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ON THE INTERRELATION OF PEER CLIMATE AND SCHOOL PERFORMANCE IN MATHEMATICS: A GERMAN-CANADIAN-ISRAELI COMPARISON OF 14-YEAR-OLD SCHOOL STUDENTS

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Recent international comparisons of students' scholastic achievement have once again shown enormous worldwide differences in the abilities of youngsters to comprehend text and to solve mathematical problems. The Program for International Student Assessment (PISA) included predominantly countries from the Organization for Economic Cooperation and Development (OECD), among others Germany and Canada. Canada ranked in the top achievement group of the PISA study. The achievement of Germany's students emerged as being in the lowest quarter of all participating countries, and was considerably below the OECD average (Adams & Wu, 2002, Baumert et al., 2001). These results created a public uproar in Germany, in particular because they replicated findings of the Third International Mathematics and Science Study (TIMSS) that had been published some years before (Martin et al., 2000; Mullis et al., 2000), and in which Germany, Canada, and Israel had participated. In that study, which was confined to the assessment of mathematics and physics abilities, German students also barely reached the average of all countries participating in it. In this study Canada and Israel had a ranking in the middle group of all participating countries as well.

In Germany, the *Deutsche Forschungsgemeinschaft* (DFG), the country's largest funder of scientific research (comparable to the National Science Foundation in the U.S.A) launched a well-endowed research scheme on the "Educational Quality of Schools." It is within this framework that the study presented here was undertaken. Contrary, however, to almost all other studies funded in the scheme, the present project was not concerned with either the quality of teaching, with curricular issues, or with structural questions of the German educational system, but with the achievement-related peer climate in middle school, grades 8/9 in particular. Our project *Streber* versus *Nerd*—on the culture and gender specificity of the (positive and negative) sanctioning of high achievement in mathematics" is guided by the notion that high achievement is, on average, negatively sanctioned by German peers, whereas it is usually sanctioned positively in North America and others cultures that value achievement highly: In cross-cultural comparisons of adolescent value priorities, Germany regularly rates low on achievement values (Boehnke, 2003).

In Germany it seems to be common that good students are accused of being a *Streber*. *Streber* is a genuinely German concept that is difficult to translate to English (particularly American English) or to Hebrew. In British English the term "swot" comes close to what is meant by *Streber*. In American English a comparable term is hardly known. The concepts of "nerd" and of "teacher's pet" address more or less the same topic but both miss essentials of the semantics of the *Streber*. Compared to the *Streber*, the concept of "nerd" points too narrowly to the dedicated overachiever, "teacher's pet" points too narrowly to an opportunistic behavior vis à vis the teacher. Possibly the up-to-date student slang expression 'geek' now comes closest to the German *Streber*; but it was not yet well-established in student slang when the study started. In Hebrew the term *Hnun* was used to translate *Streber*. The word is a common slang expression that has connotations very similar to the American English "nerd." *Haviv Ha-more* was used as a translation for "teacher's pet", but it is not an expression commonly used by Israeli students. Both terms have a narrower content than the *Streber*. A *Streber* is somebody who is being opportunistic *by* being a high achiever.

It is our main hypothesis that high achievement — unlike in North America and other cultures that value achievement highly — creates considerable peer pressure in Germany. German students must fear that fel-

low students and other peers socially exclude them when they show high achievement in middle school. This experience will — so our additional assumption — in the longer run compel talented students to readjust their achievement downward, which then, eventually, will lead to objectively lower abilities (as they are measured in international achievement comparisons). This latter assumption can, however, not be tested in the present study because it would need a longitudinal and/or experimental design. In the present study we only test the proposition that in Germany fears of social exclusion (being called a *Streber*) are correlated — more highly than in other cultures — with school grades, the performance assessment of students that is most visible to other students.

