AN EMPIRICAL TEST OF A GENERAL THEORY OF CRIME: A FOUR-NATION COMPARATIVE STUDY OF SELF-CONTROL AND THE PREDICTION OF DEVIANCE

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*The current investigation examined the psychometric properties of Grasmick et al.'s self-control measure and its relationship with deviance on large, representative adolescent samples (*N = *8,417) from Hungary, the Netherlands, Switzerland, and the United States. Important findings indicate that (1) the self-control measure is multidimensional; (2) the self-control measure is tenable for males, females, five different age groups (15-, 16-, 17-, 18-, and 19-year-olds), and adolescents from four different countries; (3) deviance as assessed by the Normative Deviance Scale (NDS) can be reliably measured in different countries; (4) self-control accounts for 10 to 16 percent of the total variance explained in different types of deviance and for 20 percent in total deviance; and (5) developmental processes involving self-control and deviance are largely invariant by national context. The investigation provides further support for the multidimensional self-control measure and its relationship with deviance independent of national context.*

A few years after the publication of *A General Theory of Crime* (Gottfredson and Hirschi 1990), Grasmick et al. (1993) suggested that the book "is sure to generate important theoretical debates and research" (p. 5). Undoubtedly, they were correct in their prediction, as Cohn and Farrington

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(1998) recently identified both Hirschi and Gottfredson as the two most cited authors in a combined ranking of the top three criminology and the top three criminal justice journals, largely due to the publication of their book. Gottfredson and Hirschi's theoretical propositions and associated empirical tests continue to permeate both criminological and criminal justice literature in the United States as well as abroad (for comprehensive discussions of the theory, see, e.g., Cohen and Vila 1995; Grasmick et al. 1993; Hirschi and Gottfredson 1995).

One line of empirical work has focused on developing and validating a measure of self-control, one of the central tenets of the theory. Hirschi and Gottfredson (1994) have explained self-control in the following manner:

> Criminal acts are a subset of acts in which the actor ignores the long-term negative consequences that flow from the act itself (e.g., the health consequences of drug use), from the social or familial environment (e.g., a spouse's reaction to infidelity), or from the state (e.g., the criminal justice response to robbery). All acts that share this feature, including criminal acts, are therefore likely to be engaged in by individuals unusually sensitive to immediate pleasure and insensitive to long-term consequences. The immediacy of the benefits of crime implies that they are obvious to the actor, that no special skill or learning is required. The property of individuals that explains variation in the likelihood of engaging in such acts we call "self-control." (Pp. 1-2)

Based on previous empirical work (see Hirschi and Gottfredson 1994), they suggest that self-control should be conceptualized as a "latent trait" (quotations consistently used by authors), a stable individual difference that is associated with deviant conduct. High self-control, they suggest, is a stable individual tendency that lets the actor avoid immediate or momentary acts and behaviors whose costs and consequences exceed the long-term benefits. Therefore, individuals who have low levels of self-control are more likely to commit any act of deviance or crime-analogous behavior (a concept they call offender versatility; see Gottfredson and Hirschi 1990; see Vazsonyi 1995 for an empirical test of crime-analogous behaviors); they have also termed this "an enduring criminal predisposition" elsewhere (Hirschi and Gottfredson 1993).

In the initial study of this line of inquiry, Grasmick et al. (1993) tested an operationalization of the self-control construct by developing a six-factor, 24-item scale based on Gottfredson and Hirschi's original formulation of the theory and self-control with its multiple elements (for a description, see Gottfredson and Hirschi 1990:89). The scale was tested on a sample of N = 395 adults (18 years or older; the Oklahoma City Sample) drawn from the general population. Employing principal components exploratory factor analyses (EFA) and associated evaluative criteria (the Kaiser Rule and a scree

plot), the authors explored one-factor, five-factor, and six-factor solutions. Based on their assumption of unidimensionality and on the conclusion from their analyses that "we cannot find strong evidence that combinations of items into subgroups produces readily interpretable multidimensionality" (p. 17), they computed reliability analyses (Cronbach's alpha) on a one-factor solution. They used this analysis to determine the "most reliable" set of items (from the total of 24) to measure self-control. Omitting one item from the Physical Activity subscale (omission resulted in an alpha change from .805 to .812) resulted in a single-factor, 23-item scale that was standardized for subsequent prediction analyses.

Few other attempts exist in the literature that employ a method or a self-control measure specifically operationalized to assess self-control as describ- ed by Gottfredson and Hirschi (1990), including the multiple elements, other than the one developed by Grasmick et al. (1993). However, there exist (1) other empirical investigations that examine the general theory of crime and the self-control construct without the use of the Grasmick et al. measure (e.g., Brownfield and Sorenson 1993; Gibbs and Griever 1995; Gibbs, Griever, and Martin 1998; Keane, Maxim, and Teevan 1993; Paternoster and Brame 1998; Polakowski 1994; Sorenson and Brownfield 1995; Steffensmeier 1989), (2) studies that employed only selected elements of the Grasmick et al. measure (e.g., Burton et al. 1998; Burton et al. 1999; Cochran, Wood, and Arneklev 1994; Winfree and Bernat 1998), (3) studies that employed the Grasmick measure and additional items/constructs to assess self-control (e.g., LaGrange and Silverman 1999), and (4) studies that used different methodologies to test the Grasmick et al. measure (e.g., telephone interviews) (Forde and Kennedy 1997). In general, these investigations did not focus on measurement or conceptual issues of self-control to the same extent as found in other studies (subsequently reviewed), which specifically examined the measurement of self-control and/or the Grasmick et al. measure.

A number of studies have attempted to replicate and refine the original findings by Grasmick et al. (1993) on different samples. Based largely on the apparent dichotomy presented by Grasmick et al. of the uni- versus multidimensionality of self-control, a large part of the subsequent empirical work in the literature has focused on this issue of dimensionality with a number of researchers settling on a unidimensional solution. We believe that this decision was not well supported by the data for a number of reasons. For example, Grasmick et al. did not employ rigorous statistical tests to make their decision on the retention of items or dimensionality in their study. The elimination of one item from the total scale did not seem well founded because after rounding, the 24-item solution fits equally well as the 23-item solution ($\alpha = .81$). Therefore, for conceptual argument and clarity, the 24-item solution could

have been retained. The authors also noted that the five-factor model, which they tested "with the elimination of items with poor factor discrimination, eventually becomes identical to the six factor model but without the impulsivity subscale" (p. 17). Using exploratory factor analysis, they concluded, based on inspection of eigenvalues and scree plots that revealed a substantial change between the first and second factors, that a unidimensional solution was best supported by the data. At the same time, they cautioned, "We do not, however, wish to give the impression that we consider ours the definitive conclusion on this issue" (Grasmick et al. 1993:17). Rather than employing more rigorous confirmatory factor analyses (CFA) to assess the dimensionality of the items best supported by the data, they employed descriptive analyses and inferential reasoning. Gottfredson and Hirschi (1990:89-90) clearly delineated self-control as multidimensional or as including multiple elements and, as such, forming a stable self-control trait. Together, these findings and conclusions were not so much erroneous but rather represented an excellent first step in this line of empirical work; however, they have partially contributed to substantial misinterpretations of the conceptually sound, original work.

The current investigation seeks to (1) replicate and further test the dimensional properties of the original 24-item scale proposed by Grasmick and colleagues,[1] (2) examine the issue of item retention as a number of subsequent studies have eliminated different ones (see the following literature review section), (3) employ a number of different adolescent samples from the general population, (4) test the scale by sex and by age groups, (5) assess the validity of the measure in four different national contexts, and (6) employ the self-control measure to predict different types of deviant conduct in the different samples. In the following section, we carefully examine previous empirical tests of the self-control measure developed by Grasmick et al. (1993).

PREVIOUS EMPIRICAL STUDIES

Arneklev et al. (1993) tested the relationship between self-control and noncriminal, irresponsible acts or behaviors, something they termed *imprudent behaviors*. The same sample and analytical procedure (EFA) was employed as in the study by Grasmick et al. (1993) to arrive at a final 23-item self-control scale. In addition, the authors decided to pursue what they called *component scales*, which were simply the six original subscales they conceptualized, minus three items in three different subscales. Then, the six component scales (21 items) and a total measure of self-control (23 items) were used to predict imprudent behaviors, which included smoking, drinking, gambling, and a composite score of all three. They found that the low self-control composite accounted for 3.3 percent of the total variability in imprudent

behavior (drinking and gambling, but not smoking); however, it did not significantly predict individual imprudent behaviors at all. Finally, by considering risk seeking independently, they successfully predicted about 8.7 percent of the variability in a revised imprudent behavior composite (excluding smoking), after controlling for age, sex, and race. They concluded that the theory and its main construct of self-control hold promise but that more empirical tests need to be completed to determine the full utility of the theory and its basic tenets.

In a related study, Wood, Pfefferbaum, and Arneklev (1993) tested the measure on a different sample of about 1,000 adolescents. Similar to Grasmick et al. (1993) and Arneklev et al. (1993), results of EFAs revealed six factors with eigenvalues greater than 1 but a scree plot change from the first to the second factor sufficiently large to consider unidimensionality. They decided to retain all 24 items and tested both individual subscales and the total self-control scale to predict adolescent risk taking (e.g., imprudent behaviors, illegal and legal substance use, interpersonal delinquency, vandalism, and theft). The authors found that the predictive efficiency of self-control and each subscale varied by type of risky behavior. Based on differences in predictive power (i.e., summed, individual subscales accounted for more total variance than the total self-control measure), they concluded that "the composite of self-control measure deserves to be treated in a multidimensional fashion" (Wood et al. 1993:124). Substantively, the authors also suggested that employing the multidimensional solution allows inspection of how different aspects of self-control are related to different types of risky and deviant behavior. They also argued for multidimensionality of delinquency measures, something subsequent studies have not examined further (e.g., most have combined deviance or crimes into crimes of fraud and crimes of force). They found that self-control accounted for about 16 to 17 percent of the variance explained in different types of delinquency, although this varied between measures.

