Trends of School Violence Across Years: What Do TIMSS and TIMSS-R Tell Us?

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Abstract

This study investigated how patterns of school violence change across years using the data extracted from the school questionnaire in TIMSS and TIMSS-R. Violence was operationally defined as a continuum or hierarchy of physical and nonphysical aggression. The study found that four types of violence (intimidation or verbal abuse of other students, intimidation or verbal abuse of teachers or staff, physical injury to other students, and physical injury to teachers or staff) were reported with decreasing frequency and two (alcohol use/possession and illegal drug use/possession) were reported with increasing frequency for the eighth graders for 1995 than for the eighth graders in 1999. Alcohol use/possession and illegal drug use/possession became increasingly an issue that should be addressed by the schools and the family. Going from grade 4 to grade 8, vandalism was reported more frequently while physical injury to other students was reported less frequently. The severity of violent behaviors perceived was related to the frequency they were reported.
Background

School violence is a controversial and complex issue. Yu (2001) noted that published reports and studies portrayed a mixed picture of school safety and that the lack of consensus on what is defined as school violence makes comparisons of findings across studies difficult. Small and Tetruck (2001) also found it difficult to depict a thorough picture of school violence, due to the lack of common indicators of violence, unavailability of data from grade levels other than high school, and different definitions for incidents.

To investigate the nature of school violence and its patterns across elementary, junior high, and high schools, Yu (2001) utilized school questionnaire data collected in the Third International Mathematics and Science Study (TIMSS) and extracted the items from the school principals’ responses as indicators of school violence. She found that school violence consisted of a hierarchy of violent behaviors with increasing intensity from the bottom to the top. She also found that across all grade levels the most frequently reported type of violence is intimidation or verbal abuse of students and the least frequently reported is physical injury to teachers or staff. She did not find evidence showing that violence was the norm in the U.S. schools.

The Third International Mathematics and Science Study was the largest and most complex study that assessed student achievement in mathematics and science at third and fourth grades, seventh and eighth grades, and the final year of school. Conducted in 1995, TIMSS also gathered background information at the student, the teacher, and the school level to understand the context under which learning and teaching took place. To measure trends in student mathematics and science achievement since 1995, TIMSS assessed again in 1999 (known as TIMSS-Repeat, or TIMSS-R) the mathematics and science achievement of the
eighth-grade students and collected extensive background information from students, teachers, and school principals. TIMSS-R, similar to TIMSS, used a two-stage sampling procedure to ensure that the sampled students were representative of the national eighth grade student population (Foy & Joncas, 2000). In the first stage, schools were randomly selected, and in the second stage, classrooms were randomly selected within schools. Approximately 150 schools were randomly selected from each participating country for the study. Twenty-six of the forty-two countries that participated in TIMSS also participated in TIMSS-R (Martin & Mullis, 2000). U.S. participation in both TIMSS and TIMSS-R and the availability of school questionnaire data made it possible to examine the trends of school violence across time.

Research Questions

This study was designed to investigate how patterns of school violence change across years and used the same theoretical base and methodology, as were used in Yu (2001). Violence was operationally defined as a continuum or hierarchy of physical and nonphysical aggression.

Eighth grade students in 1995 were assessed in TIMSS and eight grade students in 1999 were assessed in TIMSS-R. In addition, students in fourth grade in 1995 (TIMSS) were in eighth grade in 1999 (TIMSS-R). This study addressed the following research questions:

1. What was the trend of school violence between the eighth grade in 1995 and the eighth grade in 1999?

2. What were the changes in the reported patterns of school violence from the fourth grade to the eighth grade?
3. What was the relationship between the severity and the frequency of school violence?

Method

Sample. The samples used in the study included all the U.S. schools that contained eighth grade students selected to participate in TIMSS and TIMSS-R. All the schools that contained fourth grade students selected to participate in TIMSS were also included. As was mentioned above, these schools were randomly selected according to the sampling design of TIMSS and TIMSS-R.

