

The Stability of Self-Control: A Group-Based Approach

Youngoh Jo · Yan Zhang

Received: 27 December 2011 / Accepted: 1 January 2012 /
Published online: 3 February 2012
© Springer Science+Business Media B.V. 2012

Abstract In *A General Theory of Crime* (1990), Gottfredson and Hirschi argue that self-control, fully developed in the early stage of life (around age 8 to 10), is a primary explanatory factor of deviance. Research consistently supports the relationship between self-control and deviance, while only limited studies have examined whether self-control is stable after age 10. Using a longitudinal national sample of South Korean youths from age 10 to 14, this study provides a rigorous test of three assumptions of the self-control stability thesis: first, if the development of self-control follows a homogenous process among individuals; second, if within-individual level of self-control stay unchanged over time (absolute stability); and third, if the age and self-control relationships parallel across individuals (relative stability). Both attitudinal and behavioral measures of self-control were used to investigate whether different measures yielded different results in the stability thesis. The results indicated that among individuals multiple developmental paths of self-control existed instead of a homogeneous path. The findings also showed different measures yielded divergent results in the stability thesis. While the analysis of the attitudinal measure revealed strong absolute stability for 50% of the sample, and strong relative stability for 99.7%, the analysis of the behavioral measure showed strong absolute and relative stabilities for 88.6% of the sample.

Keywords The general theory of crime · Stability of self-control · Developmental trajectory · Korean youth

The Stability of Self-Control: A Group-based Approach

In *A General Theory of Crime*, Gottfredson and Hirschi (1990) argue that self-control is a primary factor explaining individual differences in the tendency to commit crime and

Y. Jo · Y. Zhang (✉)
College of Criminal Justice, Sam Houston State University, Huntville, USA
e-mail: zhangyan@shsu.edu

Y. Jo
e-mail: yoj001@shsu.edu

analogous behaviors. Individuals with ample self-control are more likely to restrain themselves from committing crimes, while people who lack self-control are more likely to engage in delinquent behaviors due to less internal constraint. Ineffective child-rearing, according to Gottfredson and Hirschi is the major contributor to low self-control, and self-control is relatively stable in the individual by the age of 8 to 10. Gottfredson and Hirschi (1990) claim that their theory is consistent across different times, cultures, and subgroups.

Empirical studies testing low self-control and deviant relationships have found general support for Gottfredson and Hirschi's theory. Low self-control has significantly impacted deviant behaviors, such as crime, delinquency, imprudent behavior, antisocial behavior, and school misconduct (Baron et al. 2007; Burton et al. 1998; Higgings and Tewksbury 2006; Longshore et al. 1998; Romero et al. 2003; Smith 2004; Tittle et al. 2003). This significant low self-control and deviance relationship has extended across gender (Burton et al. 1998; Higgings and Tewksbury 2006), race/ethnicity (LaGrange and Silverman 1999; Vazsonyi and Crosswhite 2004), and nationality/culture (Hwang and Akers 2003; Wang et al. 2002).

Other research of self-control theory has examined measurement of self-control (Hirschi and Gottfredson 1993; Hirschi 2004; Longshore et al. 1998; Marcus 2004; Piquero and Rosay 1998), source of self-control (Burt et al. 2006; Hope et al. 2003; Wright and Beaver 2005), and the effect of criminal opportunity on low self-control and deviant relationships (Baron et al. 2007; Hay and Forrest 2008). Under assessed is the theory's assertion of self-control stability. Gottfredson and Hirschi (1990) argue that self-control fully develops early in childhood as an outcome of parenting, and "people differ in the likelihood that they will commit crimes and that these differences appear early and remain stable over much of the life course" (p. 108).

Since its publication, this controversial argument has attracted extensive criticism. The main dispute is that crime involvement is significantly affected by recent life events and circumstances during adolescence and adulthood along with time-stable individual differences in criminal propensity (Nagin et al. 1995; Sampson and Laub 1993, 1995). To date, the little research that has examined the stability thesis has produced inconclusive results. While some studies found that differences in self-control remained stable (i.e. Arneklev et al. 1998; Hay, and Forrest 2006; Turner and Piquero 2002; Winfree et al. 2006; Yun and Walsh 2012), others indicated that relative differences in self-control changed over time (i.e. Burt et al. 2006; Mitchell and MacKenzie 2006).

Examination of literature testing the self-control stability hypothesis suggests two issues have been overlooked in previous studies. The first issue concerns the measurement of self-control (Hirschi and Gottfredson 1993; Hirschi 2004; Longshore et al. 1998; Marcus 2004; Piquero and Rosay 1998). Two types of measurements have been commonly used to test Gottfredson and Hirschi's self-control theory: attitudinal measurement (e.g., scale; Grasmick et al. 1993) and behavioral measurement (e.g., failure to wear a seat belt; Keane et al. 1993). Empirical research on self-control theory suggests different measures of self-control may affect the relationships between self-control and deviant behaviors (Arneklev et al. 2006; Pratt and Cullen 2000). For example, Arneklev et al. used Grasmick et al.'s (1993) self-control scale as an attitudinal measure and utilized six behavioral items, including drinking, smoking, and wearing a seat belt as behavioral measures of self-control. The results indicated that the attitudinal measure had greater effect than the behavioral measure on self-control. When these two measures were included in the analysis simultaneously, only attitudinal measures had a statistically significant impact on self-control. Pratt and Cullen's meta analysis of 21 studies, however, showed behavioral measures had a greater effect than attitudinal measures on self-control.

Studies testing self-control stability in general used attitudinal measurements (i.e. Arneklev et al. 1998; Beaver et al. 2008; Mitchell and MacKenzie 2006; Winfree et al. 2006; Yun and Walsh 2012) with only two exceptions (i.e. Hay and Forrest 2006; Turner and Piquero 2002). Hay and Forrest, however, used only behavioral measures in their study. Although Turner and Piquero included both measures in their study, they used behavioral measures for one time period and attitudinal measures for another time period. As a result, these studies were not able to examine whether different measurements of self-control yield different results in the stability thesis.

The methodology application is another issue of testing the proposition of self-control stability. Gottfredson and Hirschi's argument that "differences in crime tendency across individuals remain relatively stable over the life course" (1990, p. 144) implies that the age and self-control relationship parallels across individuals; therefore, the development of self-control follows a homogeneity process. With only one exception (i.e. Hay and Forrest 2006), previous studies of self-control stability did not really test this hypothesis. Reflected in the analytical methods is that most studies used correlation analysis (i.e. Arneklev et al. 1998; Burt et al. 2006; Mitchell and MacKenzie 2006; Turner and Piquero 2002; Winfree et al. 2006; Yun and Walsh 2012) to test the stability assertion. The correlation method in general has assumptions that the parameters are continuously scattered throughout the population with a normal distribution. All individuals are assumed from the same group of the population, and share a homogeneous trajectory of self-control.