In addition to these three studies, one more was done on a sample of college students (Piquero and Tibbetts 1996), and four more tested the Grasmick et al. (1993) self-control scale on a sample of drug-using adult and juvenile offenders. In the latter studies, all offenders had been charged with some crime in addition to their drug use (Longshore 1998; Longshore and Turner 1998; Longshore, Turner, and Stein 1996; Piquero and Rosay 1998). Piquero and Tibbetts (1996) employed the Grasmick et al. scale on a sample of N = 642 adolescents and young adults (age range: 17 to 35; median age: 19 years) attending an East Coast university. Participants were asked to rate different scenarios and the likelihood that they would commit the act specified in each one. The authors decided to use a 24-item summed composite of self-control based on indicators of high reliability (α = .84) and on the fact that explor-

atory factor analyses yielded similar factor loadings as in Grasmick et al.'s original study. They examined models in which self-control directly and indirectly predicted drinking and driving as well as shoplifting. Their data supported the idea that self-control had both a direct and indirect effect on deviance, mediated through situational variables—in this case, perceived pleasure and perceived shame for the act. More specifically, they found, for example, that self-control (direct and indirect effects) explained about 4 percent of the total variance in drunk driving and 5 percent of the variance in shoplifting.

Longshore et al. (1996) addressed numerous shortcomings of previous work by employing more rigorous CFAs on the Grasmick et al. (1993) self-control scale. They examined the scale on the described sample of drug-using criminal offenders who were largely ethnic minorities; most previous work had been done on general population samples and college students who were predominantly Caucasian. Longshore et al. employed the 23-item measure suggested by Grasmick et al., but like Wood et al. (1993), they used a 5-point Likert-type scale instead of a 4-point Likert-type scale. They also introduced reverse-worded items to avoid what they termed "yea-saying." Employing EFA (maximum likelihood, oblique rotation), they initially found a five-factor solution, and all reverse-coded items made up a sixth factor that they called a "methods factor." Subsequently, they specified a five-factor solution and found that impulsiveness and self-centeredness items loaded together on a single factor. They also report dropping a reverse-worded item at this stage, as it did not appear to load on any factor. Next, they employed a CFA to fit the data to a one-factor and the obtained five-factor solution. Initial fit was very poor for the one-factor solution (Comparative Fit Index [CFI] = .66) and slightly better for the five-factor one (CFI = .76). By dropping two additional items, adding the methods factor back in, and adding five correlated error terms, model fit improved to CFI = .85 for the one-factor solution. Similarly, by dropping one reverse-worded item, adding a methods factor as well as four correlated errors, and letting one item cross-load (across factors), the five-factor model improved to an acceptable level of fit (CFI = .91). The authors then tested both the one-factor and five-factor solutions for men, women, and older and younger offenders and by ethnicity. The models generally fit best for Caucasians (CFIs = .89 and .93) and poorest for women (CFIs = .80 and .80). The one-factor solution never exceeded the lowest acceptable fit of CFI = .90, but for the five-factor solution, women and juveniles were also below CFI = .90.

Subsequent tests of the relationship of self-control with crimes of force and fraud suggested that the total self-control scale accounted for between 6 and 12 percent of the total variability in criminal behaviors. In some cases, Longshore et al. (1996) also found that individual subscales, such as the impulsiveness/self-centeredness composite, accounted for slightly more than

others. They concluded that because the study tested the self-control construct on a criminal sample, findings were likely to depart from previous work. Nevertheless, findings were fairly consistent with the originally conceptualized, multidimensional measure of self-control as suggested by Grasmick et al. (1993). They also suggested that self-report methodology was valid but that this measure may not be tenable for women with a history of heavy involvement in crime. Finally, in their study, the data did not distinguish measures of impulsiveness from other components of self-control. In two more recent studies employing the same sample by Longshore (1998) and Longshore and Turner (1998), despite findings of multidimensionality, the authors employed a 23-item, unidimensional measure of self-control to predict personal and property crime and crimes of fraud and force, respectively.

Piquero and Rosay (1998) also examined dimensionality and the predictive utility of the Grasmick et al. (1993) self-control measure on the sample of drug-using adult and juvenile offenders. They strongly argued for the unidimensionality of self-control, for equivalency of the scale for both males and females, and against employing correlated errors in CFA model testing. Due to findings in EFAs and other preliminary analyses, Piquero and Rosay decided to use only 19 of the original 24 items proposed by Grasmick and colleagues. Despite some evidence that a multisubscale model may be tenable in their data set, the authors tested a one-factor solution using CFAs. Testing a series of congeneric measurement models and employing Goodness-of-Fit Indexes and chi-square statistics, they found that the one-factor solution supported invariance by sex. Despite arriving at a unidimensional solution for the self-control measure, like Longshore et al. (1996), Piquero and Rosay then tested the predictive strength of both a total self-control measure and individual subscales. Consistent with previous studies, the total self-control measure accounted for about 7 percent of the variance in crimes of fraud and 13 percent of the variance in crimes of force after controlling for age, sex, and ethnicity. With one exception (impulsiveness predicting crimes of fraud), the total scale consistently outperformed individual subscales in predicting crimes. They concluded that their study provides evidence of unidimensionality because it "appears to come together in the same people" (p. 169) and suggested that this was consistent with Gottfredson and Hirschi's conceptual framework. At the same time, they also noted that these findings are "somewhat troubling for Gottfredson and Hirschi since their notion of self-control is clearly organized around six components" (p. 170). These statements seem inconsistent and contradictory because their study also provides support for multidimensionality.

In fact, we believe that the conceptual and methodological dimensionality of the self-control measure has little relevance to the former statement. Consider the following example. If we would like to assess intelligence in a person,

a traitlike quality, we regularly and frequently employ a multidimensional measure of intelligence, such as the Wechsler Intelligence Scale for Adults (WAIS); in fact, this measure includes 13 subscales that assess a trait that "comes together" in the same person. Therefore, a multidimensional measure of self-control still can and does imply that these elements together form the single latent trait of self-control. A stable, individual latent trait, therefore, does not need to be unidimensional, as suggested by Piquero and Rosay (1998).[2] Finally, Gottfredson and Hirschi (1990:89-90) conclusively outlined self-control as multidimensional; referring to the six elements of self-control as later operationalized by Grasmick et al. (1993), they concluded that "since there is considerable tendency for *these traits* [emphasis added] to come together in the same people, and since the *traits* tend to persist through life, it seems reasonable to consider them as comprising a stable construct useful in the explanation of crime" (pp. 90-92).

We have provided a rather detailed review of the studies that have empirically examined the self-control measure by Grasmick et al. (1993) to illustrate and provide a history of most published accounts testing the scale. This seems indispensable if we seek to further our knowledge and understanding of the measurement of self-control and, ultimately, our understanding and knowledge of the validity and parsimony of the general theory of crime. Nagin and Paternoster (1993) and Longshore et al. (1996) have noted how comparatively few rigorous empirical studies have been completed on the Grasmick et al. self-control measure. In fact, tests of the Grasmick et al. measure as originally conceptualized have generally been limited to a very small number of American samples (one general population sample in Oklahoma, one high school sample in Oklahoma, one college student sample in the East, and one sample of drug-using criminals). Therefore, we believe that further tests of this measure and basic tenets of the theory are necessary.

CROSS-CULTURAL/NATIONAL CRIME AND DEVIANCE

A very modest number of non-American studies have empirically tested the general theory of crime, and none employed the Grasmick et al. (1993) measure of low self-control as originally conceptualized, the measure most frequently used in empirical tests of the theory in the United States. For example, testing the predictive strength of lack of control, Caspi et al. (1994) and Henry et al. (1996) provided support for the self-control/delinquency relationship and, therefore, the general theory of crime in a longitudinal study on a sample of about 1,000 individuals from New Zealand. Similarly, based on a longitudinal study of Finnish youth, Pulkkinen (1982) and Pulkkinen and Hämäläinen (1995; see also Pulkkinen 1986 for a theoretical discussion

of the role of impulse control) concluded that self-control was predictive of crimes and accidents (crime-analogous behaviors). Testing the basic tenets of the general theory on Canadian youth, Forde and Kennedy (1997; they used the Grasmick et al. measure, but based on phone interviews), Keane et al. (1993), LaGrange and Silverman (1999), and Tremblay et al. (1995) found support for the negative association between self-control and imprudent behaviors, driving under the influence of alcohol, deviance involvement, delinquency, and accidents.

One distinguishing feature of the general theory is its elegance, simplicity, and parsimony in the predictions it makes. Much like Gottfredson and Hirschi (1990:125-44) predicted no differences in the relationship between self-control and deviance or crime in males and females (or by age), which was supported in Piquero and Rosay's (1998) study, they also predicted the same for individuals from different cultures and countries (for an eloquent discussion of the problems of comparative criminology, see Gottfredson and Hirschi 1990:169-79). After reviewing the evidence of comparative criminology, they remarked that "in the end, then, the major disciplines conclude that the conceptual chaos of criminology reflects the natural chaos of a multicultural world" (p. 173), referring to the fact that deterministic schools of thought have developed the idea, based on cross-national studies, that culturally unique explanations of crime apply to culturally unique definitions of crime. They further noted that

> science typically assumes that proper explanations of phenomena are produced by inductive examination of differences and their correlates. First one determines that, for example, the United States has a higher homicide rate than Japan. Then one locates the cultural (or perhaps structural) differences between Japan and the United States that account for homicide differences. (P. 173)

Therefore, Gottfredson and Hirschi (1990) call for a new approach in cross-cultural and cross-national comparative criminology. Their approach

> assumes instead that cultural variability is *not* important in the causation of crime, that we should look for constancy rather than variability in the definition of and causation of crime, and that a single theory of crime can encompass the reality of cross-cultural differences in crime rates. (P. 175)

In conclusion, they suggested that "absent such a theory, cross-national research has literally not known what it was looking for, and its contributions have rightfully been more or less ignored" (p. 179; see also Archer and Gartner 1984:3). Some requirements for such a "culture-free theory of crime" include definitions of crime and deviance that are not culture specific but that

transcend national and cultural boundaries. In other words, crime cannot be measured by legalistic terms or strictly behavioral terms but must rather be "culture free" in a mundane sense. The same acts measuring crime must assess behaviors by individuals that are considered violations against moral and human codes in each culture—or, as Gottfredson and Hirschi (1990) put it, "Our definition of crime should be derived from a conception of human nature that transcends social groupings (whether within or across societies)" (p. 175).

