Unlock Research
Research for Physical Educators

Research Report of the Month
FEBRUARY 2005

McKenzie, T.L., Prochaska, J.J., Sallis, J.F., & LaMaster, K.J. (2004).

Coeducation and single-sex physical education in middle schools: Impact on physical activity.

Research Quarterly for Exercise and Sport, 75, 446-449.

Although the results from this study are certainly interesting, they did not provide the motive for selecting this month's research report. Instead, I picked this investigation because of the opportunities it provides for talking about: 1) researchers and how they decide what to study, 2) research journals and how they manage different kinds of submissions, 3) "mediating variables" and how they can help to explain things that happen (or fail to happen) in PE classes, and, of course, 4) single-sex versus coeducation as arrangements for PE in public middle schools.

The report for this issue was found in the "Research Notes" section of the *Research Quarterly for Exercise and Sport* (RQES) (December, 2004). In recent years, that part of the journal has been positioned to follow the "Articles," which are the reports and reviews that constitute the main section. The notes section may contain only a single contribution or as many as 10 items. The RQES notes include both research reports and various forms of comment on previously published reports, as well as discussion about research-related topics.

Generally, notes are shorter than the articles in the main section (no more than 14 pages of double-spaced manuscript is the formal advice to authors), and consist of reports on such things as study replications, re-analysis of previously published data, test or equipment development, research in progress, pilot studies, and smaller scale investigations with limited objectives. Some submissions have been prepared specifically for publication as research notes (as was the case with the present report), and others are routed there after initial consideration by editors and reviewers.

In any case, the staff of RQES has been scrupulous about not using the notes section as a dumping ground for second-rate manuscripts. Notes simply consist of a classification for documents that are different from those appearing as articles in the main section. They are not inferior; they often are very useful to others in the research community, and sometimes they achieve the status of important contributions to scholarship.

The data analyzed as the basis for the present note, "Coeducational and single-sex physical education in middle schools: Impact on physical activity," have an interesting history. They were drawn from observations made in the course of the 4-year Middle-School Physical Activity and Nutrition (M-SPAN) research program that began in 1997. Two reports from that series of studies already have been annotated as Unlock Research Reports of the Month in July 2003 and December 2004. Both are available in the Unlock Archive that can be accessed from the main page.

M-SPAN began in the spring of 1997 with a 5-month collection of data from 430 PE lessons taught in 24 middle-schools. The purpose of this first study was to establish a baseline describing

what was going on in the PE classes of the participating schools before the M-SPAN experimental intervention was applied. Among the many variables recorded were data representing the kind and level of physical activity as well as the kinds of class contexts in which that activity occurred. The results were published in the RQES (September, 2000) as "Student activity levels, lesson context, and teacher behavior during middle school physical education."

In the following two years, 1997-98 and 1998-99, the M-SPAN curriculum and teacher development program was introduced in 12 of the baseline schools, with the other 12 schools serving as a measurement-only control group. The resulting report appeared in 2003 and was annotated in the July Unlock of that year. A second report which provided more detail about what happened within the PE classes of the 12 M-SPAN treatment schools appeared in 2004 and was annotated here in the December issue. To examine the impact of coeducation and single-sex arrangements for PE classes, this month's research note drew upon data from both the baseline and the intervention phases of M-SPAN, and thereby hangs a tale about research and the researchers who must contemplate the fruits of their investigative labors.

Returning to the M-SPAN baseline report of 2000 you will find a curious little notation near the end of the results sub-section that is devoted to student gender. The authors observed that most of the lessons had been coeducational (93%), and the much smaller number of single-gender lessons (N=31), 15 all boys and 16 all girls, did not permit a valid comparison of the physical activity opportunities for boys and girls during the two kinds of classes. In other words, for a sound comparative analysis of single-sex PE, they just did not have enough data.

What was also true, however, was the obvious fact that across all of the M-SPAN studies the authors had become deeply concerned about the finding that adolescent girls were increasingly disadvantaged by what was happening in PE classes at grades 6, 7, and 8. That failure was apparent in the baseline data of 1997, and although the M-SPAN interventions of 1997-99 produced significant physical activity gains for the boys, they did not do so for the girls.