Instrument. The same items were extracted from TIMSS and TIMSS-R as indicators of school violence. They were vandalism, theft, intimidation or verbal abuse of other students, physical injury to other students, intimidation or verbal abuse of teachers or staff, physical injury to teachers or staff, alcohol use/possession, illegal drug use/possession, weapon use/possession, and inappropriate sexual behavior. Data on these ten items came from school administrators’ responses to the question "About how often does the school administration or staff have to deal with following behaviors among Grade 4/Grade 8\(^1\) students?" in the school background questionnaire. As only the first six items were administered to Grade 4 schools, data on these items only were used involving the fourth-grade analysis.

There was one notable change in the rating scale categories used in TIMSS and TIMSS-R. In TIMSS, the rating scale has four response options – “rarely”, “monthly”, “weekly”, and “daily”, while in TIMSS-R, the rating scale has five response options –

\(^1\) Only one grade level was used in questionnaires addressed to the administration of the schools that contained that grade level.
“never”, “rarely”, “monthly”, “weekly”, and “daily”. At the same time the school administrators were asked about the frequency with which they dealt with these problems, they were asked to rate their severity: “To what extent do these behaviors present a problem in your school?” The scale provided for rating the severity of the problems has three options: “not a problem”, “minor problem”, and “serious problem”.

Analysis. The study was conducted using the Rasch rating scale model (Wright & Masters, 1982). The use of the rating scale model assumes that all the items share the same category structure. Free calibrations centering on each sample were conducted to examine the trends of school violence both across years and across grade levels. As the rating scale used in TIMSS-R is different from that used in TIMSS, the category options in TIMSS-R were collapsed to conform to those used in TIMSS. That is, the two categories --“never” and “rarely”— were combined to form one category called “rarely.” In the comparison of frequency and severity ratings, anchored person estimates from the frequency analysis were used in the severity analysis so that the items estimates obtained were on the same scale. For easy interpretation, the mean of the scale was set to 50, and 1 logit was rescaled to be 9.1 so that the scale ranged from 0 to 100 with increments of 10 units, as was used by Yu (2001).

Results

School demographics show that the same types of schools that contained eighth grade students were selected in both TIMSS (N=183) and TIMSS-R (N=240), with similar percentages of schools from geographically isolated areas and rural areas. However, more schools close to the center of a town/city and fewer schools on the outskirts of a town/city were sampled in TIMSS-R than in TIMSS. Schools had similar enrollment of boys and girls from eighth grade in both studies.
Rasch analysis was conducted using Winsteps 2.98 (Linacre & Wright, 1999). Separate calibrations were run for 1995 and 1999 data for the eighth grade, with the mean of each sample set to 50. The results show that the person separation reliability and the person separation index were .81 and 2.05 for 1995, and .86 and 2.44 for 1999, respectively. The item separation reliability and the item separation index were .97 and 5.87 for 1995, and .99 and 10.45 for 1999, respectively. Fit statistics show that physical injury to teachers or staff and inappropriate sexual behavior were misfitting items for 1995 while only inappropriate sexual behavior was a misfitting item for 1999. Both person and item statistics improved from 1995 to 1999 data. Across the time the most frequently reported type of violence was intimidation or verbal abuse of other students and the least frequently reported type of violence was physical injury to teachers or staff, although the ordering of other items in between changed. T-tests (Wright & Masters, 1982) were conducted to compare the measures obtained for 1995 and 1999. The results show that there were statistically significant changes between the two sets of measures (t >1.96), as indicated in Figure 1. Three items, intimidation or verbal abuse of other students, intimidation or verbal abuse of teachers or staff, and physical injury to other student were reported significantly less frequently in 1999 than in 1995 while two items, alcohol use/possession and illegal drug use/possession, were reported significantly more frequently in 1999 than in 1995 for the eighth grade. The other four items remain invariant across the years.
Changes in item estimates for grade 4 in 1995 going to grade 8 in 1999 were also examined. As only six items were administered to administrators of schools that contained grade 4 in 1995, the same number of items was extracted for analyzing grade 8 data in 1999. There were no misfitting items for the analysis of grade 4 data. A t-test shows that vandalism was reported more frequently with grade 8 than grade 4 ($t=2.58$) while physical injury to other students was reported more frequently with grade 4 than with grade 8 ($t=-3.89$).