THE CURRENT INVESTIGATION

The current investigation seeks to do the following:

1. Reexamine the psychometric properties of the original 24-item scale as proposed by Grasmick et al. (1993). Specifically, it seeks to employ EFAs and CFAs to examine individual items and the issue of dimensionality. Based on the original conceptualization and on Gottfredson and Hirschi's (1990) outline of the elements of self-control, we believe that a multidimensional scale is most tenable theoretically. Therefore, we will test both a one-factor and multiple-factor model of the self-control measure in an attempt to assess dimensionality.
2. Test a final model on males, females, and different age groups in the samples. In addition to arguing for invariance by sex of the construct and its relationship to crime, Gottfredson and Hirschi (1990:97-100) also suggested that the self-control behavioral trait, which is established early in life (by age 6 or 8) in the family context, will not vary as a function of age.
3. Examine the psychometric properties of the self-control scale in multinational samples from countries known to experience high levels of crime and countries experiencing comparatively low levels of crime (Gartner 1990). We are also interested in examining this very question in Eastern countries (former Soviet block) as well as Western countries (the United States and Western Europe).
4. Test the predictive strength of the self-control measure for measures of deviance that are not culture specific, ranging from school misconduct to assault on the different cross-national samples.

METHOD

Procedure

All data for this study were collected as part of the International Study of Adolescent Development (ISAD), a multinational, multisite investigation consisting of about 8,500 subjects from four different countries (Hungary,

the Netherlands, Switzerland, and the United States). The purpose of ISAD was to examine the etiology of adolescent problem behaviors and deviance using large representative samples from different countries (Vazsonyi and Killias 2001; Vazsonyi and Pickering 2000; Vazsonyi, Pickering, and Junger 1999). A standard data collection protocol was followed across all study locations. It was approved by a university international review board and consisted of a self-report data collection instrument that included instructions on how to complete the survey, a description of the ISAD project, and assurances of anonymity and confidentiality. The questionnaires were administered in classrooms by project staff or teachers who had received extensive verbal and written instructions. This was done to maintain a standardized protocol across all study locations. Students had a one- to two-hour period to complete the survey. Much attention was given to the development of the ISAD survey instrument, particularly by developing new or employing existing measures that could be used cross-culturally without losing nuances or changing meanings. The survey was translated from English into the target languages (Dutch, German, and Hungarian) and back-translated by bilingual translators. Surveys were examined by additional bilingual translators, and when translation was difficult or ambiguous, consensus was used to produce the final translation.

Sample

Valid data for this study were gathered from a total of $N = 8,417$ adolescents from four different countries (Hungary, $n = 871$; Netherlands, $n = 1,315$; Switzerland, $n = 4,018$; United States, $n = 2,213$).[3] In all locations, medium-sized cities were selected for participation. For each country, different schools were selected to obtain representative samples of the general population.[4] For the European samples, this included schools for university-bound students (Gymnasium) as well as schools specializing in vocational/technical training for students in apprenticeships. In the United States, the samples included high school students, community college students, and university students.

The Hungarian data were collected in two schools. In the first school, 46 (11 percent) students were absent on data collection days, leaving a final sample of $n = 374$ (89 percent of school population). The second Hungarian school had a total population of $n = 554$. Fifty (9 percent) students were absent on collection days, whereas 7 (1 percent) turned in incomplete (less than 50 percent completed) or invalid surveys (patterned responses), leaving a final sample of $n = 497$ (90 percent of school population). The Dutch data (see Dekkers 1998 for a thorough description of this sample) were collected from four schools. At these schools, $n = 1,578$ students were enrolled at the

time of data collection; $n = 219$ (14 percent) were absent on data collection days. Also, 44 (3 percent) students turned in incomplete or invalid surveys, leaving a final sample of $n = 1{,}315$ (83 percent of school populations). The Swiss data were collected in three schools. At the first school, the population was $n = 1{,}117$. Eighty-one (7 percent) students were absent on data collection days, and 48 (4 percent) declined participation or turned in incomplete or invalid surveys, leaving a final sample of $n = 988$ (89 percent of school population). The second Swiss school had a total population of $n = 375$. Eighty (21 percent) students were completing internships, were otherwise absent on data collection days, or turned in incomplete or invalid surveys, producing a final sample of $n = 295$ (79 percent of school population). The third Swiss school had a total population of 3,732. Only daytime classes were selected by the administration for participation. A total of 2,866 (77 percent) students were enrolled in these selected classes. Sixty-three (2 percent) of these students declined participation or turned in incomplete or invalid surveys, and 68 (2 percent) students were absent on data collection days, leaving a final sample of $n = 2{,}735$ (73 percent of total school population, 95 percent of students selected for participation). The American data were collected in three schools. The first was a large university where students from 15 freshman- and sophomore-level classes representing a wide variety of majors across the campus (e.g., architecture, geology, mathematics, theater, and engineering) were surveyed. In these classes, $n = 1{,}596$ surveys were distributed, and $n = 1{,}188$ (74 percent) completed surveys were returned. Twenty-six (2 percent) surveys were incomplete or invalid, leaving a final sample of $n = 1{,}162$ (73 percent response rate). The second American school was a community college in the same geographical vicinity. Teachers of social science courses were solicited for participation in the study by the dean of the college. A total of 258 surveys were distributed, and 84 (33 percent) students declined participation or turned in incomplete or invalid surveys, leaving a final sample of $n = 174$ (67 percent response rate). The third American school was a high school in the same geographical vicinity that had a population of $n = 1{,}134$. Of these students, 214 (19 percent) declined participation or were absent on data collection days, and 43 (4 percent) turned in incomplete or invalid surveys, leaving a final sample of $n = 877$ (77 percent of total school population).

Because these various schools represented an age range of approximately 14 to 22 years old, we decided to select a group of students within a specific "age band" for cross-national comparisons. Age frequencies indicated that there were more than 1,000 students in each group of a cross section of the total sample representing 15- to 19-year-olds (15-year-olds, $n = 1{,}099$; 16-year-olds, $n = 1{,}542$; 17-year-olds, $n = 1{,}580$; 18-year-olds, $n = 1{,}504$; 19-year-olds, $n = 1{,}189$). Thus, this age band was selected, and 1,503 (18 percent of the total sample) students were not used in the current investigation,

reducing the sample to $n = 6{,}914$ (82 percent of the total sample). After this age band selection, some slight differences in mean age by country remained; specifically, the Hungarian and Dutch samples were slightly younger than the other two.

Next, the problem of missing data was addressed. Due to analytical problems associated with missing data, three different methods to handle missing data were examined. Initial analyses on the self-control measure were completed employing both mean substitution and mean imputation. In addition, analyses were also run using a sample in which cases with missing data on key variables had been completely removed (listwise deletion). Analyses using all three of these methods revealed no important differences in initial comparisons; therefore, it was decided to use the third method. Feedback from Multivariate Software (EQS) confirmed this decision (Eric Wu, personal communication, October 14, 1998). Thus, all cases that contained missing data on the self-control measure were deleted from the sample (829; 10 percent of the total sample), resulting a final study sample of $n = 6{,}085$ (72 percent of the total sample; mean age = 17.5, $SD = 1.3$).

The final study sample included $n = 717$ Hungarians (mean age = 16.7, $SD = 1.2$), $n = 889$ Dutch (mean age = 16.5, $SD = 1.0$), $n = 3{,}177$ Swiss (mean age = 17.9, $SD = 1.1$), and $n = 1{,}302$ adolescents from the United States (mean age = 18.0, $SD = 1.5$). There were $n = 3{,}398$ males (mean age = 17.6, $SD = 1.3$) and $n = 2{,}644$ females (mean age = 17.5, $SD = 1.4$) in this sample; 43 participants did not identify their sex. Of the Hungarian adolescents in the sample, 495 were male and 217 were female (5 Hungarian subjects did not identify their sex). The Dutch adolescents were composed of 417 males and 468 females (4 Dutch subjects did not identify their sex). Among the Swiss adolescents, 1,952 were male and 1,200 were female (25 Swiss subjects did not identify their sex). Finally, the American adolescents in the sample consisted of 534 who were male and 759 who were female (9 American subjects did not identify their sex).

Measures

Subjects from all countries were asked to fill out the same questionnaire, including demographic and background variables,[5] age, self-control, and deviance.

AGE

Participants were asked to indicate the month and year in which they were born. To maintain anonymity of subjects, we did not ask for the day. The 15th day of the respective month was used to calculate subjects' ages.

SEX

Subjects were asked to indicate their sex on a single item: "What is your gender?" Responses were given as 1 = male and 2 = female.

LOW SELF-CONTROL

Grasmick et al.'s (1993) low self-control scale was used to measure self-control. This scale is composed of a total of 24 items in six subscales (impulsiveness, simple tasks, risk seeking, physical activity, self-centeredness, and temper; see Appendix A). All items in the low self-control scale were worded as originally suggested (i.e., none of them were reverse worded), and responses were given on a 5-point Likert-type scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neither disagree nor agree*, 4 = *agree*, 5 = *strongly agree*). This was revised from the 4-point Likert-type scale (1 = *strongly disagree*, 2 = *disagree somewhat*, 3 = *agree somewhat*, 4 = *strongly agree*) originally used by Grasmick et al. (1993), but it was consistent with other previous studies using this scale (e.g., Longshore et al. 1996; Pfefferbaum et al. 1993; Piquero and Rosay 1998). Reliability coefficients on the low self-control sub- scales for the entire sample ranged from $\alpha = .50$ to $\alpha = .79$ (see Appendix A).[6]

DEVIANCE

Lifetime deviance was measured by the 55-item Normative Deviance Scale (NDS) newly developed for the ISAD project. The purpose of this scale was to measure adolescent deviance in a manner that would capture norm-violating conduct in all cultures in the present investigation (norm-violating conduct that is independent of cultural definitions of crime and deviance), as well as in general adolescent populations, and to provide etiological data; in a sense, we wanted to develop and employ a serviceable cross-national measure. Therefore, this measure examined a broader spectrum of deviant activities rather than status and index offenses (see Junger-Tas 1988 for a discussion). Although a number of widely used self-report measures exist in the literature, none of them were uniformly appropriate for use with different age groups and males and females as well as youth from four different countries. The NDS was also developed to measure less serious forms of norm-violating conduct that are common in most cultures and countries. This conceptualization of deviance, one independent of penal code and legal definitions, is consistent with results from nationally representative data sets (e.g., the National Youth Survey) (Huizinga, Menard, and Elliott 1989), which report that more than 90 percent of sampled males and females indicate having committed at least one delinquent act at some time in their lives. It is also con-

sistent with specific recommendations made by Moffitt (1988) to improve cross-national comparative efforts (see also Junger-Tas 1988). Specifically, she suggested including instrument items that tap a more normal distribution of responses, especially in low-delinquency cultures, such as Switzerland.