Research examining trajectories of crime and antisocial behavior, however, has found heterogeneity in developmental processes exists within most populations (Hay and Forrest 2006; Nagin 1999; Nagin and Tremblay 2005; Sampson and Laub 2003). Lacourse et al. (2003), for example, identified three different trajectories of gang involvement for different subgroups. Using the longest longitudinal data from age 7 to 70, Sampson and Laub (2003) found six distinct offender groups with different developmental patterns of offending. Using a national sample of U.S. children from age 7 to 15, Hay and Forrest (2006) tested the development trajectories of self-control, and found that the development of self-control did not follow a homogenous process. Instead, eight different self-control trajectories were found among the sampled individuals. Evidence from previous studies suggests a possibility that the developmental processes of self-control may vary across individuals. Conventional methods using a single stability coefficient may obscure the disclosure of the heterogeneity of self-control trajectories (Hay and Forrest 2006).

To add empirical evidence to the self-control stability literature, the current study examines both behavioral and attitudinal measures of self-control using longitudinal data of South Korean adolescents from the Korean Youth Panel Survey (KYPS). Group-based trajectory modeling is utilized to examine whether heterogeneous groups of the developmental process of self-control exist across individuals. This group-based development approach is able to provide insight into three research questions: first, if the development of self-control follows a homogenous process among individuals; second, if the absolute levels of self-control, which is developed at the early childhood, stay unchanged over time; and third, whether the age and self-control relationships parallel across individuals. The comparison of two different self-control measures, combined with group-based trajectory modeling, allows for a more rigorous examination of Gottfredson and Hirschi's self-control hypothesis.

Furthermore, the current study also efforts to contribute to the literature by examining the self-control stability thesis in an Asian social context. Gottfredson and Hirschi (1990) posit that self-control theory is cross-cultural 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). While some studies have provided support for Gottfredson and Hirschi’s proposition of invariant relationship between self-control and deviant behavior across different nations/cultures (Rebblon et al. 2008; Vazsonyi and Belliston 2007; Vazsonyi et al. 2001), others suggest that the self-control-deviance relationship is affected by cultural factors (Hwang and Akers 2003; Wang et al. 2002). Using a sample of Koren adolescents, this study also examines whether the self-control stability thesis is invariant in a different cultural context.

The Stability of Self-Control

Gottfredson and Hirschi (1990) argue that individual differences in deviant behavior persist over time because individual differences in its underlying factor, low self-control, persist over time. According to Gottfredson and Hirshi, self-control is fully developed around age 8 to 10 as an outcome of parenting. They content that “the differences observed at ages 8 to 10 tend to persist from then on. Good children remain good. Not so good children remain a source of concern to their parents, teachers, and eventually to the criminal justice system,” (Hirschi and Gottfredson 2001, p. 90) and “differences in self-control between individuals are unaffected by subsequent experience” (Hirschi 2004, p. 540).

Although not specified in their original work, Gottfredson and Hirschi’s stability thesis contains two facets. First, the argument that self-control is stabilized at the age of 8 to 10 and is unaffected by subsequent life experience, suggests within-individual stability or absolute stability exists among individuals. Second, the assertion that differences in self-control remain stable from the time they are first identified, indicates between-individual stability or relative stability exist between individuals or groups. Tests of the within-individual stability hypothesis usually focus on the correlations of self-control levels over time (i.e. Beaver and Wright 2007; Burt et al. 2006; Hay and Forrest 2006; Mitchell and MacKenzie 2006; Turner and Piquero 2002; Yun and Walsh 2012). Analysis of between-individual stability, on the other hand, examines the differences of self-control levels over time between different groups, such as gender, race, or offender/non-offender (i.e. Turner and Piquero 2002; Winfree et al. 2006; Yun and Walsh 2012). Since socialization continues to occur throughout the life course, Gottfredson and Hirschi emphasize more on the between-individual/relative stability. They assume that “people differ in the likelihood that they will commit crimes and that these differences appear early and remain stable over much of the life course.”

Empirical Assessment of the Stability of Self-Control

Previous studies have assessed both within- and between-individual self-control stability and found mixed results. Using a convenience sample of college students, Arneklev et al. (1998) first tested self-control stability with two waves of (four months apart) panel data. The researchers found that measures of all subdimensions of self-control and the overall self-control construct presented relatively stability across the short time period. The coefficients of the six subdimensions and the overall self-control ranged from .646 to .820.

Noticing serious limitations in this study, Turner and Piquero (2002) extended Arneklev et al.’s (1998) work using a national probability sample, with a longer observational time period (7-wave panel study across 13 years). In addition, Turner and Piquero examined different measures of self-control, leading to different results by utilizing both attitudinal and

behavioral indicators. Finally, the stability hypothesis was assessed across distinct groups of individuals categorized by sex and race. Results of this study provided mixed support for Gottfredson and Hirschi's stability hypothesis. The authors found that change in levels of self-control for both behavioral and attitudinal measures occurred, even if modest significant within-group intercorrelations appeared across each of the waves of data, which lent support for within-group stability over time. Self-control differences between offenders and non-offenders were observed among six of the seven waves; however, change in self-control varied for these two groups. Non-offenders gained more self-control than offenders during childhood and into early adolescence; offenders on the other hand, gained more self-control in late adolescence and into early adulthood.

In a recent study, Hay and Forrest (2006) tested the stability thesis using behavioral measures over a nine-year period. In correlation analysis, the authors found moderate stability, ranging from a correlation coefficient of .43 to .67. Noticing that correlation analysis may obscure substantial variation in the population, the authors assumed that multiple groups rather than a single group might exist. The researchers further used a group-based modeling approach to examine the existence of different developmental paths of self-control and found eight unique groups. While four (around 59%) of the eight groups had very strong within-individual self-control stability, and two groups (around 35%) had moderate stability, the other two groups (around 6%) experienced significant changes in self-control over time.

In a study using a sample of kindergarten students with a three-semester follow-up, Beaver and Wright (2007) examined whether self-control was fully developed at the early stage of life and stabilized thereafter. The researchers found strong stability coefficients ranging from .84 to .96.