School grades in mathematics are in the focus of the study reported here. This emphasis is taken — among others — because the study has a second point of attention, namely the role of gender. Mathematics is often seen as a 'male' subject. Boys are assumed to be better at it than girls a priori. High achievement in mathematics is sometimes even seen as an "un-girl-like" activity (Hannover, 1999). Köller, Baumert, Clausen, and Hosenfeld (1999) at the same time show that girls depend more heavily than boys on the judgment of others in their self-evaluations. Knowing this, it seems highly probable that girls show greater fears of social exclusion than do boys when they are high achievers in mathematics. Our second assumption thus is that the relationship between fears of social exclusion (fear of being called a *Streber*) and the grade achieved in mathematics will be significantly higher for girls than for boys. This time we see no reason to expect cross-cultural differences because the stereotype of the 'maleness' of mathematics is presumably similarly strong in all cultures of our concern (Germany, Canada, and Israel).

Before we present our empirical study, it is necessary to discuss two further aspects of our research endeavor. Fear of social exclusion may rightfully be seen as highly correlated with self-esteem. In order to show its genuine bearing on mathematical achievement one has to show that the measure for fear of social exclusion (fear of being called a *Streber*) is not a measure of self-esteem in disguise. Furthermore, if grades in mathematics were entirely or at least largely predictable on the grounds of "objective" abilities in mathematics, the role fears of social exclusion play in the prediction of school grades in mathematics would diminish. In case high quality school performance was a "pure" measure of "objective" abili-

ties, there would not really be room for a strong impact of fears of social exclusion.

The cross-cultural differences to be expected should be elaborated in more details: Our assumption is that the higher the culture-specific preference of achievement values, the more irrelevant are fears of social exclusion for the actual school performance, i.e. for grades — in our case in mathematics. In any culture there may be accusations of others as "nerds" or "teacher's pets", but no relationship with actual achievement should be found in cultures that on average evaluate achievement highly. Students in these cultures should usually be more achievement conscious than in cultures with a low evaluation of achievement. In cultures in which achievement is valued highly, the accusation of somebody as being a "nerd" should have a more idiosyncratic, even playful connotation; while in low achievement cultures there should be a systematic relationship with high achievement.

In a study comparing three cultures, however, it makes little sense to include the culture-specific preference of achievement values as a predictor. To do so would mean that all individual students tested in one country would have to be given the same score for that country's preference of achievement values. Instead of taking this approach, an approach that has been labeled "decomposition of culture" (Rohner, 1984) will be used. In that approach, individual scores on a variable that can be taken as a proxy for an important property of a culture are partialled from all other variables under consideration. In our case this means that cross-cultural differences in the predictability of school grades in mathematics are assumed to diminish when the dependent variable as well as the predictor variables are partialled for individual achievement value priorities.

All our hypotheses will be tested in a unified approach using multiple regressions. In a first model test, we probe into the question whether the size of the predictive power of fears of social exclusion for school grades in mathematics does indeed differ between Germany, Canada, and Israel (after partialing for objective abilities in mathematics and for mathematical self-esteem), with Germany expected to exhibit the strongest relationship. This model is tested in a three-group comparison. In a second model the three culture groups will be split into two gender groups each. This six-group model will test the question whether in all three cultures included, the sizes of the paths from fear of social exclusion to mathematical school achievement are larger for girls than for boys irrespective of culture (once

again after partialing for objective mathematical abilities and for mathematical self-esteem).The third and final model test undertakes the described decomposition of culture. This analysis is complicated in so far as it is logically impossible to decompose culture when the cultural samples are kept apart in the analysis. A joint analysis of the entire sample at the same time does not allow a test of the question whether cross-cultural and cross-gender differences will disappear, so-to-speak, once an explanatory variable is included. The only way to correct for the explanatory variable, in our case the individual preference of achievement values, and nevertheless do a test of the cross-cultural equality/difference in the model, is to partial all variables in the model in the trans-cultural grand sample and then test the model within culture and gender groups on the basis of their residuals (see the Results section for procedural details).