Few such self-report scales that include multi-item subscales with psychometric properties have been developed for use in different national contexts. In fact, this may be one of the first attempts to employ a comprehensive scalar measure of deviance on large, representative samples from different countries (see Moffitt and Silva 1988 for a brief discussion on individual self-report studies measuring delinquency in different countries). Single-item, incidence-based crime measures that have well-defined reporting periods (e.g., during the past month) are more common in criminological work—that is, one item measuring vandalism, for example. However, because the current study was primarily concerned with delinquency etiology and not an epidemiological assessment of deviance, an open-ended reporting period (lifetime prevalence) was adopted. One advantage of this approach is that it captures a greater number of reports of deviance and eliminates the potential problems common in bounding incidence-based self-reports. Furthermore, the rates of recent participation in deviant behaviors in the general adolescent population may be too low in many individually measured behaviors. And finally and in part because of the latter issue, the NDS measures deviance and deviance subscales as traitlike constructs that are assessed by multiple, overlapping items. Although this approach does not establish prevalence or incidence estimates of deviance, it may yield more reliable and robust overall assessments of deviant behavior for etiological work in particular.

The current investigation examined seven subscales of the NDS (vandalism, alcohol, drugs, school misconduct, general deviance, theft, and assault), as well as a total deviance measure (the mean of all 55 items); (see Appendix B). Responses for all items in the NDS were given on a 5-point Likert-type scale and identified lifetime frequency of specific behaviors (1 = *never*, 2 = *one time*, 3 = *two to three times*, 4 = *four to six times*, and 5 = *more than six times*). Reliability coefficients on the deviance subscales for the entire sample ranged from $\alpha = .76$ to $\alpha = .89$. Subscales and the total deviance measure were reliable by sex, age groups, and countries (see Appendix B). Table 1 presents descriptive statistics on the deviance measures by country; this includes means, standard deviations, and measures of skewness.[7]

PLAN OF ANALYSIS

In a first step, we employed EFAs to examine the low self-control measure. Specifically, these analyses were run for the total sample, as well as for

TABLE 1: Descriptive Statistics of the Normative Deviance Scale (NDS) by Country

	Americans (n = *1,302)*			*Dutch* (n = *889)*			*Hungarians* (n = *717)*			*Swiss* (n = *3,177)*		
Deviance Measure	M	SD	*Skew*	M	SD	*Skew*	M	SD	*Skew*	M	SD	*Skew*
Vandalism	1.52	.72	2.00	1.52	.69	2.01	1.63	.74	1.78	1.64	.72	1.62
Alcohol	2.70	1.27	.11	2.34	.82	.39	2.26	.95	.58	2.15	.92	.61
Drug use	1.94	1.07	.99	1.63	.87	1.57	1.49	.69	1.92	2.09	1.09	.78
School misconduct	2.05	.91	1.02	2.23	.77	.74	2.06	.77	.73	2.15	.76	.83
General deviance	1.85	.74	1.23	2.01	.69	.97	1.79	.72	1.45	2.04	.76	.91
Theft	1.38	.64	2.57	1.38	.55	2.21	1.34	.58	2.93	1.54	.73	1.97
Assault	1.46	.66	2.16	1.56	.63	1.63	1.60	.68	1.64	1.61	.70	1.53
Total deviance	1.85	.70	1.18	1.82	.58	1.31	1.74	.61	1.53	1.91	.66	1.03

NOTE: Standard error of skewness ranged from *SE* = .043 for the Swiss to *SE* = .091 for the Hungarians.

males and females, for each of the five age groups (15-, 16-, 17-, 18-, and 19-year-olds)[8] and for each of the four countries. Next, CFAs were conducted on the low self-control scale as a more rigorous test of the underlying factor structure of the measure. Again, these CFAs were run for the total sample as well as all subgroups. Third, hierarchical regression analyses were employed using the low self-control scales as predictors of different types of deviant behavior. These regressions were completed for the total sample and by country. In a final analysis, we compared *developmental processes* (see explanation below) by country in an attempt to establish whether the patterns of association between low self-control and deviance differed as a function of nationality. In the following section, we examine the statistical procedure suggested by Rowe, Vazsonyi, and Flannery (1994, 1995) to compare developmental processes between different groups and briefly discuss the evaluation of model fit in CFAs.

Evaluating Developmental Process and CFAs

Rowe et al. (1994) employed a unique analytical method using LISREL to evaluate similarities and differences in developmental process across different ethnic and racial groups in the United States.[9] They defined developmental process as the strength of statistical associations (covariances) between variables of influence (antecedents or correlates) and developmental outcomes. They suggested comparing entire covariance matrices from each group that include the antecedents (in this case, low self-control variables) and outcomes (in this case, measures of deviance). This approach is superior to a large number of pairwise comparisons for each association. For example, to compare whether a single relationship between drug use and risk seeking differs by country (four groups), six pairwise comparisons would have to be computed. This means that for four 13×13 matrices (seven deviance scales and six low self-control scales), each containing 78 covariances, 468 pairwise comparisons would have to be computed. Not only is such a "piecemeal" approach to pairwise difference testing extremely tedious (not to mention impossible to comprehend), but it is also likely to increase the risk of Type I error (inferring relationships where there are really none). In short, such an approach would be statistically unsound. The current investigation of developmental processes employed both unstandardized measures of association (covariances) and standardized measures (correlations) for model fitting.

Model fit for developmental process analyses (see Rowe et al. 1994 for a more comprehensive discussion on comparing developmental processes) and CFAs was evaluated employing the standard chi-square fit statistic as well as fit indices such as the Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), and the root mean square residual (RMR) or root mean square

error of approximation (RMSEA) (Browne and Cudeck 1993; Loehlin 1992) because the chi-square statistic is overly sensitive to sample size and almost always significant in large samples. Furthermore, because of the violation of multivariate normality in these data, Satorra-Bentler-corrected statistics, both CFI and chi-square, were used for evaluating model fit in CFAs (Bentler and Dudgeon 1996; Byrne 1994). For the CFI and GFI, a fit between .90 and 1.0 is considered acceptable (Bentler 1992). Browne and Cudeck (1993) suggest that an RMSEA value of less than .05 demonstrates excellent fit, and a value between .05 and .08 suggests reasonable fit. In general, they also suggest that a value between .08 and .1 demonstrates adequate fit, and a model with a value greater than .1 exhibits poor fit.

RESULTS

Exploratory Factor Analyses

In a first step, EFAs were run for all groups (by sex, age, and country) and for the total sample using SPSS for Windows. Results of EFAs for the total sample and by sex are found in Table 2. Principal components analysis with varimax rotation was used. Comparative analyses using various combinations of both principal components analysis and principal axis factoring with nonorthogonal (oblimin) and orthogonal (varimax) rotations showed no differences in the results. An examination of these results revealed a six-factor solution based on eigenvalues greater than 1 consistent with Grasmick et al.'s (1993) original conceptualization. Results suggested that 2 of the 24 items did not load well on their respective scales. Item 2 ("If things I do upset people, it's their problem not mine") had a loading of .38, whereas the overall loading for item 20 ("I don't devote much thought and effort to preparing for the future") was only .20. Therefore, we decided to delete these two items from subsequent analyses and to use a six-factor, 22-item solution for what we called the "final model."

Confirmatory Factor Analyses

In a second step, a series of CFAs were completed for all groups (by sex, age, and country) and for the total sample using EQS for Windows (Bentler 1995; Bentler and Wu 1995). Table 3 includes the results of CFAs for the total sample and by sex, age, and country. Two initial confirmatory models, including all 24 original items, were tested to compare current findings with results from previous studies on this scale. First, a one-factor model was specified. This model did not include any cross-loadings or correlated error

TABLE 2: Exploratory Factor Analysis Loadings for Low Self-Control Scale for Total Sample and by Sex

	Total Sample (N = 6,085)	*Males (n = 3,398)*	*Females (n = 2,644)*
Risk seeking			
Test with risk (3)	.78	.75	.81
Risk for fun (4)	.81	.79	.83
Trouble exciting (6)	.73	.72	.75
Security not important (11)	.49	.51	.49
Temper			
Lose temper easily (21)	.71	.69	.72
Hurt when angry (22)	.68	.69	.72
Avoid people if angry (23)	.73	.71	.77
Hard to be calm (24)	.73	.72	.74
Simple tasks			
Avoid difficulty (5)	.69	.65	.71
Dislike hard tasks (7)	.77	.76	.77
Quit if complicated (15)	.64	.65	.64
Ease brings pleasure (19)	.51	.52	.53
Physical activity			
Prefer physical (8)	.62	.59	.67
On the move (10)	.72	.71	.71
Go out (16)	.64	.64	.63
Need for activity (18)	.61	.60	.62
Self-centeredness			
If upset, their problem (2)	.38	.37	.43
Look out for self (12)	.60	.62	.61
Get things I want (14)	.59	.61	.54
Not sympathetic to others (17)	.72	.66	.78
Impulsiveness			
Spur of moment (1)	.56	.57	.48
Pleasure now (9)	.44	.47	.39
Concerned with short run (13)	.72	.67	.77
Not prepared for future (20)	.20	.12	.41

NOTE: Principal components exploratory factor analysis with varimax rotation was used. Items are ordered in numerical order within each scale rather than by factor loading value. Italicized items have been dropped from their respective subscales in subsequent analyses. Survey item numbers are in parentheses next to each item.

terms. Fit statistics for this model suggested that this model did not work well for the data (χ^2 = 9443.06, CFI = .65, GFI = .82, RMSEA = .09 for the total sample). CFIs for the various group analyses ranged from .58 to .69, GFIs ranged from .70 to .85, and RMSEAs ranged from .08 to .12. Overall, fit statistics indicated that the data did not fit the one-factor solution for the total sample or by sex, age, and country.