The self-control stability thesis was also tested among South Korean adolescents. Using five-year panel data, Yun and Walsh (2012) found evidence supporting between-individual stability. The results showed that nondelinquents' self-control was significantly higher than delinquents' self-control across five waves of data. Their correlation analysis of within-individual stability, however, showed that the stability of self-control was not consistent over time. The magnitudes of the coefficients decreased as the time gap between wave 1 and the comparison waves grew further apart.

Not all the findings, however, have supported the stability hypothesis. Burt et al. (2006) examined the applicability of self-control stability to a sample of African American using two waves of data (two years apart). The authors found that, while a moderately significant correlation (.48) of self-control existed, self-control levels changed significantly among individuals across the two waves. About 52% of individuals moved more than one standard deviation, and around 21% moved more than two standard deviations in self-control ranks.

Using a sample of incarcerated adults, Mitchell and MacKenzie (2006) tested self-control stability during a six-month period. The correlation coefficients of six subdimensions of self-control and total self-control indicated moderate positive relationships (ranging from .27 to .48p) between two time points. Using the subgroup of those in the lowest quartile on self-control at the first survey, the authors found, however, only 51% of them stayed in the lowest quartile at the second survey. In general, these findings showed that relative self-control is changing rather than stable over time.

Measurement and Analysis Issues in Self-Control Stability

Literature reviews on self-control stability studies report that previous studies overlooked two issues. One of the issues concerns the measurement of self-control. Two types of

measurements—attitudinal measurement and behavior measurement—have been commonly used to test Gottfredson and Hirschi's self-control theory. Attitudinal measures ask respondents to judge themselves in terms of whether they possess a low self-control trait. Among the several types of attitudinal measures (see Pratt and Cullen 2000), Grasmick et al.'s (1993) self-control scale is the most frequently used measure. Like other attitudinal measures, Grasmick and his colleagues constructed the scale comprising six components of personality traits, including “impulsive, insensitive, physical (as opposed to mental), risk-taking, short-sighted, and nonverbal” as suggested by Gottfredson and Hirschi (1990, p. 90). The attitudinal measure of self-control, however, was criticized by Hirschi and Gottfredson on the basis that respondents' self judgment of attitudes may not be valid because “the level of self-control itself affects survey responses” (Hirschi and Gottfredson 1993, p. 48). Piquero et al. (2000) examined the impact of self-control on self-reported survey responses, finding that the Grasmick et al. scale provoked different answers from the participants based on their level of self-control. Hirschi and Gottfredson (1993) therefore suggest that low self-control should be measured behaviorally with indicators of noncriminal analogous conduct. Strictly speaking, for a behavioral measure, self-control should be scored through direct observation by others. For instance, children's behavior can be monitored and rated by parents or other family members at home or by teachers at school. One example of those measures is the Behavioral Problem Index (BPI), in which mothers are asked to report children's behavioral problems exhibited at home (Hay and Forrest 2006; Pratt et al. 2004; Turner et al. 2005; Turner and Piquero 2002). Some of the previous studies using behavioral measures of self-control adopted respondents' self report of behaviors, such as smoking, drinking, taking medicine with minor illnesses, overeating, wearing seat belts, and having accidents (Keane et al. 1993; LaGrange and Silverman 1999; Tittle et al. 2003).

Behavioral measures of self-control have also been criticized for causing a tautology problem because the behavioral indicators of self-control are indistinct from the dependent variable of criminal behaviors among others (Akers 1991). For example, alcohol abuse, smoking, and having an accident cannot be both measures of low self-control and crime and analogous behavior. Presenting seven requirements of an appropriate self-control measurement, Marcus (2004, p. 47) pointed out that attitudinal measure had the “fundamental problem of theoretical inadequacy,” although it “yields a psychometrically sound measurement,” while behavioral measures “come more closer to the theoretical concept of self-control but appear to fall short of meeting acceptable standards of psychometrics.”

In a meta-analysis of the empirical research on self-control theory, Pratt and Cullen (2000) found that the effect sizes estimated for attitudinal and behavioral measures of self-control were similar; the magnitude of the effect size for the behavioral measure was slightly greater than for the attitudinal measure. Some studies, however, found that attitudinal indicators had relatively stronger effects on deviance than behavioral measures of self-control (Arneklev et al. 2006).

With only one exception (Turner and Piquero 2002), previous studies testing self-control stability did not explore the possibility that different measures may cause the differences in self-control stability. Although Turner and Piquero tried to explore both behavioral and attitudinal self-control assessments, their collection of both measures did not occur during the same observational time periods. Behavioral measures were used for wave one through four. Attitudinal measures were used for wave six through eight (they did not use wave five data in the study). Therefore, they were not able to examine whether different measures of self-control yielded different results in self-control stability.

Another issue pertains to analytical methods used in studies testing self-control stability. Gottfredson and Hirschi (1990) argue that self-control develops fully around age 8 to 10 and

stabilizes thereafter. A hypothesis based on this proposition is that the developmental processes of self-control follow the same trajectory among individuals. Instead of testing this hypothesis, most previous studies accepted this assumption and treated people as one homogeneous group. Reflected in the analytical method is that correlation analysis is frequently used in these studies (i.e. Arneklev et al. 1998; Burt et al. 2006; Mitchell and MacKenzie 2006; Turner and Piquero 2002; Winfree et al. 2006). Higher correlation coefficients are claimed to indicate higher stability over time. The methodological assumption under correlation analysis is that the parameters are continuously scattered throughout the population with a normal distribution. All individuals are assumed from the same group of population and share a homogeneous trajectory of self-control. Although correlation coefficients may show how strongly relative rankings among individuals remain over time, this method may obscure the disclosure of possible variations of developmental processes among the population.

Recent studies examining the development of crime and deviant behaviors showed the existence of diverse developmental patterns among individuals (Hay and Forrest 2006; Nagin 1999; Nagin and Tremblay 2005; Sampson and Laub 2003). Nagin and Tremblay (2005), for example, used a sample of 1,037 boys from 6 to 15 years of age, and identified four developmental trajectories for the physical aggression from childhood to adolescence: the chronic trajectory, the high level declining trajectory, the moderate level declining, and the low trajectory. Using a longitudinal dataset of adolescent boys between ages 11 and 17, Lacourse et al. (2003) examined the developmental trajectories of adolescent boy's involvement in delinquent groups. They identified three different trajectories of delinquent group affiliation: the "never" affiliation group, the "adolescence" affiliation group, and the "childhood" affiliation group. In a study of life-course desisters, Sampson and Laub (2003) examined trajectories of offending over the life course of delinquent boys followed from ages 7 to 70, and found six distinct offender groups with different developmental patterns of offending. In a recent study examining self-control stabilities, Hay and Forrest (2006) used a national sample of U.S. children from age 7 to 15, and found the development of self-control did not follow a homogenous process. Instead, eight different self-control trajectories were found among the sampled individuals.