Methods

Samples

Samples were stratified convenience cluster samples of eighth and ninth graders in Germany and Canada/Israel, respectively. Grades were chosen according to the rule followed in the TIMS Study, namely to select that grade from a specific culture that encompasses the majority of the 14-year-olds of that country. As schooling starts later in Germany than in the two other countries, the majority of 14-year-olds are in grade 8 there, while in the other two countries they are in grade 9. The essence of this class selection is that in all three cultures predominantly 14-year-olds were sampled. Sampling units were school classes, clusters in the language of sampling theory. Classes were chosen on a convenience basis from schools with sufficiently diverse social backgrounds. Typically all eighth/ninth grade classes from a school were included in the sample. In Germany the study was conducted in Chemnitz, a city with 260,000 inhabitants in the south of the former German Democratic Republic, now the East of the Federal Republic of Germany. In Canada the study was conducted in Calgary (well over 900,000 inhabitants) in the Province of Alberta. In Israel the study was conducted in Haifa and in Beer-Sheva, where Haifa is a somewhat larger than Chemnitz (280,000), and Beer-Sheva is somewhat smaller (180,000).

Altogether 336 girls and 305 boys were included in Chemnitz, 301 girls and 304 boys were included in Calgary, whereas the Israeli sample comprised of 205 girls and 214 boys, thus being smaller.

Instruments

The questionnaire used in the three cultures had numerous parts, not all are included in this report. Here data are reported only with regard to school grades in mathematics, "objective" mathematical abilities (TIMSS Scores), fear of social exclusion, mathematical self-esteem, and achievement value preferences.

Students were requested to indicate their grade in mathematics from their most recent report card. In Israel and Canada grades were given in percent values. German grades were given in the classical form (1 = excellent, corresponding to A to 6 = insufficient, corresponding to F). For the purpose of a common analysis percent grades were transformed into classical grades: 1 = 100% to 86%, 2 = 85% to 71%, 3 = 70% to 56%, 4 = 55% to 41%, 5 = 40% to 26%, and 6 = 25% and less. After this transformation high numeric scores, of course, reflect bad grades.

"Objective" mathematical abilities were measured by three tasks taken from the TIMS Study. A sample task read: "In the following we would like to ask you to solve three math tasks. There are four to five possible answers. One of them is correct. Please mark the correct answer. (1) Brighto soap powder is packed in cube-shaped cartons. A carton measures 10 cm on each side. The company decides to increase the length of each edge of the carton by 10 per cent. How much does the volume increase? A. 10 cm^3, B. 21 cm^3, C. 100 cm^3, D. 331 cm^3. Number of correctly solved tasks was used as the measure of mathematical ability (Mullis et al., 2000). For the "objective" ability measures high scores — possible values 0 (no task solved) to 3 (all tasks solved) — stand for good performance. This means that technically ability measures are a priori correlated negatively to – traditional – grades.

Measurement of fear of social exclusion was different in the three countries. In Germany, one item was used, namely "How often do you fear being called a *Streber*. Rating options were "never" (1) to "frequently" (4). In the other two countries responses to two items were averaged, namely responses to the items "…. being called a nerd" and "…. being called teacher's pet." Answering options were the same as in Germany.

The culture-specific construction of the measurement finds its explanation in the fact that the concept of *Streber*, as explained above, does have a meaning that encompasses aspects of both nerd and teacher's pet.

Mathematical self-esteem was measured with nine items taken from the Second International Mathematics Study (Westbury & Travers, 1990). A sample item read, "Regardless of how much I strive, I will never be good in math." Answering options ranged from "completely true" (0) to "not at all true" (3). High scores thus stood for high mathematical self-esteem. The scale had a consistency of $\alpha = .93$ in the overall sample, country-specific α's ranged from .90 to .94.

Finally, achievement value preferences were measured by using four achievement items from the new portrait version of the Schwartz Value Survey (Schwartz et al., 2001). A sample item read, "Here we briefly describe some people. Please read each description and think about how much each person is or is not like you. Put a number in the box to the right that shows how much the person in the description is like you; 1 = not like me at all, 2 = not like me, 3 = a little like me, 4 = somewhat like me, 5 = like me, 6 = very much like me: "Being very successful is important to her/him. She/he likes to impress other people." The four-item scale had a consistency of $\alpha = .77$, country-specific α's ranged from .72 to .78.