Besides reporting the frequency with which they dealt with problem behaviors, school principals were also asked simultaneously to rate the seriousness of each problem. To examine the relationship between frequency and seriousness of each problem, the results from frequency analysis were compared to those from severity analysis. Person estimates from the frequency analysis were anchored in the severity analysis so that item estimates from the severity analysis were on the scale of the frequency analysis. The correlation between the two sets of item statistics was .96, indicating that the severity of violent behaviors were strongly correlated with the frequencies with which they were reported. Item estimates from the two analyses were placed in Figure 2. The graph shows that the more frequent a violent act is reported, the more serious it is reported, although frequency and severity may not be at the comparable level. Illegal drug use/possession, weapon use/possession, alcohol use/possession and inappropriate sexual behavior were rated comparably in terms of frequency and severity. Other five items, intimidation or verbal abuse of other students, vandalism, theft, physical injury to other students, and intimidation or verbal abuse of teachers or were reported in higher level of frequencies than they were perceived with the degree of severity.

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Insert Figure 2 About Here

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Discussion

Trends of school violence for the eighth grade population between 1995 and 1999 were found in this study. Four out of the ten types of violence (i.e., vandalism, theft, weapon use/possession, and inappropriate sexual behavior) did not show any difference in their reported frequency. Four types of violence (i.e., intimidation or verbal abuse of other students, intimidation or verbal abuse of teachers or staff, physical injury to other students, and physical injury to teachers or staff) were reported with decreasing frequency and only two (alcohol use/possession and illegal drug use/possession) were reported with increasing frequency. Recall that Yu (2001) reported that alcohol use/possession and illegal drug use/possession were reported more frequently for grade 8 than for grade 12 in TIMSS. And they were reported even more frequently four years later. Therefore, alcohol use/possession and illegal drug use/possession, replacing interpersonal conflicts, became increasingly an issue that should be addressed by the schools and the family.

Going from grade 4 to grade 8, vandalism was reported more frequently while physical injury to other students was reported less frequently. The severity of violent behaviors perceived was related to the frequency they were reported. In general, the more frequent a violent behavior is reported, the more serious it was perceived.

School violence is a complicated phenomenon. Research on school violence faces a lot of challenges due to the lack of comprehensive data, appropriate data gathering methods, denial, and underreporting of violence data. The data gathered from the national representative samples of schools from both TIMSS and TIMSS-R made it possible to investigate the trends and patterns of school violence across time. The use of Rasch modeling provides much more informative information about the data and its quality than traditional analysis. The fact that the school administrators reported the frequency with which they dealt with these problems and rated their severity at the same time made it possible to examine the relationship of the two for the first time. The findings of this study contribute to school violence literature.
References


Table 1.

**Demographics of the schools with eighth grade students**

<table>
<thead>
<tr>
<th>Type of community</th>
<th>TIMSS</th>
<th>TIMSS-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A geographically isolated area</td>
<td>2.6%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Village or rural (farm) area</td>
<td>18.1%</td>
<td>17.0%</td>
</tr>
<tr>
<td>One on the outskirts of a town/city</td>
<td>29.0%</td>
<td>23.1%</td>
</tr>
<tr>
<td>One close to the center of a town/city</td>
<td>50.3%</td>
<td>56.0%</td>
</tr>
<tr>
<td>Total number of schools</td>
<td>183</td>
<td>240</td>
</tr>
<tr>
<td>Average of total school enrollment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>396</td>
<td>388</td>
</tr>
<tr>
<td>Girls</td>
<td>364</td>
<td>376</td>
</tr>
</tbody>
</table>
Figure 1. Item estimates for the eighth grade in TIMSS and TIMSS-R.
Figure 2. Comparisons of frequency and severity estimates Using TIMSS-R.