The South Korean Context

As discussed previously, even if Gottfredson and Hirschi insist that the self-control theory is cross-cultural, empirical evidence suggests cultural factors have a significant impact on the self-control and deviance relationship (Hwang and Akers 2003; Wang et al. 2002).

Different from Western countries, East Asian countries and particularly South Korea emphasize collectivism and Confucianism. Collectivism has significantly influenced people's attitudes toward their lives. For example, adolescents in South Korea are encouraged to put public interests before that of individuals by limiting their individual freedom and controlling themselves. Through their lives, this value is internalized at homes, schools, and peer-associations (Cho 1995; Kim et al. 1999; Lee and Larson 2000; Morash and Moon 2007). Confucianism highly emphasizes filial piety and familism (Yun 2008), which leads to South Korean parents putting considerable efforts into monitoring children's behavior, and correcting their misbehavior.

The unique cultural context in South Korea also affects school environments. Parents devote themselves for their children's educational, occupational, and financial successes. The most guaranteed way of achieving these successes in Korea is to support children at

schools to obtain good academic records. Studies show that parental enthusiasm for children's educational success and their support for schools are extremely high in South Korean (Lee and Larson 2000). Although Gottfredson and Hirschi emphasize the primary function of parenting in developing self-control, they recognize school is another institution that can socialize and teach children self-control if the schools receive sufficient cooperation and support from parents (Gottfredson and Hirschi 1990).

Given the Korean society's emphasis on collectivism, Confucianism, and parents' support for school, it is reasonable to expect youths in Korea may experience unceasing socialization through their childhood.

Taken together, previous studies suggest that the self-control stability assumption is not conclusive. Most studies found moderate correlations of self-control exist; levels of self-control may change among individuals over time. Different measures of self-control may impact the results of the stability postulate, and there is a possibility that the development processes of self-control may vary across individuals. To better test the stability postulate, the current study uses both attitudinal and behavioral measurements of self-control to examine whether different measurements of self-control yield different results. Second, this study employs growth mixture modeling to examine whether heterogeneous developmental processes of self-control exist among individuals. Finally, this study tests whether the self-control thesis is applicable to South Korean adolescents.

Methods

Data

The data for this article comes from the Korean Youth Panel Survey (Korea Youth Panel Survey 2010). The KYPS is a five-wave national longitudinal study supported by the National Youth Policy Institute and was administered by the Millward Brown Media Research Institute. There are two separate datasets in the KYPS survey: the elementary students data (started at 4th grade) and the middle school students data (started at 8th grade).¹ In a recent study, Yun and Walsh (2012) examined the self-control stability postulate using the middle school student's data in the KYPS. Conversely, the current study uses five waves of elementary school students' data. The following discussion of the data focuses only on the elementary school students' sample.

In 2004, this survey was first administered to 2,844 4th grade students (10 years old). Consent from parents was obtained for all of the participants. The main purpose of KYPS is to assess the effects of developmental change in children's personality, family, school, peer, and community environments on children's job selection, leisure time, and delinquency. Data collection was based on a stratified multi-stage cluster sampling design. Schools from 12 out of 13 jurisdictions in South Korea were first selected based on the number of 4th grade students. One 4th grade class was then selected randomly from each school, resulting in a total of 2,844 students. After a brief explanation of the purpose of the survey and confidentiality, the survey was conducted in students' classrooms. In addition, a telephone

¹ There are two longitudinal datasets in the Korean Youth Panel Survey [elementary student data (4th grade) and middle school student data (8th grade)]. The elementary student data were first collected in 2004 and data collection continued every year until 2008. The middle school student data were first collected in 2003 and followed each year until 2008. Yun and Walsh used the first five waves of middle school student data for their study, while the current article uses the five waves of elementary school student data.

survey was conducted with parents whose children had participated in the survey, and the data from both students and their parents were combined into one dataset. Data were collected each year for five years. The final sample included in the current study contains 2,159 (76%) individuals who finished all of the five wave surveys. They are assessed between ages 10 and 14. Hirschi and Gottfredson (1993) argue that people with low self-control are more likely to drop out of a longitudinal survey. *T* tests were conducted to examine if any differences in the levels of self-control existed between participants included and excluded. The results showed that participants who dropped the survey did not significantly differ on self-control at age 10 ($p=.443$ for attitudinal measure and $.651$ for behavioral measure). A further examination of the dropped-out students suggested most dropouts occurred due to reasons such as moving one's residence or illness on the day of survey. Therefore, the final sample included in the analysis is representative of the target population.

Measures

Self-control Both behavioral and attitudinal measures are utilized in this study to examine whether different measures yield different results in the stability postulate. Behavioral measures of self-control were composed with 13 dichotomous items, asking adolescents "Have you ever done the following acts during the last year (e.g., cheating, smoking, drinking, and running away, etc.);" (see the [Appendix](#)). These behavioral items are similar to those of the Behavior Problem Index used in many studies testing self-control theory (e.g., Pratt et al. 2004; Turner et al. 2005). The reliabilities for self-control measures from wave 1 to wave 5 were .561, .598, .605, .683, and .689, respectively. These behavioral self-control indexes were coded with higher score indicating higher levels of self-control. Attitudinal measures of self-control were constructed using six items asking adolescents questions such as if they are apt to enjoy risky activities; are they easy to lose temper whenever they get angry; and do they enjoy teasing and harassing other people, etc. (see [Appendix A](#)). Responses for each item were coded as 1=always to 5=never. The reliabilities for attitudinal measures of self-control from wave 1 to wave 5 were .644, .659, .713, .738, and .754, respectively.² Like the behavioral measures, the attitudinal measures of self-control had higher scores after coding, indicating higher levels of self-control.