Results

Before presenting results of the regression analyses described above, we will first provide descriptive information for all variables included. We will do so by presenting univariate two-factor ANOVAs for all variables included in the study. Independent variables in these analyses are country and gender. Dependent variables are math grades, fear of social exclusion, mathematical self-esteem, "objective" mathematical abilities (TIMSS scores), and achievement value preferences.

Table 1 shows an important finding that has not been addressed in our hypotheses, namely that grades in mathematics are substantially higher in Canada and Israel in comparison to Germany. The German modal grade is something like a C+, while in Israel and Canada the average student seems to get a B or B-. Substantial numbers of students get As in Canada and Israel while in Germany only very few get that grade. No gender difference and gender-x-country interaction was found for grades.

Table 1

Means of All Variables and Two-Way ANOVA Results

Dependent Variables	**Most Recent Grade in Mathematics**		**Fear of Social Exclusion**		**Mathematical Self-Esteem**		**Mathematical Abilities (TIMSS)**		**Preference of Achievement Values**	
Country	Entire Sample		Entire Sample		Entire Sample		Entire Sample		Entire Sample	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Germany	2.88		1.51		1.76		1.00		3.26	
	2.88	2.88	1.62	1.39	1.62	1.90	.94	1.07	3.07	3.44
Canada	2.21		1.90		1.97		.72		4.08	
	2.18	2.25	1.91	1.88	1.79	2.15	.64	.80	4.06	4.10
Israel	2.04		1.75		2.13		.78		3.81	
	2.07	2.00	1.87	1.63	2.00	2.26	.70	.86	3.71	3.90
p of country effect	.006		.068		.021		.002		.037	
p of gender effect	.997		.108		.009		>.001		.185	
p of interaction	.517		.160		.556		.556		.029	

Fears of social exclusion (fear of being called a *Streber* in Germany, mean of fear of being called a nerd or teacher's pet in Canada and Israel) did not differ between the countries, nor were differences between boys and girls found, nor was there an interaction of gender and country. This may seem a bit surprising at first glance, but remember that our hypotheses do not pertain to mean level differences between genders and/or cultures, but to the relationship of math grades and fears of social exclusion.

For mathematical self-esteem a significant country effect and a highly significant gender effect emerged, but no interaction effect: Mathematical self-esteem was higher in Canada and much higher in Israel in comparison to Germany. At the same time girls had a lower mathematical self-esteem in all cultures.

Results for the three TIMSS tasks were telling. In none of the three countries could an average student solve more than one of the three tasks. This score was only reached in Germany even, while Canadian and Israeli students solved even less than one task on average, the country difference being as highly significant as the gender effect: Girls solved fewer tasks than boys regardless of country. This finding is interesting in connection with the finding for grades and for mathematical self-esteem. Although "objective" mathematical abilities of the Canadian and Israeli participants were lower than those of the German participants they reported better grades and higher self-esteem.

Regarding preferences of achievement values, the expected results emerged: German students were least prone to subscribe to achievement values in comparison to their Canadian and Israeli age-mates. With no significant gender effect, here just for once we found a significant interaction of gender and country: In Canada achievement values of boys and girls did not differ substantially, while in Germany and Israel gender differences occurred, with boys more than girls being inclined to support achievement values.

Let us now turn to the test of our hypotheses. The essence of our three hypotheses was that (1) we expect a closer relationship between fear of social exclusion and (good) math grades in Germany than in the other two cultures, (2) we expect a closer relationship between fear of social exclusion and (good) math grades for girls than for boys, irrespective of culture, and (3) we expect culture and gender differences in the strength of the relationship between fear of social exclusion and math grades to diminish once preferences of achievement values are partialled.