TABLE 3: Confirmatory Factor Analysis Fit Indices for Three Models by Sex, Age, and Country

		One-Factor Model				*Six-Factor Initial Model*				*Six-Factor Final Model (two items dropped, two correlated errors)*[a]			
	Number	χ^2	*CFI*	*GFI*	*RMSEA*	χ^2	*CFI*	*GFI*	*RMSEA*	χ^2	*CFI*	*GFI*	*RMSEA*
Total sample	6,085	9443.06	.65	.82	.09	2585.91	.91	.95	.05	1816.05	.93	.96	.04
Males	3,398	4493.54	.68	.84	.08	1378.66	.92	.95	.05	975.87	.94	.97	.04
Females	2,644	5269.26	.60	.78	.10	1469.25	.90	.94	.05	925.94	.94	.96	.05
15-year-olds	926	1547.17	.69	.82	.09	585.65	.92	.93	.05	433.09	.94	.95	.05
16-year-olds	1,345	2120.53	.69	.82	.09	744.20	.92	.94	.05	535.92	.94	.95	.05
17-year-olds	1,374	2223.77	.63	.81	.09	813.69	.89	.94	.05	609.70	.92	.95	.05
18-year-olds	1,349	2415.31	.59	.79	.09	820.20	.89	.94	.05	579.94	.92	.95	.05
19-year-olds	1,091	2320.57	.58	.76	.10	708.45	.90	.93	.05	504.56	.93	.95	.05
Americans	1,302	3783.00	.60	.70	.12	991.41	.91	.92	.06	648.32	.94	.94	.05
Dutch	889	1514.05	.65	.81	.09	568.68	.91	.93	.05	442.22	.92	.94	.05
Hungarians	717	1313.94	.62	.79	.09	543.03	.89	.92	.05	354.20	.94	.94	.05
Swiss	3,177	4079.18	.60	.85	.08	1605.67	.86	.94	.05	1010.76	.90	.96	.05

NOTE: All chi-square and CFI statistics are Satorra-Bentler corrected. CFI = Comparative Fit Index; GFI = Goodness-of-Fit Index; RMSEA = root mean square error of approximation.

a. Dropped items: 2, 20; correlated errors: (3, 4) (5, 7).

Second, a six-factor model was tested; it included all 24 items in six subscales as hypothesized by Grasmick et al. (1993). Again, this model did not include any cross-loadings or correlated error terms. The fit statistics for this model were much improved in comparison to the one-factor model (χ^2 = 2585.91, CFI = .91, GFI = .95, RMSEA = .05 for the total sample) and suggested an acceptable fit. CFIs for the various groups ranged from .86 to .92, GFIs ranged from .92 to .95, and RMSEAs were all .05, with only one exception (RMSEA = .06 for American adolescents). Overall, these statistics indicated that the six-factor, 24-item scale exhibited an acceptable fit as hypothesized, not only for the total sample but also for most subgroups. The only groups for which the CFI was below the .9 cutoff were the Swiss adolescents (CFI = .86) and the Hungarians as well as 17- and 18-year-olds (CFI = .89 for all). Figure 1 includes the standardized solution of this initial model test for the total sample. Factor intercorrelations (not shown) were moderate (mean r = .53), suggesting multidimensionality of self-control.

In a final series of CFAs, we tested a six-factor, 22-item final model. Two items were deleted based on initial EFAs. Based on Lagrange multiplier test statistics (Chou and Bentler 1990), two correlated error terms were specified (between items 3 and 4 and items 5 and 7). This decision was considered tenable both theoretically (within-factor error correlation) and statistically (Byrne 1994; Peter Bentler, personal communication, November 10, 1998). The fit statistics for this modified final model were very good and substantially improved from the previous six-factor, 24-item model (χ^2 = 1816.05, CFI = .93, GFI = .96, RMSEA = .04 for the total sample). CFIs for the various group analyses ranged from .90 to .94, GFIs ranged from .94 to .97, and all RMSEAs were .05 or less. These fit indices suggested that the final model with two within-factor correlated errors fit for the total sample as well as for all subgroups (sex, age, and country). Figure 2 displays the standardized solution of the final model for the total sample (again, factor intercorrelations are not shown for clarity).

To further assess how much the final 22-item model was an improvement over the original six-factor, 24-item model, chi-square change tests were computed. Results of these tests are presented in Table 4. For all 11 groups as well as for the total sample, the chi-square change was statistically significant ($\Delta\chi^2$ = 769.86, df = 46, $p < .05$, two-sided test for total sample). Table 4 also reports the observed CFI change between the models for each group. Though there is no statistical test of significance associated with the CFI change, any improvement is a desirable acknowledgment of the correction of some previous misspecification in the model (Peter Bentler, personal communication, February 10, 1999). Results indicated that the CFI consistently improved for every group examined; specifically, CFI values increased between .01 and .05.

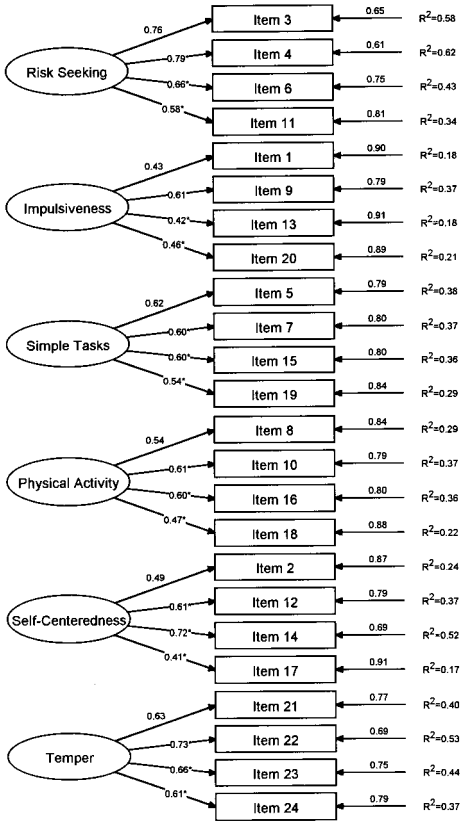

Figure 1: Initial Model Confirmatory Factor Analysis on Total Sample (standardized solution)

NOTE: All six factors were allowed to intercorrelate; all parameter estimates are significant at $p < .05$ for all groups tested; * = parameters that were free to be estimated. R^2 = the percentage of variance that is left unexplained.

Regression Analyses

In the next step, hierarchical regression analyses were used to determine the predictive utility of low self-control for different types of deviance.[10] In the hierarchical regressions, we decided to enter the predictors (low self-control scales) into the regression equation in an order that would maximize their prediction ability.[11] In other words, the scale that explained the least amount of variance in deviance was entered first into the equation, followed by the second smallest and so forth, until finally the self-control scale with the most predictive power was entered last. This process simply allowed an assessment of whether each scale predicted a statistically significant amount of

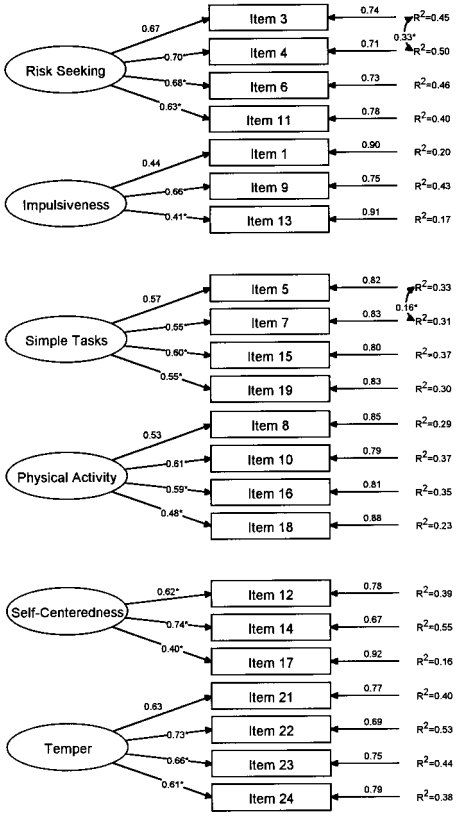

Figure 2: Final Model Confirmatory Analysis on Total Sample (standardized solution)

NOTE: All six factors were allowed to intercorrelate; all parameter estimates are significant at $p < .05$ for all groups tested; * = parameters that were free to be estimated. R^2 = the percentage of variance that is left unexplained.

variance in deviance above and beyond what previous self-control scales predicted. Admittedly, this approach may be somewhat misleading as weaker self-control subscales may simply be nonsignificant when entered simultaneously with all others in an omnibus regression analysis; in fact, this is something that we would expect based on a high level of multicollinearity between individual self-control subscales. Nevertheless, to determine the order of entry, partial correlations between low self-control and deviance were computed controlling for sex, age, and country. Table 5 presents these third-order partial correlations. After computing these partial correlations, the average correlation of each low self-control scale with each deviance

TABLE 4: Chi-Square and Comparative Fit Index (CFI) Change Statistics for Six-Factor Initial[a] and Six-Factor Final[b] Models by Sex, Age, and Country