Analytical Method

To test relative stability of self-control, two statistical methods were utilized. First, correlation analyses were conducted among wave 1 through 5 (age 10 to 14), with high correlation coefficients indicating high relative stability of self-control (Arneklev et al. 1998; Burt et al. 2006; Hay and Forrest 2006). Although correlation coefficients show how strongly rankings among individuals persist through time, this method may obscure substantial variation for unique groups of the population because it treats the whole sample as one homogeneous group and it also fails to estimate curvilinear change over time. Moreover, a small group

² Longitudinal studies in which self-control was measured repeatedly showed a consistent increase in reliability coefficients over time (Arneklev et al. 1998; Beaver and Wright 2007; Burt et al. 2006; Hay and Forrest 2006; Turner and Piquero 2002; Winfree et al. 2006). Results of the current study are consistent with previous studies. Reliability concerns are present due to the extent to which a measuring procedure yields the same results on repeated trials (Carmines and Zeller 1979). The reason that the reliability coefficients increased over time could be the result that, as children age, their understanding of the survey questions and their evaluation of themselves improved and became more consistent.

with extreme characteristics in self-control may have significant effects on the correlations (Muthen 2002). To complement the limitations, a group-based modeling approach, growth mixture modeling (GMM), which has been introduced and advanced by Muthen and colleagues was used in the current analysis (Muthen 2004; Muthen and Muthen 2010).

The GMM approach has several advantages over traditional methods used for repeated measures. For example, one of the assumptions of ANOVA is that there should be no correlation among error variance of repeatedly measured variables; that is, the error variance should be equal and independent, which is often violated by repeated data measures (Kline 2005, p. 277). Also, splitting cases into several groups for ANOVA might be arbitrary and lose numerical information (Kline 2005, p. 277). GMM is intended to illuminate the existence of heterogeneous developmental trajectories over time with estimation of error variance. In GMM, two parameters (the intercept parameter and the slope parameter) are regressed on a categorical latent trajectory class variable, which represents unobserved groupings of individuals showing similar intercept and slope parameters. Analyses are iterated by adding an additional group to the model at a time. Change in model-fit indices across analyses is then examined. Based on the similarities in growth trajectories, latent classes of individuals are generated. The optimal number of groups is identified by model-fit indices, including the Bayesian Information Criteria (BIC), the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT), the Bootstrap likelihood ratio test (Bootstrap-LRT), and entropy, as well as the usefulness and interpretability of latent trajectory classes (Connell and Frye 2006; Muthen 2002, 2004).

Results

The means and standard deviations of self-control are presented in Table 1. These data indicate that the average levels of self-control declined slightly from age 10 to age 14 (22.70 in age 10 to 20.97 in age 14) for attitudinal measures. For behavioral measures, the average levels of self-control were almost consistent across the five years (11.60 in age 10 to 11.40 in age 14).

Correlation coefficients of self-controls at different times are presented in Table 2. The upper part of the table indicates stability coefficients of attitudinal measures, while the lower part of the table indicates stability coefficients of behavioral measures. The results are consistent with previous studies that even though all correlations are statistically significant,

Table 1 Descriptive statistics

	Mean	SD
Self-control (Attitudinal, wave 1)	22.70	4.09
Self-control (Attitudinal, wave 2)	21.86	4.18
Self-control (Attitudinal, wave 3)	21.42	4.29
Self-control (Attitudinal, wave 4)	21.36	4.38
Self-control (Attitudinal, wave 5)	20.97	4.45
Self-control (Behavioral, wave 1)	11.60	1.37
Self-control (Behavioral, wave 2)	11.68	1.34
Self-control (Behavioral, wave 3)	11.66	1.32
Self-control (Behavioral, wave 4)	11.50	1.52
Self-control (Behavioral, wave 5)	11.40	1.55

Higher values for the self-control scale are indicative of higher level of self-control

Table 2 Self-control stability coefficients

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Wave 1		0.45	0.41	0.33	0.28
Wave 2	0.30		0.49	0.38	0.31
Wave 3	0.24	0.35		0.48	0.40
Wave 4	0.12	0.23	0.34		0.52
Wave 5	0.13	0.15	0.30	0.42	

All correlations <.001; the upper part of the table indicates stability coefficients of attitudinal measure, while the lower part of the table indicates stability coefficients of behavioral measure

the stability of self-control is moderate over the short term and tends to decrease over the long term (Hay and Forrest 2006; Yun and Walsh 2012). For instance, while the correlation coefficient for attitudinal measures of self-control between wave 1 and wave 2 is .45, it drops to .28 between wave 1 and wave 5. The same tendency is also observed for behavioral measures. While the correlation coefficient for behavioral measures of self-control between age 10 and age 11 is .30, it drops to .13 between age 10 and 14. Different from Hay and Forrest's findings, however, is that short-term stability (stability over a 1-year period) does increase as the children age. For attitudinal measures, while the correlation coefficient between age 10 and 11 is .45, it increases to .52 between age 13 and 14. For behavioral measures, the correlation coefficient between age 10 and 11 is .30. It also increases to .42 between age 13 and 14. The correlation analysis results also indicate that although both attitudinal measures and behavioral measures of self-control exhibit similar patterns, the magnitude of correlation coefficients for attitudinal measures are consistently greater than for behavioral measures.

As noted earlier, correlation analysis assumes individuals are from the same group of population, and share a homogeneous trajectory of self-control. This analytical approach cannot address the question whether substantial variations of development trajectories of self-control exist among individuals. In the current study, a group-based approach, GMM, is utilized to test the homogeneity hypothesis of self-control trajectories.

Table 3 shows the model fit indexes of GMM. The optimal number of groups are identified based on criteria including parsimony, usefulness, and interpretability of latent groups as well as model fit indexes (i.e. the smallest Bayesian Information Criteria (BIC), the highest Entropy, significant values of Lo-Mendell-Rubin Likelihood Ratio Test (L-M-R LRT), and Bootstrap Likelihood Ratio Test (Bootstrap LRT)) (Connell and Frye 2006; Hay and Forrest 2006; Muthen and Muthen 2000).

For attitudinal measures, all model-fit indexes indicate that a four-group model is the best [the smallest BIC, the highest Entropy, and significant values of L-M-R LRT ($p < .001$) and Bootstrap LRT ($p < .001$)]. This justifies that the group-based approach is more appropriate than conventional modeling. Therefore, the assumption that individuals follow a common self-control developmental trajectory is not supported. Instead, different self-control developmental patterns exist among individuals.