To test our first hypothesis, we subjected our data to three — within country — multiple regression analyses in which math grades were the dependent variable, while fear of social exclusion, mathematical self-esteem, and "objective" mathematical abilities were the predictors. The results of these analyses are documented in Table 2.

Table 2 reveals that the relationship between fears of social exclusion and grades in mathematics was indeed strongest in Germany. The difference in strength was significant for the Germany-Israel comparison: The Israeli coefficient did not fall into the 95% confidence interval of the German coefficient. For the Germany-Canada comparison the picture was a bit less convincing: The Canadian coefficient was on the lower edge of the

Table 2

Country-specific Multiple Regression Analyses: Prediction of Grades in Mathematics

Predictor	Fear of Social Exclusion	Mathematical Self-Esteem	'Objective' Mathematical Abilities
Germany			
B	-.14	-.54	-.13
95% Confidence Interval	-.20/-.07	-.61/-.47	-.19/-.08
β	-.13***	-.52***	-.16***
Canada			
B	-.08	-.63	-.27
95% Confidence Interval	-.16/-.01	-.71/-.54	-.37/-.17
β	-.07*	-.52***	-.18***
Israel			
B	.01	-.71	-.07
95% Confidence Interval	-.08/.09	-.81/-.60	-.16/.02
β	.01	-.54***	-.07

* = $p \leq .05$, *** = $p \leq .001$

German 95% confidence interval. Had one constructed the 90% confidence interval, the Canadian coefficient would have fallen outside this interval. The difference between Germany and Canada was, thus, significant on the 10% level, only. The table also makes clear that math grades can best be predicted on the grounds of knowledge about a student's mathematical self-esteem regardless of culture. One other finding seems important to highlight: The comparison of coefficients and confidence intervals shows that in Canada grades were tied to "objective" mathematical abilities significantly closer than in Germany and particularly Israel, where grades have almost nothing to do with TIMSS task results. In summary one can say that our first hypothesis has been confirmed, but that the size of the postulated effect is fairly small, in particular compared to mathematical

self-esteem. The significance of the postulated effect after partialing for self-esteem does, however, make clear that we have something at stake that is not just another measure of self-esteem.

Our second hypothesis assumed that — regardless of country — the relationship between fear of social exclusion and grades in mathematics should always be higher for girls than for boys. In order to test this hypothesis, we repeated the prior regression analyses separately for girls and boys within the three countries. Table 3 documents the results of these analyses.

Table 3 shows that indeed in all three cultures the relationship between fear of social exclusion and (good) math grades is higher for girls, but it is only significant in Germany and Israel. A second point worth mentioning is the result that — although strong for both girls and boys — the predictive power of mathematical self-esteem for math grades is significantly lower for boys than for girls in Canada and Israel. All in all, our gender related hypothesis was also confirmed, but again effect sizes are not high.

Our third and final hypothesis was that cultural differences in the strength of the relationship between fear of social exclusion and grades in mathematics should diminish when a variable is introduced that we see as one that can decompose culture, that can 'catch' the cross-cultural variation, which is most decisive here from a substantive point of view. Such a variable, in our view, is the preference of achievement values. We assumed that a high preference for achievement values would immunize a person, so-to-speak, against fears of social exclusion being closely associated with actual performance ratings. To technically decompose culture in a regression approach that treats culture as a moderator variable and therefore analyzes separate samples is somewhat complicated. As sketched above, we first pooled the sample, then had individual achievement values separately predict all variables included in the prior regression analyses, and finally saved the residuals of all variables to then conduct the same regression analyses as before for the variables that are now partialled for the influence of achievement value preferences. Through this procedure we were able to ensure that the proportions of variance of the "decomposing" variable, achievement value preferences, were no longer part of the culture-specific subsamples. At the same time, we could uphold our analytic strategy to keep the cultures apart. Had we, alternatively, used culture-specific raw data plus within-country partialing, the level differ-

Table 3

Gender-specific Multiple Regression Analyses by Country: Prediction of Grades in Mathematics