Group/Model	df	χ^2	Δdf	$\Delta\chi^2$	*CFI*	Δ*CFI*
Total sample						
Six-factor initial	237	2585.91			.91	
Six-factor final	191	1816.05	46	769.86	.93	.02
Males						
Six-factor initial	237	1378.66			.92	
Six-factor final	191	975.87	46	402.79	.94	.02
Females						
Six-factor initial	237	1469.25			.90	
Six-factor final	191	925.94	46	543.31	.94	.04
15-year-olds						
Six-factor initial	237	585.65			.92	
Six-factor final	191	433.09	46	152.56	.94	.02
16-year-olds						
Six-factor initial	237	744.20			.92	
Six-factor final	191	535.92	46	208.28	.94	.02
17-year-olds						
Six-factor initial	237	813.69			.89	
Six-factor final	191	609.70	46	203.99	.92	.03
18-year-olds						
Six-factor initial	237	820.20			.89	
Six-factor final	191	579.94	46	240.26	.92	.03
19-year-olds						
Six-factor initial	237	708.45			.90	
Six-factor final	191	504.56	46	203.89	.93	.03
Americans						
Six-factor initial	237	991.41			.91	
Six-factor final	191	648.32	46	343.09	.94	.03
Dutch						
Six-factor initial	237	568.68			.91	
Six-factor final	191	442.22	46	126.46	.92	.01
Hungarians						
Six-factor initial	237	543.03			.89	
Six-factor final	191	354.20	46	188.83	.94	.05
Swiss						
Six-factor initial	237	1605.67			.86	
Six-factor final	191	1010.76	46	594.91	.90	.04

NOTE: All chi-square difference tests were statistically significant based on critical value $\chi^2 = 71.42$ ($df = 50$, $p = .05$, two-sided test).
a. Twenty-four items.
b. Twenty-two items with two correlated errors.

scale was calculated and then rank-ordered from smallest to largest. This is the order that was subsequently used for hierarchical entry into the regression equations.

TABLE 5: Third-Order Partial Correlations of Low Self-Control Scales with Normative Deviance Subscales Controlling for Sex, Age, and Country

	Impulsiveness	*Simple Tasks*	*Risk Seeking*	*Physical Activity*	*Self-Centeredness*	*Temper*
Vandalism	.224	.177	.339	.136	.246	.257
Alcohol	.248	.198	.399	.252	.186	.188
Drug use	.244	.135	.316	.108	.142	.138
School misconduct	.277	.167	.337	.148	.161	.208
General deviance	.259	.161	.358	.170	.191	.202
Theft	.182	.147	.249	.096	.182	.170
Assault	.150	.114	.239	.107	.193	.292
Average[a]	.226	.157	.320	.145	.186	.208
Rank[b]	5	2	6	1	3	4

a. Values in this row represent the average of all correlations in that column.
b. Rank ordering of average correlations, from least to greatest.

Using these results, a series of hierarchical regressions using each deviance scale as the dependent variable was run for each country and for the total sample. The following order of entry was used: (1) sex, (2) age, (3) country, (4) physical activity, (5) simple tasks, (6) self-centeredness, (7) temper, (8) impulsiveness, and (9) risk seeking. As previously mentioned, the first three (sex, age, and country) were entered as control variables.[12] For this purpose, country was dummy coded in the analyses on the total sample. Initial results based on simultaneous regression analyses evaluating the importance of the control variables indicated that sex accounted for about 9 percent of the variance in total deviance and age for about 8 percent; country only accounted for an additional 0.6 percent total variance explained. In analyses by country, sex accounted for from 6.4 percent for American youth to 9.8 percent for Hungarian youth (average: 8.3 percent) in total deviance; age accounted for an additional 0.3 percent for Swiss youth and 1.9 percent for Hungarian youth (average: 1.3 percent). In analyses by sex (controlling for age and country) employing the total sample, we found that self-control accounted for 21 percent of the variance in male total deviance and 25 percent in female total deviance. Furthermore, although we expected similar findings as Piquero and Rosay (1998), we also completed analyses by age group. After controlling for sex and country, these regression analyses on the total sample indicated that self-control accounted for the following amounts of variance in total deviance by age group: 24 percent for 15-year-olds, 21 percent for 16-year-olds, 18 percent for 17-year-olds, 18 percent for 18-year-olds, and 22 percent for 19-year-olds. In conclusion, in both analyses by sex and by age group, findings were very similar and consistent with subsequent results in that self-

control appeared to explain a similar amount of variance in total deviance—namely, about 20 to 25 percent.

Table 6 includes the results of the hierarchical regression analyses by country; the effects of the control variables have been partialled out in all analyses. With very few exceptions, all self-control scales significantly predicted the different types of deviance and produced statistically significant R^2 changes. That is, each low self-control scale accounted for a significant amount of variance above and beyond what had already been explained by previous self-control scales. To be consistent with and to be able to compare these results with previous work, the R^2 change statistics were summed to determine the total amount of variance explained by all six low self-control scales for each of the deviance scales. For the total sample, these totals ranged from 10 to 16 percent of total variance explained in deviance subscales by self-control. Results also suggested that the low self-control scale had very similar predictive utility cross-nationally; R^2 change values and the total amount of variance explained remained relatively consistent by country. On average, across all groups (in order of increasing amount of variance explained), low self-control explained a total of 10 percent of the variance for theft, 12 percent for assault, 13 percent for alcohol, 13 percent for drug use, 14 percent for school misbehavior, 15 percent for vandalism, and 16 percent for general deviance. Similarly, self-control accounted for 20 percent of the total variance explained in total deviance for the total sample. This amount varied from 17 percent for Swiss youth, 19 percent for Hungarian youth, 22 percent for Dutch youth, and 28 percent for American youth. In a final step, due to substantial evidence of similarity in the prediction of deviance by self-control measures in each country, we decided to compare developmental processes by country as previously outlined.

Model-Free LISREL Analyses

We employed LISREL to complete a simultaneous "model-free" comparison of four 13 × 13 covariance matrices by country (for more detail, see Rowe et al. 1994, 1995). In such model-free analyses, sample size equality is important. When the matrix of a large sample is compared with that of a small sample, the large sample matrix tends to dominate the solution, thus causing the smaller sample matrix to fit poorly. To address this issue, we decided to employ random subsamples of $n = 700$ from each country for this analysis. Each covariance matrix employed had age and sex partialled out and included six self-control scales and seven deviance measures. Findings indicated that developmental processes were similar across country (overall model fit: CFI = .93, GFI = .96, $\chi^2 = 1320.10$, $df = 273$, RMR = .05; Hungarian GFI = .94, Dutch GFI = .96, Swiss GFI = .92, American GFI = .93). Some

TABLE 6: Amount of Variance Explained by Self-Control Subscales in Deviance Measures

Nationality	*Self-Control Scale*	*Vandalism*	*Alcohol*	*Drug Use*	*School*	*General*	*Theft*	*Assault*	*Total Deviance*
Total (n = 6,085)	Physical activity	.018	.037	.016	.022	.031	.013	.013	.033
	Simple tasks	.020	.011	.013	.017	.014	.017	.008	.022
	Self-centeredness	.034	.008	.013	.011	.023	.023	.025	.028
	Temper	.020	.004	.005	.016	.012	.008	.048	.018
	Impulsiveness	.006	.014	.024	.029	.017	.005	.001*	.021
	Risk seeking	.048	.052	.058	.049	.061	.032	.020	.074
	Total	.146	.126	.129	.144	.158	.098	.115	.196
Americans (n = 1,302)	Physical activity	.012	.038	.019	.031	.027	.008	.013	.032
	Simple tasks	.064	.022	.049	.078	.060	.066	.043	.076
	Self-centeredness	.026	.013	.017	.013	.017	.018	.035	.027
	Temper	.027	.005**	.005**	.021	.012	.018	.064	.022
	Impulsiveness	.019	.031	.046	.036	.036	.013	.003*	.042
	Risk seeking	.047	.067	.078	.057	.069	.027	.010	.082
	Total	.195	.176	.214	.236	.221	.150	.168	.281
Dutch (n = 889)	Physical activity	.022	.026	.009**	.016	.043	.015	.029	.033
	Simple tasks	.008**	.015	.009**	.015	.012	.010**	.005*	.017
	Self-centeredness	.070	.018	.037	.021	.052	.040	.045	.059
	Temper	.018	.014	.020	.019	.022	.015	.064	.034
	Impulsiveness	.004*	.011	.015	.020	.014	.010**	.001[a]	.017
	Risk seeking	.038	.048	.048	.051	.048	.032	.012	.064
	Total	.160	.132	.138	.142	.191	.122	.156	.224
Hungarians (n = 717)	Physical activity	.015	.033	.008*	.033	.020	.005[a]	.005[a]	.022
	Simple tasks	.019	.003[a]	.001[a]	.002[a]	.005*	.006*	.002[a]	.006
	Self-centeredness	.024	.003[a]	.004[a]	.013**	.014	.013**	.011**	.016

(continued)

TABLE 6 Continued

Nationality	*Self-Control Scale*	*Vandalism*	*Alcohol*	*Drug Use*	*School*	*General*	*Theft*	*Assault*	*Total Deviance*
	Temper	.020	.007*	.006*	.019	.019	.004[a]	.046	.022
	Impulsiveness	.010**	.016	.014	.037	.012**	.007*	.002[a]	.018
	Risk seeking	.066	.072	.092	.078	.071	.028	.054	.101
	Total	.154	.134	.125	.182	.141	.063	.120	.185
Swiss (n = 3,177)	Physical activity	.024	.037	.020	.019	.035	.021	.013	.038
	Simple tasks	.011	.007	.007	.004	.005	.010	.003	.010
	Self-centeredness	.030	.008	.010	.006	.020	.022	.018	.022
	Temper	.017	.002**	.003	.008	.009	.004	.038	.012
	Impulsiveness	.003	.014	.025	.018	.014	.003	.000[a]	.016
	Risk seeking	.046	.044	.055	.034	.060	.038	.021	.067
	Total	.131	.112	.120	.089	.143	.098	.093	.165

NOTE: The values in this table represent R^2 change regression statistics. In analyses on the total sample, we controlled for sex, age, and country; in analyses by country, we controlled for sex and age. Listwise deletion was employed because of cases with missing deviance scale data; therefore, actual sample sizes fluctuated for each regression analysis. However, no more than 1 percent of any of the samples was ever deleted in these analyses; all values in the table are significant at $p < .001$ unless otherwise noted. These tests of significance represent the significance of the F change associated with the R^2 change.

a. Not significant.