Figure 1 shows the trajectories of the four distinct groups for attitudinal measures. Each trajectory is named based on the initial level of self-control and the nature of its change over time. The biggest group includes 50% of the adolescents, who started with average levels of self-control and showed virtually no change from age 10 to 14 in absolute levels of self-control. This group is identified as the "medium-stable" group. The second biggest group (42.7%) is identified as "high-decrease" group. Children in this group began with high levels

Table 3 Model fit index

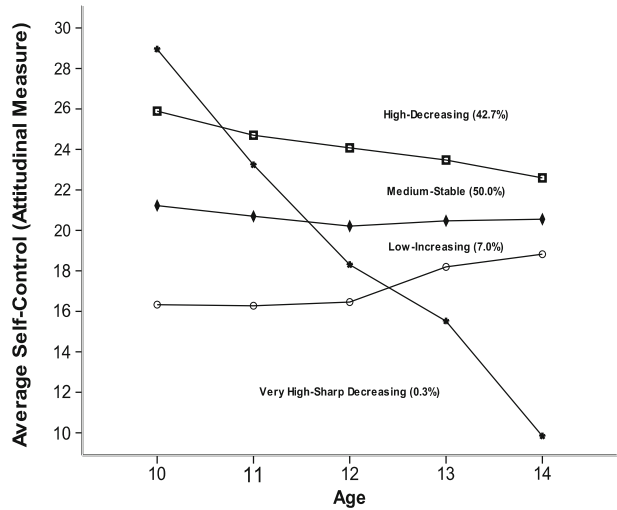
Number of class	Log likelihood	BIC	Entropy	L-M-R LRT(p)	Bootstrap LRT (p)	<i>n</i> (%) of smallest class
Attitudinal measure						
1	-29,716.670	59,510.114	N/A	N/A	N/A	2,159 (100)
2	-29,699.966	59,499.739	0.453	<.001	<.001	548 (25.4)
3	-29,691.394	59,505.627	0.650	<.001	<.001	6 (0.3)
4	-29,676.233	59,498.337	0.697	<.001	<.001	7 (0.3)
5	-29,681.540	59,531.982	0.569	0.0223	0.0128	6 (0.3)
6	-29,674.063	59,540.061	0.623	0.0011	0.0000	10 (0.5)
7	-29,662.141	59,539.250	0.636	0.2147	0.0000	7 (0.3)
8	-29,657.911	59,553.821	0.627	0.1921	0.1364	10 (0.5)
Behavioral measure						
1	-18,469.354	37,015.483	N/A	N/A	N/A	2,159 (100)
2	-18,148.444	36,396.695	0.952	0.0000	0.0000	136 (6.3)
3	-17,968.742	36,060.321	0.930	0.0017	0.0000	106 (4.9)
4	-17,889.979	35,925.828	0.904	0.1160	0.0000	42 (1.9)
5	-17,830.824	35,830.551	0.901	0.7234	0.0000	30 (1.4)
6	-17,781.618	35,755.171	0.897	0.2226	0.0000	16 (0.7)

of self-control, but their levels of self-control decreased consistently over time. A third group called “low-increase” group includes 7% of the adolescents who started with low level of self-control at the beginning of the survey, but their levels of self-control continued to increase thereafter. The smallest group (0.3%) with very unique trajectory is called the “very high-sharp decrease” group. This group had the highest level of self-control among all groups at age 10; however, their levels of self-control became the lowest at age 14.

The emergence of four different self-control developmental trajectories rejects the hypothesis that individuals follow a homogenous developmental process of self-control. While half of the adolescents keep their absolute levels of self-control steady, others present some changes over time. The trajectories of the “medium-stable” and the “low-increase” groups (accounting for 57% of the sample) support Gottfredson and Hirschi’s stability assertion. The presence of the “low-increase” group specifically bolsters their declaration that “the low self-control group continues over time to exhibit low self-control. Its size, however, declines” (Gottfredson and Hirschi 1990, p. 108). The trajectory of the “high-decrease” group, accounting for over 40% of the sample, on the other hand, is different from the expectation with an evident decreasing tendency. Even so, children’s absolute levels of self-control for this high-decrease group are still higher than all the other groups at the age of 14. Overall, for the attitudinal measures, the vast majority of the adolescents (99.7%) present relative stability of self-control over time. Although the high-decrease group and low-increase group show some changes, they are not substantial enough to change the relative levels of self-control.

For behavioral measures, the group-based model-fit indexes are not consonant with each other. When there is a conflict among fit indexes, parsimony, usefulness, and interpretability of each model should be considered (Muthen and Muthen 2000). Although the six-group model had the smallest value of BIC, which is foremost among the indexes (Connell and Frye 2006), the three-group model was selected as the best fit because it had a higher value of Entropy than the four-, five-, and six-group models, and it had significant values of L-M-

Fig. 1 Trajectories of self-control (attitudinal measures)

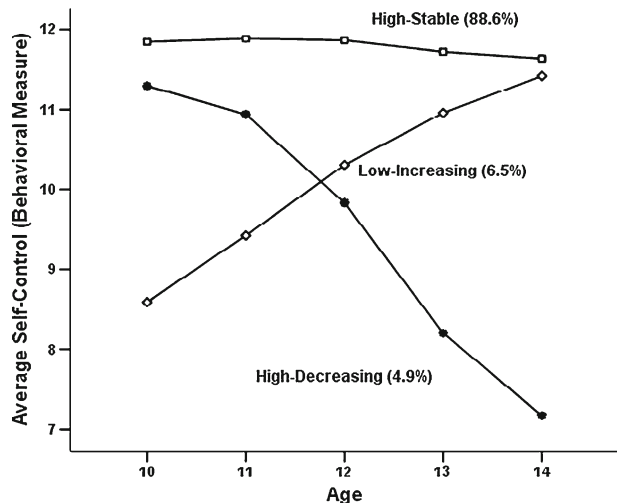


R LRT and Bootstrap LRT. In addition, this model provides more meaningful information on data than the one- and two-group model (i.e., one distinct group, not shown in one-, and two-group models, appeared in this model).

Figure 2 shows the trajectories of the three-group model for behavioral measures. The biggest group named “high-stable” group contains 88.6% of the adolescents. Individuals in this group started with high levels of self-control and experienced almost no change over time. This result is consistent with Hay and Forrest’s findings in their study examining the development pattern of self-control, which supports Gottfredson and Hirsch’s argument that development of self-control occurs early in life and stabilizes thereafter.

In addition to this “high-stable” group, two more groups are presented in Fig. 2. Some 6.5% of the adolescents starting with low self-control at age 10 show a steady increase over the study period. By age 14, the “low-increase” group’s absolute levels of self-control are getting close to the “high-stable” group. The last group named as the “high-decrease” group

Fig. 2 Trajectories of self-control (behavioral measures)



contains 4.9% of the individuals. This group started with high levels of self-control at age 10, but experienced a steady drop that continued through age 14.