Predictor	Fear of Social Exclusion	Mathematical Self-Esteem	'Objective' Mathematical Abilities
Germany/Girls			
B	-.17	-.56	-.16
95% Confidence Interval	-.25/-.08	-.65/-.48	-.24/-.09
β	-.17***	-.56***	-.18***
Germany/Boys			
B	-.05	-.55	-.10
95% Confidence Interval	-.17/.06	-.66/-.43	-.19/-.01
β	-.05	-.48***	-.12*
Canada/Girls			
B	-.09	-.73	-.24
95% Confidence Interval	-.19/.02	-.83/-.62	-.38/-.10
β	-.07+	-.62***	-.15***
Canada/Boys			
B	-.03	-.57	-.33
95% Confidence Interval	-.14/.08	-.70/-.44	-.47/-.19
β	-.03	-.44***	-.23***
Israel/Girls			
B	-.08	-.83	-.03
95% Confidence Interval	-.20/.03	-.98/-.69	-.15/.10
β	-.08	-.64***	-.02
Israel/Boys			
B	.06	-.44	-.14
95% Confidence Interval	-.06/.20	-.75/-.46	-.29/-.01
β	.06	-.44***	-.14*

+ = $p \leq .10$; * = $p \leq .05$, *** = $p \leq .001$

ences between cultures would not have been taken into account. Findings of our methodologically complex analytic procedure were disappointing. Not in a single case did standardized β coefficients differ more than .02. This means that achievement value preferences are not a variable that has the proficiency to decompose culture in the present case. This "disappointing" finding enticed us to follow up with a number of exploratory analyses. We engaged in a test that examined whether achievement values could be conceptualized as a moderator variable. This means that we tested whether the relationship between fear of social exclusion and grades in mathematics was different in groups of participants with a different preference for achievement values. On the basis of a cluster analysis (SPSS QUICK CLUSTER) using the achievement value preference scale score as the variable on which clustering is based, we formed four groups: Group 1 (N = 384, M = 5.25) — very high achievement values, "A++"; Group 2 (N = 601, M = 3.96) — above average achievement values, "A+"; Group 3 (N = 465, M = 2.93) — below average achievement values, "A-", and Group 4 (N = 233, M = 1.89) — low achievement values, "A- -". Group membership and culture are correlated, the contingency coefficient is at .30, $p < .001$, Cramer's V at .22, $p < .001$, but by no means is group membership strictly determined by the cultural background. Table 4 cross-tabulates country and cluster membership.

Table 4

Crosstabulation of Achievement Values Preferences per Cluster by Country

	Cluster 1 Very High Achievement Values "A++"	**Cluster 2 Above Average Achievement Values "A+"**	**Cluster 3 Below Average Achievement Values "A-"**	**Cluster 4 Low Achievement Values "A--"**
Israel	111 (26.0%)[a]	147 (34.4%)	47 (11.0%)	122 (28.6%)
Germany	66 (10.2%)	212 (32.7%)	137 (21.1%)	234 (36.1%)
Canada	207 (34.1%)	242 (39.9%)	49 (8.1%)	109 (18.0%)

[a] Number of participants from a country allocated to a specific cluster, and percentage that this number comprises of the participants from that country.

Table 4 shows that Germany has the smallest number of students in the cluster that expresses very high achievement value preferences, and the most students in the cluster that has the lowest achievement value preferences.

When we now repeat the within-country regression analyses, reported above, for each cluster, we find that sizes of β-coefficients for the relationship between fear of social exclusion and math grades follow the logic of mean preferences of achievement values: In Group 1β is -.03, in Group 2 it is -.10, in Group 3 it is -.12, and in Group 4 it is -.17. The lower the average achievement value rating in the group, the stronger the relationship between fear of social exclusion and (good) grades in mathematics. This finding would indicate that indeed high achievement values act as a safeguard against fears of social exclusion in an achievement setting like the classroom. However, a closer look at the three countries modifies the picture again somewhat and makes clear why achievement values do not serve as a variable that decomposes culture in the way that Rohner (1984) suggested. The β-coefficients for the four groups are .07, -.01, -.02, -.02, respectively, in Israel, -.02, -.17, -.07, -.23, respectively, in Germany, and -.02, -.03, -.16, -.16, respectively, in Canada.