Those findings (along with results from other studies that have underscored similar concerns) were the stimulus for the Trial of Activity for Adolescent Girls (TAAG) presently underway in six states, an effort in which some members of the original M-SPAN research team are now involved. But, for the M-SPAN investigators there always must have been the memory of those 31 single-sex classes in the 24 middle-schools so invitingly balanced between 16 of one gender and 15 of the other. If there had been enough lessons in the data set to make analysis possible, would it have revealed higher levels of physical activity for girls once the PE class environment did not contain boys?

As you might already have guessed, additional data really were available. They were resident in the recorded observations of what was happening in the lessons being taught in the 12 control schools during the intervention years. When combined with data from the baseline study, the total set for single sex classes now added up to 298 lessons: 26 boys-only, 32 girls-only, plus 240 coeducational lessons (more than enough for a powerful analysis).

Through a decade-long series of physical education study reports, the members of the research team that directed M-SPAN have shown themselves to be particularly interested in the gender differences that turn up in studies of PE. Many of their reports provide objective data that have been inspected to reveal differences in the physical education experiences of boys and girls, usually as part of the main analysis. This instance, however, is different because the possibility for a gender analysis of same-sex classes did not become apparent until data collection had been completed.

I was not present for the discussions the researchers must have had about undertaking a further analysis of the M-SPAN data, but it probably was a question that received some careful thought. Among research scholars it is not considered appropriate to keep re-analyzing a data set once the basic reports have been published, slicing and re-slicing it to generate a string of further

publications. That is pejoratively called "data churning." In this case, however, the particular question at hand had not been addressed in any of the previous analyses; the data were both substantial in volume and unique in kind (considerations related to Title IX insure that data from single-sex public school classes are not readily available), and as veteran researchers none of the authors could ever be accused of needing to pump out more publications.

CONTEXT AND METHOD

All of the data were gathered in public middle-schools in Southern California. Each of the single-sex classes was taught by same-gender teachers, all of whom were PE specialists. The coeducational classes were taught by both male and female instructors, most of whom were physical educators (only 12% of the 240 lessons were taught by classroom teachers). Classes lasted an average of 50 minutes and most of the classes took place outdoors. Average class size was 37 students. All of the physical activity and instructional context data were gathered with use of the System for Observing Fitness Instruction Time (SOFIT). Detail concerning that methodology can be found in Unlock's previous M-SPAN annotations. Physical activity was represented as time expended by students in moderate to vigorous physical activity (MVPA).

RESULTS

The first level of analysis revealed results that were starkly simple and surprisingly symmetrical. Boys-only and coeducational classes provided significantly more MVPA than girls-only classes (a difference of about 4 minutes per class). In turn, boys accrued similar amounts of MVPA in boys-only and coeducational classes, while girls accumulated more MVPA time when enrolled in coeducational than in girls-only classes. Finally, in coeducational classes, boys got more MVPA than girls, again by the substantial margin of nearly 4 minutes. Single-sex classes for girls may have some important advantages, but in the M-SPAN sample, opportunity for lots of moderate to vigorous physical activity was not one of them.

We still don't know, however, how the three kinds of classes differed in ways that produced more MVPA time for boys and less for girls. Those differences were revealed by a second analysis that inspected SOFIT data for time spent in the different lesson contexts (management, fitness, game play, skill drills, knowledge, and free play). Fitness and management activities were the prominent features in all three class configurations. Only time spent in skill drills and game play differed significantly by gender composition. Girls-only classes provided significantly more skill drill minutes and fewer game play minutes than either boys-only or coeducational classes. And, here there is a crucial point. Skill drills (as they commonly appear in physical education classes) generally provide less opportunity for moderate or vigorous physical activity than is available in the typical PE lesson context of game play.

Clearly, the differences in MVPA could be accounted for by the differences in time spent in drills and in actual games. Different lesson contexts served as a mediating variable between gender and MVPA. As illustrated by another statistical manipulation of the data, when the lesson context differences were removed, the effect of class gender composition on MVPA was greatly reduced (though not eliminated). Put simply, in girl-only classes, the students (probably) spent more time standing in line and waiting for their turn in skill drills. But the question remains -- **why** did teachers structure their lessons in that manner?

DISCUSSION

At this point you can join in the discussion. The authors of this research note provided their opinions, and I will provide some of mine. But here the playing field is level because none of us have any real data on the question of "why?" Your own experiences and judgment might be as good as ours. Let me offer one small additional clue with which to get started. The earlier M-SPAN analyses showed no overall differences for student MVPA on the basis of teacher gender. This means that whatever the female teachers were doing when they taught all-girl classes, they were not doing when they taught co-educational classes.