*$p < .05$. **$p < .01$.

researchers have suggested that when comparisons are made on different samples, it is also acceptable to use standardized measures of association (correlations) rather than covariances (Loehlin 1992). Loehlin (1992) has also suggested that this is especially applicable if there are strong conceptual or a priori considerations that call for standardized measures. In the current analysis, completing comparisons with standardized measures was important, as we knew that variances on measures of deviance were different by country. Therefore, the same analysis was completed employing correlations. As expected, results suggested even greater similarity in developmental processes by country (overall model fit: CFI = .98, GFI = .97, χ^2 = 594.87, *df* = 273, RMR = .037; Hungarian GFI = .97, Dutch GFI = .97, Swiss GFI = .98, American GFI = .96), suggesting that much of the observed previous difference was due to differences in the elements of the diagonal (variances).

DISCUSSION

The current investigation has generated a number of important findings for the Grasmick et al. (1993) self-control measure, the measurement of self-control and adolescent deviance, the prediction of deviance with self-control, and the general theory of crime as well as comparative criminology. First, findings suggest that the self-control measure appears to work as hypothesized (though slight modifications improved fit). As predicted by Gottfredson and Hirschi (1990) and based on rigorous confirmatory tests, the scale is multidimensional. In other words, the latent trait of self-control is multifaceted and includes a number of conceptually distinct yet overlapping constructs and elements. Statistically, it also consists of a set of intercorrelated subscales that form a higher order construct. These findings were replicated for large samples of males and females, five different adolescent age groups spanning middle to late adolescence, and adolescents from four different countries known to have varying levels of deviant conduct and crime.

Second, the study provides evidence of a successful measure of deviance cross-nationally. The Normative Deviance Scale (NDS) worked reliably for males and females, all adolescent age groups, and adolescents residing in all four countries. This measure was not developed to assess frequency of norm-violating conduct, nor was it developed to identify the most chronic and violent offenders and associated most serious offenses. Rather, the measure was developed to measure less serious forms of deviance found in the general population as there is evidence that deviance may be normative (see, e.g., Gabor 1994; Huizinga et al. 1989). The importance of the current measure is that it was applied in four distinctly different countries where previous local efforts generally cannot be compared across national and cultural boundaries

(for a discussion, see Archer and Gartner 1984). Frequently, studies ask about deviant behaviors that are deviant in a specific national context but that are basically nonexistent in others. For example, Americans cannot relate to theft of mopeds (something the Swiss and Dutch know very well), and adolescents in all three European countries cannot understand "trying to cash a phony check." In other words, aside from FBI and Interpol categories of index crimes reported in official data sources, there is very little work that has attempted to develop a comprehensive, multi-item, multifactor deviance scale that can reliably assess norm-violating conduct cross-nationally (see Junger-Tas 1988; Moffitt 1988). One such measure was developed for a multination self-report study on juvenile delinquency (Junger-Tas, Terlouw, and Klein 1994); however, it largely consisted of single-item indicators of behaviors (see Vazsonyi 1996).

Third, the final self-control measure based on Grasmick et al.'s (1993) original work accounted for between 17 and 28 percent of total deviance (average for total sample: 20 percent) in four countries after controlling for age and sex. This is consistent with previous work, although total amount of variance explained is larger. We also found that different elements of self-control accounted for slightly different amounts of variance in different types of deviant behavior. For example, the risk-seeking subscale was the best predictor of all deviance subscales with the exception of assault. Assault was best predicted by the temper and self-centeredness subscales. In general, the total scale accounted for more variability in less serious forms of norm-violating conduct.

Based on model-free comparisons of the relationships between all self-control subscales and all deviance subscales, we can also conclude that what Rowe et al. (1994) called developmental process is highly similar by country. In other words, the patterns of association and rank ordering of associations between self-control and deviance measures are highly similar across all four countries. This suggests that different aspects of self-control operate in a similar fashion in all national contexts; there do not appear to be unique or culture-specific relationships and patterns of association. This may also suggest that observed mean-level differences of deviant behaviors in different national contexts cannot be accounted for by unique models, unique measures, and unique explanations. Therefore, the self-control and deviance relationship appears to be tenable for all adolescents from the four countries in this study.

These findings of similarity in developmental process are very consistent with what Gottfredson and Hirschi (1990) predicted in the general theory of crime—namely, constancy of what predicts deviance across cultures but also a definition of crime and its predictor(s) that transcends social groupings. Self-control predicts deviance in males and females and in members of different cultural or national groups. These findings have important implications for

future efforts in comparative criminology in that they provide the foundation for a study of crime, deviance, and its predictors that is not culture specific but rather transcends cultural and national boundaries and/or groupings. They also provide further support for the parsimony and power of some of the predictions made by the general theory of crime. These tested elements of the theory and the observed relationships appear to transcend and hold for all tested sociological and psychological subgroups in the current populations.

APPENDIX A
Grasmick et al.'s Low Self-Control Scale

Impulsiveness (α = .50; α range = .45 to .62)

1. I often act on the spur of the moment without stopping to think.
9. I often do whatever brings me pleasure here and now, even at the cost of some distant goal.
13. I'm more concerned with what happens to me in the short run than in the long run.
20. I don't devote much thought and effort to preparing for the future.

Simple tasks (α = .68; α range = .61 to .73)

5. I frequently try to avoid projects that I know will be difficult.
7. I dislike really hard tasks that stretch my ability to the limit.
15. When things get complicated, I tend to quit or withdraw.
19. The things in life that are easiest to do bring me the most pleasure.

Risk seeking (α = .79; α range = .69 to .84)

3. I like to test myself every now and then by doing something a little risky.
4. Sometimes I will take a risk just for the fun of it.
6. I sometimes find it exciting to do things for which I might get into trouble.
11. Excitement and adventure are more important to me than security.

Physical activity (α = .63; α range = .55 to .74)

8. If I had a choice, I would almost always rather do something physical than something mental.
10. I almost always feel better when I am on the move than when I am sitting and thinking.
16. I like to get out and do things more than I like to read or contemplate ideas.
18. I seem to have more energy and a greater need for activity than most other people my age.

Self-centeredness (α = .60; α range = .45 to .68)

2. If things I do upset people, it's their problem, not mine.
12. I try to look out for myself first, even if it means making things difficult for other people.
14. I will try to get things I want even when I know it's causing problems for other people.
17. I'm not very sympathetic to other people when they are having problems.

(continued)

APPENDIX A Continued

Temper (α = .76; α range = .68 to .76)

21. I lose my temper pretty easily.
22. Often, when I am angry at people, I feel more like hurting them than talking to them about why I am angry.
23. When I'm really angry, other people should stay away from me.
24. When I have a serious disagreement with someone, it's usually hard for me to talk calmly about it without getting upset.

NOTE: Items 2 and 20 are included here because they were part of the original low self-control scale; however, they are italicized to indicate that they were not included in their respective scales for analyses in this study. Alpha ranges include reliability analyses by sex, age, and nationality.

APPENDIX B
Normative Deviance Scale (NDS)

Vandalism (α = .84; α range = .77 to .87)

Have you ever. . . ?

Smashed bottles on the street, school grounds, or other areas?
Intentionally damaged or destroyed property belonging to your parents or other family members (brothers or sisters)?
Intentionally damaged or destroyed property belonging to a school, college, or university?
Intentionally damaged or destroyed other property (signs, windows, mailboxes, parking meter, etc.) that did not belong to you?
Intentionally damaged or destroyed property belonging to your employer or at your workplace?
Slashed or in any way damaged seats on a bus, in a movie theater, or something at another public place?
Written graffiti on a bus, on school walls, on restroom walls, or on anything else in a public place?
Committed acts of vandalism when coming or going to a football game or other sports event?

Alcohol (α = .84; α range = .76 to .90)

Have you ever. . . ?

Consumed hard liquor (e.g., tequila, whiskey, vodka, or gin) before you were 21?[a]
Consumed alcoholic beverages (e.g., beer, wine, or wine coolers) before you were 21?[a]
Got drunk (intentionally) just for the fun of it (at any age)?
Got drunk just to fit in and be part of the crowd (at any age)?
Lied about your age to buy alcohol before you turned 21?[a]
Had an older brother/sister or friend buy alcohol for you?
Bought alcohol for a brother/sister or friend?

(continued)

APPENDIX B Continued

Drug use (α = .89; α range = .83 to .90)
Have you ever. . . ?
- Used tobacco products regularly (e.g., cigarettes, chew, snuff, etc.)?
- Used "soft" drugs such as marijuana (grass, pot)?
- Used "hard" drugs such as crack, cocaine, or heroin?
- Gone to school when you were drunk or high on drugs?
- Gone to work when you were drunk or high on drugs?
- Gone to a concert when you were drunk or high on drugs?
- Gone to a club/dance/party when you were drunk or high on drugs?
- Gone to a club/dance/party to get drunk or high on drugs?
- Sold any drugs such as marijuana (grass, pot), cocaine, or heroin?

School misconduct (α = .76; α range = .73 to .82)
Have you ever. . . ?
- Cheated on school/college/university tests (e.g., cheat sheet, copy from neighbor, etc.)?
- Been sent out of a classroom because of "bad" behavior (e.g., inappropriate behaviors, cheating, etc.)?
- Been suspended or expelled from school/college/university?
- Stayed away from school/classes when your parent(s) thought you were there?
- Intentionally missed classes over a number of days for "no reason," just for fun (e.g., there was no family emergency)?
- Been in trouble at school so that your parents received a phone call about it?
- Skipped school/work (pretending you are ill)?