To some degree the sizes of the β coefficients (which reflect the strength of the interrelation between fears of social exclusion and math grades) and the approval of achievement values follow the hypothesized rational: The higher the approval of achievement values, the weaker the relationship between fears and grades. The correlation between the twelve (4 clusters-by-3 countries) subgroup achievement value preference means and the twelve reported β-coefficients is $r = .60$, $p = .038$. But at closer inspection significant safeguarding effects can only be substantiated for Germany. Only there does the high achievement value group ($\beta = -.02$) have a significantly lower β-coefficient for the relationship between fears of social exclusion and (good) grades in mathematics than the low achievement value group ($\beta = -.23$). In the other countries the contrasts between the low achievement value group and the high achievement value group are insignificant.

Discussion

Findings of the present study only partially confirm our hypotheses. It was indeed the case that for German students fear of social exclusion,

through being labeled a *Streber* (nerd/teacher's pet), was indeed more closely related to grades than among students from the other two countries. Also, the finding of a relationship between good grades and high fears of social exclusion was always clearer for girls than for boys, regardless of the cultural context. However, the effect sizes of both findings were low, though usually significant. Moreover, our proposition that the cross-cultural differences would be explainable on the grounds of culture-specific preferences of achievement values could not be substantiated. This finding is somewhat puzzling, because all interrelations of achievement values with other variables proved to be highly plausible. Achievement value preferences were higher in Canada and Israel than they were in Germany, achievement values were positively correlated with grades in mathematics. Additional exploratory analyses did, however, reveal that only for the country with the lowest achievement values, Germany, the assumption was substantiated that among good students high achievement values serve as a safeguard against fearing social exclusion. Students in the other two cultures actually did not need this safeguard, because in their cultures good students do not fear social exclusion at all (Israel) or only to a minimal degree (Canada).

If then individual differences (and thereby implicitly cross-cultural differences) in the preference of achievement values do not explain the cross-cultural differences in the strength (or even the very existence) of the relationship between fears of social exclusion and (high) academic performance in mathematics, what might be the reasons? Our data give one clue. This clue lies in the clearly different distribution of grades in the three countries. In Canada and Israel good students regularly get good grades. It is common for them to be rewarded with an "A" if they perform very well. If they perform satisfactory they typically receive a "B." In Germany this is different. Only the most exceptional students are rewarded with an "A," while students that perform well above average get only a "B." The "C" is the typical grade for satisfactory performance. This tradition may have repercussions. For German students being informed that they are excellent happens more rarely than it does for students in the two other cultures. This may reduce mathematical self-esteem. Findings of cross-cultural differences in mathematical self-esteem (higher scores in Canada and Israel) support this interpretation.

Low frequencies in exceptional grades may at the same time make such grades more prone to initiate social exclusion. If exceptionality of mathematics achievement (as publicized to students through grades) is quite common in a culture, social exclusion on its grounds seems less logical, because most students will receive good or even excellent grades every once in a while. In a culture, however, where exceptional grades are very rare, social exclusion on the grounds of exceptionality of academic performance seems more logical. Only very few students ever get exceptional grades. In social comparisons these students may indeed appear to their peers as "something better." A thorough data inspection supports this *post hoc* explanation. Numerically a higher correlation between our two variables in Germany as compared to the other two cultures can originate from a higher proportion of students in Germany who have good grades and high fears of social exclusion. It can, however, also originate from particularly low proportions of students who have good grades and no such fears. The latter seems to be the case: In Germany less than 1% of the participants have the best possible grade and no fear of social exclusion whatsoever, while in Canada and in Israel about 13% of the participants have best grades and no fear.

What follows from our study are four things: First, social exclusion of the grounds of high achievement in school is a phenomenon that does need attention in Germany, little attention in Canada, and no attention at all in Israel.