Further, in order to avoid distractions, let us all agree that we know full well that there were girls in the M-SPAN schools who were more skilled, more physically fit, and more anxious to engage in vigorous physical activity than some portion of the male student sample. That just does not happen to be what we are discussing right now, nor is it something for which the M-SPAN study provides any insight.

Always at hand are the standard hypotheses we have all encountered. First, perhaps middle school girls don't like to sweat or get their hair mussed, thus they might resist more vigorous activities. Or, second, perhaps girls simply are more compliant with authority than are boys, and thus they don't resist the boredom imposed by slow-paced skill drills (while we might guess that boys tolerate very little of that). And third, we could theorize that many girls find competitive game activities aversive and thus resist being placed in such situations. If you think about it, however, there are problems with several of those explanations. Why, for example, should girls be more resistant to playing games in all-girl classes than in coeducational settings?

The direction of the authors' discussion is to focus more on the teachers of girls-only classes. They might have been sensitive to the fact that many of their female pupils already were well behind the boys in development of basic movement and sport-related skills. Given the opportunity of having them in a psychologically safer and more homogeneous setting, the teachers might have focused their efforts on skill building and motor development activities, rather than game play. And, I will add, the same teachers might expend more time on game play (with more MVPA) in coeducational classes because constructing skill drills that are appropriate for heterogeneous groups (such as a mixture of girls and boys) is a challenging pedagogical task.

Let me caution you about explanations involving the notion that because boys typically hog the action in game situations (an observed behavior for which other studies offer substantial evidence), the girls may have been coded by SOFIT as engaging in a game but not as having been engaged in MVPA. Experienced teachers will know that some pupils develop by-standing into an art form so that they appear engaged but actually do almost nothing. Assuming that to be the case, however, you still must account for the fact that SOFIT does show girls getting more physical activity in coeducation settings than in girls-only classes.

Also, please remember that it is unreasonable to contend that physically undemanding drills are the price we have to pay for properly addressing the needs of adolescent girls. Designing skill learning drills with high MVPA for girls (or boys) just demands more care and skill from the designer. This is not a situation with unavoidable trade-offs between physiology, motor learning, and psychosocial benefits.

We also don't know whether the larger proportion of time spent on skill drills in single-sex girls' classes actually paid off in terms of improved motor skills. Even if some of the girls did make significant progress in skill development, if the more distal objective is to make physical activities seem attractive to girls as part of an adult life-style, the M-SPAN data make it difficult to believe that girls-only PE was moving them toward that goal.

All of which leads me to remind you of the fact that in M-SPAN, as in nearly all studies of this kind, it is likely that gender was used as a single discriminating variable for analysis because it is readily available, reliable, and of some particular interest to the investigators. But, was it the most revealing way to slice the data? Suppose that skill level had been used instead? What was happening to the MVPA of higher and lower skilled girls in the two lesson contexts (or to boys, for that matter)? Intending no criticism of M-SPAN, where gender-based analysis takes place in PE studies there is a strong tendency to treat girls as a homogeneous group. As long as researchers ignore the fact that there actually are highly skill girls who might be impacted very differently by such things as coed and single-sex learning environments, we are not going to learn much more than we already can guess.

As you can see, the topic of gender in physical education is enormously complicated and entangled in all sorts of social and psychological considerations. At the least, it seems reasonable

to say that engagement in vigorous physical activity can't be the only (or, perhaps, even the major) determinant of whether middle school boys and girls should be taught together or separately. Perhaps a program structure that allows students a degree of choice in that matter would be a prudent option.

If the issues involved in gender and physical education are of particular interest to you, I can recommend a useful resource. Dawn Penny has edited a fine collection of essays on the topic entitled *Gender and physical education: Contemporary issues and future directions* (2002, New York: Routledge). The paperbound edition can be purchased in the second-hand textbook market for about $30.00 USD.

What is your own interpretation of the results from this re-analysis of M-SPAN data? If your experiences provide some additional insights, please share them with me at the internet address below. I promise to pass them on to the M-SPAN team. And, when you browse a research journal, please do remember not to skip the section containing research notes. Sometimes they are more informative and thought-provoking than the big stuff that precedes them.

Your comments on this annotation will be welcome at lflocke@hotmail.com.