Similar to the attitudinal measures, results of the group based modeling for behavioral measures of self-control again find that individuals do not follow a homogenous developmental process of self-control. While 88.6% of the adolescents started with high levels of self-control show no change from age 10 to 14 in absolute levels of self-control, the two remaining groups present significant changes in self-control. The trajectory of the “high-decrease” group traverses the trajectory of the “low-increase” group, and reaches the lowest point at age 14. This finding contradicts Gottfredson and Hirschi’s claim that there is “little or no movement from high self-control to low self-control” (1990, p. 107). A significant and steady decreasing tendency is evident in this group. On the other hand, the “low-increase” group shows a significant and steady increasing tendency over the observation period. At age 14, their absolute levels of self-control are getting close to the vast majority. The relative stability assumption therefore is not supported in the behavioral measurement model.

Discussion and Conclusion

The purpose of this study was to test the stability assertion of self-control, and to examine whether different measures of self-control produce divergent results in the stability hypothesis using group-based developmental trajectory modeling and a sample of South Korean adolescents. Conventional correlation analysis was first conducted to examine the correlations of self-control levels across the observational period. Results of stability coefficients for self-control showed that all correlations were statistically significant, but the stability of self-control was moderate over the short term and tended to decrease over the long term. The results are consistent with previous self-control stability studies using either Western samples (i.e. Hay and Forrest 2006) or Korean samples (i.e. Yun and Walsh 2012). The comparison of attitudinal measures of self-control and behavioral measures of self-control suggested that, although both measures of self-control exhibited similar patterns, the magnitude of stability coefficients for attitudinal measures was consistently greater than that for behavioral measures.

As discussed earlier, correlation analysis is limited in examining the variations of developmental processes of self-control. A group-based modeling, GMM, was then utilized to test the homogeneity hypothesis of self-control trajectories and examine the absolute and relative stability hypotheses of self-control.

Like most studies using attitudinal measures of self-control (Arneklev et al. 1998; Turner and Piquero 2002; Yun and Walsh 2012), the results of GMM using attitudinal measures showed strong relative stability in self-control over the 5-year period. Although some changes occurred for the absolute levels of self-control among half of the individuals, relative stability still held for the vast majority of the sample.

Different from the results using attitudinal measures, results of GMM using behavioral measures revealed strong evidence of absolute stability in self-control. Over 88% of the adolescents fit the trajectory, in which absolute levels of self-control remained essentially unchanged from age 10 to 14. This finding is comparable to Hay and Forrest’s study, in which the authors found 84% of the sample showed strong absolute stability in self-control. The presence of another two trajectories—the high-decrease, and the low-increase—in the behavioral measuring models however, provided evidence against both the absolute stability and relative stability hypotheses. Absolute levels of self-control may change significantly during the life course.

Taken together, three important findings are evident in the current study. First, results using both attitudinal and behavioral measures suggest individuals do not follow a homogenous developmental trajectory in self-control. Instead, multiple patterns exist among individuals. Second, different measures of self-control impact the results of stability tests. While results using attitudinal measures of self-control provide strong support for the relative stability hypothesis in self-control, results using behavioral measures of self-control suggest strong support for the absolute stability assumption. Third, as the overall findings provide support for the stability hypothesis, there is also evidence of change in both absolute and relative levels of self-control, especially using behavioral measures. The trajectories of self-control were not parallel to each other; the “high-decrease” and the “low-increase” groups traversed each other. Although the proportion is relatively small, it is a departure from Gottfredson and Hirschi’s stability assertion in self-control.

The existence of these high-decrease and low-increase trajectories suggests not only the absolute levels of self-control but also that the differences in criminality may change substantially over the life course. Different from Gottfredson and Hirschi’s contention that criminality is not influenced by people’s social situations, previous studies found that levels of self-control might be affected continually by environmental characteristics, such as association with delinquent peers, school environments, and neighborhood environments (Burt et al. 2006; Meldrum 2008; Pratt et al. 2004; Turner et al. 2005). Schmeichel and colleague suggest a self-regulatory strength model (Schmeichel and Baumeister 2004) to explain the downward movement of self-control. According to Schmeichel and Baumeister (2004), people’s ability to regulate their responses to stimulation relies on limited self-regulatory resources. Automatic behavior requires little regulatory resources, such as retrieving information from long-term memory and non-conscious striving, while active responses to environmental stimuli such as planning for the future, resisting temptation, controlling emotions, and inhibiting impulses require considerable resources. Self-control is a conscious process that requires much regulatory resources. When regulatory resources are abundant, an individual’s self-control works well. If their resources are exhausted, self-control is depleted. Therefore, self-control within a child may decrease when the child encounters stressful situations at home, school, or in neighborhoods.

The evidence that the absolute levels of self-control change over childhood may also be a reflection of the unique social cultural context in South Korea. Given collectivism and Confucianism’s emphasis on limiting and controlling individuals’ freedom for public interests, plus the close relationships between parents and children, and high parental support and involvement in schools, it is possible that adolescents would continue to socialize, and self-control levels, therefore, may change over life course.

The finding that the degree of stability varies across types of measurement of self-control may imply that behavioral and attitudinal items do not measure the same concept. Tittle et al. (2004), for example, suggest that self-control theory is incomplete in conceptualizing self-control and deviant relationships. They argue that there are two mechanisms for self-control to affect criminal involvement: capability for self-control, and desire for self-control. They pointed out that Gottfredson and Hirschi mainly focused on the capability for self-control (i. e., level of self-control), although they mentioned the concept of desire in their studies, such as “the ability and willingness to delay gratification” (1990, p. 96). Researchers testing self-control theory have tended to measure only capability of self-control, such as Grasmick et al.’s (1993) 24 items, but neglect the measure of desire for self-control. Attitudinal measures used in the current study are very similar to the items used to measure capability in Tittle et al.’s study; therefore, the trajectories drawn from attitudinal measures may reflect only capability for self-control, while trajectories drawn from behavioral measures may be the

combination of capability and desire, given that a behavior requires desire and ability. If self-control is composed of two elements as proposed by Tittle et al., the differences in self-control stability between attitudinal and behavioral measures may reflect the differences in stability between ability and a combination of ability and desire. If so, behavioral measures may provide a more complete understanding of self-control stability.

