09 [-.12, .29]	\$188
WJ-IV Passage Comprehension (tutors)	0.23 [-.01, .48]	\$74

Conclusion

The results of this cost-effectiveness analysis indicated that the cross-age tutoring implementation of Sound Partners is slightly more costly than typical after-school programming, but somewhat more effective for both the tutors and tutees. The adult tutoring implementation was significantly costlier than the cross-age tutoring program and the BAU program but was not more effective than the cross-age tutoring implementation. These findings indicate that there is no benefit to implementing Sound Partners with adult tutors compared to cross-age tutors, but that implementing Sound Partners with cross-age tutors is cost-effective when compared to BAU after-school programming.

References

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