Girls need particular consideration in this context, because it is them who exhibit the closer ties between fears of social exclusion and good grades than boys. If a problem at all outside Germany, Canadian girls might need some attention here.

Only in Germany does high preference of achievement values immunize against social exclusion fears that are based on others' negative evaluation of one's high achievement. In the other two countries, which have much higher average ratings of achievement values, a similar safeguard effect is not found and indeed not necessary.

Beyond the immediate focus of the present study school reformers should be aware that grading is much more highly related to a student's self-esteem than to his or her "objective" abilities in the subject under scrutiny (mathematics). This replicates a cross-cultural study by Boehnke (1996) and by Scott and Scott (1998). From a pedagogical point of view this

finding should not be evaluated as altogether negative, but it definitely needs the attention of teachers and politicians who conceptualize school-based changes after disappointing results in international comparative studies: High achievement seems most probable in a context that ridicules social exclusion on its grounds, a context where achievement is rewarded with good grades, and where self-esteem of students is supported among others through the reward of good and excellent grades for good and better scholastic performance.

References

Adams, R., & Wu, M. (2002). *PISA 2000 technical report*. Paris: OECD.

Baumert, J., Klieme, E., Neubrand, M., Prenzel, M., Schiefele, U., Schneider, W., Stanat, P., Tillmann, K.-J., & Weiß, M. (Eds.) (2001). *PISA 2000: Basiskompetenzen von Schülerinnen und Schülern im internationalen Vergleich* [PISA 2000: Basic competencies of students in international comparison]. Opladen: Leske + Budrich.

Boehnke, K. (1996). *Is intelligence negligible? The relationship of family climate and school behavior in a cross-cultural perspective.* Münster: Waxmann.

Boehnke, K. (2003). Werthaltungen Jugendlicher im Kulturvergleich [Value orientations of adolescents in cross-cultural comparison]. *Jahrbuch Jugendforschung, 2*, in press.

Hannover, B. (1999). Schulischer Kontext, geschlechtsbezogenes Selbstwissen und Fachpräferenzen [School context, gender-related self-knowledge, and subject preferences.] In B. Hannover, U. Kittler, & H. Metz-Göckel (Eds.), *Sozialkognitive Aspekte der pädagogischen Psychologie. Vol. I. Dokumentation des 3. Dortmunder Symposions für Pädagogische Psychologie 1998* (pp. 125-139). Essen: Die Blaue Eule.

Köller, O., Baumert, J., Clausen, M., & Hosenfeld, I. (1999). Predicting mathematics achievement of eighth grade students in Germany: An application of parts of the model of educational productivity to the TIMSS data. *Educational Research and Evaluation, 5*, 180-194.

Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Gregory, K.D., Smith, T.A., Chrostowski, S.J., Garden, R.A., & O'Connor, K.M. (2000). *TIMSS 1999. International science report: Findings from IEA's repeat of the Third International Mathematics and Science Study at the eighth grade.* Chestnut Hill, MA: International Study Center, Boston College, Lynch School of Education.

Mullis, I. V .S., Martin, M.O., Gonzalez, E.J., Gregory, K.D., Garden, R.A., O'Connor, K.M., Chrostowski, S.J., & Smith, T.A. (2000). *TIMSS 1999. International Mathematics Report: Findings from IEA's Repeat of the Third Intentional Mathematics and Science Study at the eighth Grade.* Chestnut Hill, MA: International Study Center, Boston College, Lynch School of Education.

Rohner, R.P. (1984). Toward a conception of culture for cross-cultural psychology. *Journal of Cross-Cultural Psychology, 15*, 111-138.

Schwartz, S.H., Melech, G., Lehmann, A., Burgess, S., Harris, M., & Owens, V. (2001). Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology, 32*, 519-542.

Scott, R., & Scott, W.A. (1998). *Adjustment of adolescents: Cross-cultural similarities and differences.* London: Routledge.

Westbury, I., & Travers, K. (1990). *Second international mathematics study.* Urbana: University of Illinois Press.

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