General deviance (α = .81; α range = .73 to .86)
Have you ever. . . ?
- Intentionally disobeyed a stop sign or a red traffic light while driving a vehicle?
- Been on someone else's property when you knew you were not supposed to be there?
- Failed to return extra change that you knew a cashier gave you by mistake?
- Tried to deceive a cashier to your advantage (e.g., flash a larger bill and give a smaller one)?
- Let the air out of the tires of a car or bike?
- Lied about your age to get into a nightclub/bar?
- Made nuisance/obscene telephone calls?
- Avoided paying for something (e.g., movies, bus or subway rides, food, etc.)?
- Used fake money or other things in a candy, coke, or stamp machine?
- Shaken/hit a parked car just to turn on the car's alarm?
- Stayed out all night without informing your parents about your whereabouts?

Theft (α = .83; α range = .72 to .84)
Have you ever. . . ?
- Stolen, taken, or tried to take something from a family member or relative (e.g., personal items, money, etc.)?
- Stolen, taken, or tried to take something worth $10 or less (e.g., newspaper, pack of gum, mail, money, etc.)?[b]

(continued)

APPENDIX B Continued

Stolen, taken, or tried to take something worth between $10 and $100 (e.g., shirt, watch, cologne, video game cartridge, shoes, money, etc.)?[b]
Stolen, taken, or tried to take something worth more than $100 (e.g., leather jacket, car stereo, bike, money, etc.)?[b]
Stolen, taken, or tried to take something that belonged to "the public" (e.g., street signs, construction signs, etc.)?
Stolen or tried to steal a motor vehicle (e.g., car or motorcycle)?
Bought, sold, or held stolen goods or tried to do any of these things?

Assault (α = .76; α range = .68 to .79)

Have you ever. . . ?

Hit or threatened to hit a person?
Hit or threatened to hit your parent(s)?
Hit or threatened to hit other students/peers or people?
Used force or threatened to beat someone up if they didn't give you money or something else you wanted?
Been involved in gang fights or other gang activities?
Beaten someone up so badly they required medical attention?

Total Deviance (α = .95; α range = .94 to .96)

a. The age of 16 was substituted in European versions of the survey because this is the legal drinking age.
b. Culture-appropriate monetary values and symbols were used in each respective country's version of the survey.

APPENDIX C
Skewness of the Dependent Variables:
No, Log, and Fractional Transformations

	No Transformation		*Log Transformation*		*Fractional Transformation*	
Deviance Measure	*Skew*	SE	*Skew*	SE	*Skew*	SE
Vandalism	1.76	.03	.94	.03	–.37	.03
Alcohol	.56	.03	–.11	.03	.67	.03
Drug use	1.04	.03	.48	.03	–.08	.03
School misconduct	.84	.03	.06	.03	.66	.03
General deviance	1.02	.03	.23	.03	.43	.03
Theft	2.23	.03	1.31	.03	–.72	.03
Assault	1.67	.03	.81	.03	–.28	.03
Total deviance	1.15	.03	.41	.03	.17	.03

NOTE: For these analyses, the total sample was used (n = 6,085).

APPENDIX D
Total Amount of Variance Explained in Deviance by Self-Control: Hierarchical, Omnibus, Log Transformation, and Fractional Transformation (1/x)

Nationality	*Model*	*Vandalism*	*Alcohol*	*Drug Use*	*School*	*General*	*Theft*	*Assault*	*Total Deviance*
Total (n = 6,085)	Hierarchical	.147	.126	.128	.144	.158	.098	.115	.196
	Omnibus	.147	.127	.128	.145	.159	.089	.115	.196
	Log	.161	.126	.134	.141	.163	.109	.116	.205
	1/x	.164	.116	.133	.126	.154	.111	.110	.202
Americans (n = 1,302)	Hierarchical	.195	.176	.214	.236	.221	.150	.168	.282
	Omnibus	.195	.176	.213	.234	.221	.150	.168	.282
	Log	.215	.170	.216	.232	.233	.168	.173	.296
	1/x	.222	.155	.207	.214	.229	.175	.167	.293
Dutch (n = 889)	Hierarchical	.160	.132	.138	.142	.191	.122	.156	.225
	Omnibus	.162	.137	.140	.143	.193	.124	.158	.224
	Log	.178	.127	.147	.139	.196	.131	.168	.236
	1/x	.182	.105	.147	.125	.183	.129	.167	.232
Hungarians (n = 717)	Hierarchical	.154	.134	.125	.182	.141	.063	.120	.185
	Omnibus	.156	.134	.124	.182	.142	.064	.124	.185
	Log	.177	.141	.143	.176	.152	.084	.130	.208
	1/x	.181	.139	.150	.153	.148	.095	.124	.211
Swiss (n = 3,177)	Hierarchical	.131	.112	.120	.089	.143	.098	.093	.166
	Omnibus	.131	.112	.120	.089	.144	.098	.094	.166
	Log	.142	.115	.122	.085	.144	.103	.089	.169
	1/x	.140	.110	.117	.073	.131	.100	.079	.161

NOTE: In all analyses, we controlled for sex and age; in addition, we also controlled for country in analyses on the total sample. Listwise deletion was employed because of cases with missing deviance scale data; therefore, actual sample sizes fluctuated slightly for each analysis.

NOTES

1. The current investigation is a test of Grasmick et al.'s (1993) low self-control scale; therefore, we do not provide tests of competing or rival theories that predict deviance.

2. In fact, in a recent empirical test of the self-control measure employing a second-order confirmatory factor analysis (CFA), Arneklev, Grasmick, and Bursik (1999) found good initial evidence of this conceptual argument. Based on a random community sample of adults and a sample of college students, a second-order model of low self-control was found to fit the data adequately (Goodness-of-Fit Index [GFI] = .91, Adjusted Goodness-of-Fit Index [AGFI] = .89, root mean square residual [RMR] = .06). An attempt to replicate their findings on the current data sets also provided good support for a higher order self-control trait that is composed of multiple elements (GFI = .94, AGFI = .93, RMR = .05).

3. Initially, the goal of the investigation was to include adolescents from the United States, a Western European country, and an Eastern European country. Subsequently, a second Western European country was added for comparison. Within the two main European regions, countries were included in the study based on existing or established relationships of the principal investigator with cities, schools, and school officials.

4. Cities and schools were purposively sampled in each country. Most students in schools in a given city were surveyed. For example, in Switzerland, most youth either attended the Gymnasium, the teachers' college, or were completing an apprenticeship. Therefore, the total population in all three schools was invited for participation in the study. This approach allowed for the identification of representative samples.

5. To descriptively (for rationale, see Gottfredson and Hirschi 1990:79) assess social class, subjects were asked to indicate the type of work performed by the primary wage earner in the family. Six categories (collapsed from Hollingshead's [1975] original nine categories and modified to be applicable in each of the four countries) were specified that would readily map on professions found in each of the four study countries. Each category contained descriptions of sample jobs that would fit into each of them. Responses were given by indicating the number of the category that contained the closest or most accurate description of the family's primary wage earner's job. The categories, listed here with condensed descriptions, were as follows: 1 = owner of a large business, executive; 2 = owner of a small business, professional; 3 = semiprofessional, skilled laborer; 4 = clerical staff; 5 = semiskilled laborer; and 6 = laborer or service worker. For most countries, the second category was found to be the median type of employment for the primary wage earner (Americans, Dutch, Swiss). The descriptions for jobs in this category also included owners of small- or medium-sized businesses such as a restaurants or shops; professionals such as managers, administrators, or accountants; highly technical positions such as computer programmers; large or very large farm owners; and lower ranking military officers. For the Hungarian sample, the median employment category was lower—namely, the third category.

6. We found that reliabilities of some of the self-control subscales were rather low; nevertheless, these scales were still very predictive of all types of deviance. In other words, corrections for attenuation would result in an even stronger relationship between self-control and deviance and a greater amount of total variance explained (R^2; see Carmines and Zeller 1979:48-51).

7. Based on feedback from reviewers of a previous version of this article, we more closely examined skew of the dependent measures (see Table 1). Given that some variables were skewed $> \pm 1$ (George and Mallery 2000), we decided to employ a log transformation and a fractional transformation to reduce skew (Tabachnik and Fidell 1996); these are two commonly used transformations for positively skewed data. Appendix C includes a table that demonstrates the impact of these transformations; the fractional transformation in particular appeared to reduce positive skew to levels less than 1, although some of the deviance measures actually became slightly negatively skewed.

8. We decided to employ analyses by chronological age (15, 16 ,17, 18, and 19) because we know from both self-report efforts and official statistics that the frequency and rates of deviance and crime increase dramatically between the ages of 15 and 20 (Snyder and Sickmund 1999:58). However, despite this change, Gottfredson and Hirschi (1990) predict that self-control develops early in life and subsequently remains fairly stable; in contrast, Moffitt (1993), for example, suggests unique developmental trajectories and pathways in individuals—namely, adolescence-limited versus life course–persistent delinquency. From this latter proposition, we might expect that adolescence-limited youth who make up the majority of a large population sample such as the one we study would in some fashion change; in other words, the level of self-control and the structure of self-control might change over the five-year period examined in this study. Therefore, to test the factorial structure of self-control—one of the primary predictors of deviance according to the general theory of crime—we decided to test its structure by chronological age rather than other categories, such as middle (15-17) versus late (18+) adolescence.

9. For a methodological replication on different ethnic groups in the Netherlands, see Junger and Marshall (1997); for a previous cross-national comparison, see Vazsonyi (1995).

10. The table in Appendix D documents how the predictive relationships were largely unchanged despite the transformations that were employed to reduce positive skew in the data. In fact, the predictive models accounted for slightly more variance in deviance than the original data. Most changes were very small, about ½ percent, on average. Therefore, despite a certain degree of skewness in the data, employing the original, untransformed data yielded valid and robust results in regression analyses.

11. It is important to note here that we also examined a multiple-regression approach (or "omnibus" regression; see Appendix D) to test for model misspecification error; the data indicated that our findings were robust across the two different estimation techniques.

12. Additional analyses on the predictive strength of social status were completed, where social status was entered third, after sex and age. For analyses of the deviance subscales, the amount of variance explained ranged from 0.0 to 0.4 percent (mean = 0.15 percent, or slightly more than 1/10 of a percent); for the total deviance measure, social status added 0.1 percent to the explained variance. Therefore, we decided to exclude this variable as a control in the regression analyses presented in Table 6.

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