The current study is limited in several respects. The first relates to the attitudinal measures of self-control. In this study, instead of using Grasmick et al.'s 24 items, only 6 items were used to measure self-control, with 1 item measuring one subdimension of self-control. For example, the question "I abandon a task once it becomes hard and laborious to do," was used to measure preference for a simple task, and another question "I am apt to enjoy risky activities" was used to measure risk seeking. As a result, validity might be influenced by these single item measures. Another limitation is that the sample only covers adolescents between age 10 to 14; therefore, the results of this study may not be generalized to the youth under age 10 or above age 14.

Despite these limitations, this study provides new evidence on the stability of self-control hypothesis. By using both attitudinal and behavioral measures of self-control simultaneously, the current study indicates that different measures of self-control impact the results of the hypothesis. Using a group-based approach of developmental modeling, this study also examines whether individuals follow a homogenous developmental process of self-control, a hypothesis scarcely examined in previous studies. Overall, the current study provides mixed results about Gottfredson and Hirsch's stability hypothesis. In support of Gottfredson and Hirsch, the vast majority of the adolescents show strong relative stability in self-control trajectories for attitudinal measures. Over 88% of children also present strong absolute stability in self-control for behavioral measures. On the other hand, the existence of "high-decrease" and "low-increase" groups, especially using behavioral measures, rejects both the absolute and relative stability assertion in the social context of South Korea.

Appendix - Self-Control Measures

Attitudinal measures

Q. Read carefully each of the following questions and circle the number of most suitable response.

1. Jump into exciting things even if I have to take an examination tomorrow
2. I abandon a task once it becomes hard and laborious to do
3. I am apt to enjoy risky activities
4. I enjoy teasing and harassing other people
5. I lose my temper whenever I get angry
6. I don't do my homework habitually

Behavioral measures

Q. Have you ever done the following acts during the last one year?

1. Illegal or reckless walking across of a roadway (jaywalking)
2. Intentional free riding on a bus or on a subway
3. Defying a teacher with shouting
4. Cheating on an examination
5. Having unexcused absence

6. Misappropriating the expenses for stationery and school necessity
7. Collectively bullying
8. Severely teasing or bantering other friend
9. Threatening other friend
10. Watching obscene materials such as adult cartoon, picture, video clip or film
11. Drinking
12. Smoking
13. Running away

References

- Akers, R. L. (1991). Self-control as a general theory of crime. *Journal of Quantitative Criminology*, 7, 201–211.
- Arneklev, B. J., Elis, L., & Medlicott, S. (2006). Testing the General Theory of Crime: Comparing the effects of “imprudent behavior” and an attitudinal indicator of “low self-control”. *Western Criminology Review*, 7, 41–55.
- Arneklev, B. J., Cochran, J. K., & Gaaney, R. R. (1998). Testing Gottfredson and Hirschi’s “low self-control” stability hypothesis: An exploratory study. *American Journal of Criminal Justice*, 23, 107–127.
- Baron, S. W., Forde, D. R., & Kay, F. M. (2007). Self-control, risky lifestyles, and situation: The role of opportunity and context in the general theory. *Journal of Criminal Justice*, 35, 119–136.
- Beaver, K. M., Wright, J. P., DeLisi, M., & Vaughn, M. G. (2008). Genetic influences on the stability of self-control: Results from a longitudinal sample of twins. *Journal of Criminal Justice*, 36, 478–485.
- Beaver, K. M., & Wright, J. P. (2007). The stability of low self-control from kindergarten through first grade. *Journal of Crime and Justice*, 30, 63–86.
- Burt, C. H., Simons, R. L., & Simons, L. G. (2006). A longitudinal test of the effects of parenting and the stability of self-control: Negative evidence for the general theory of crime. *Criminology*, 44, 353–396.
- Burton, V. S., Jr., Cullen, F. T., Evans, T. D., Alarid, L. F., & Dunaway, R. G. (1998). Gender, self-control, and crime. *Journal of Research in Crime and Delinquency*, 35, 123–147.
- Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment*. Beverly Hills, CA: Sage.
- Cho, H. (1995). Examinations of war in South Korea: A cultural analysis. In S. Stephens (Ed.), *Children and the politics of culture* (pp. 141–168). Princeton, NJ: Princeton University Press.
- Connell, A. M., & Frye, A. (2006). Growth mixture modeling in developmental psychology: Overview and demonstration of heterogeneity in development trajectories of adolescent antisocial behavior. *Infant and Child Development*, 15, 609–621.
- Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.
- Grasmick, H. G., Tittle, C. R., Bursik, R. J., Jr., & Arneklev, B. K. (1993). Testing the core empirical implications of Gottfredson and Hirschi’s general theory of crime. *Journal of Research in Crime and Delinquency*, 30, 5–29.
- Hay, C., & Forrest, W. (2008). Self-control theory and the concept of opportunity: The case for a more systematic union. *Criminology*, 46, 1039–1072.
- Hay, C., & Forrest, W. (2006). The development of self-control: Examining self-control theory’s stability thesis. *Criminology*, 44, 739–774.
- Higgings, G., & Tewksbury, R. (2006). Sex and self-control theory: The measures and causal model may be different. *Youth & Society*, 37, 479–503.
- Hirschi, T. (2004). Self-control and crime. In R. F. Baumeister & K. D. Vohs (Eds.), *The Handbook of self-control regulation: Theory, research, and applications* (pp. 527–552). New York: Guildford Press.
- Hirschi, T., & Gottfredson, M. R. (2001). Self-control theory. In R. Paternoster & R. Bachman (Eds.), *Explaining criminals and crime* (pp. 81–96). Los Angeles, CA: Roxbury.
- Hirschi, T., & Gottfredson, M. R. (1993). Commentary: Testing the general theory of crime. *Journal of Research in Crime and Delinquency*, 30, 47–54.
- Hope, T. L., Grasmick, H. G., & Pointon, L. J. (2003). The family in Gottfredson and Hirschi’s general theory of crime: Structure, parenting, and self-control. *Sociological Focus*, 36, 291–311.
- Hwang, S., & Akers, R. L. (2003). Substance use by Korean adolescents: A cross-cultural test of social learning, social bonding, and self-control theories. In R. L. Akers & G. F. Jensen (Eds.), *Social learning theory and the explanation of crime: A guide for the new century* (pp. 39–61). New Brunswick, NJ: Transaction.

- Keane, C., Maxim, P. S., & Teevan, J. J. (1993). Drinking and driving, self-control, and gender: Testing a general theory of crime. *Journal of Research in Crime and Delinquency*, 30, 30–46.
- Kim, B. S., Atkinson, D., & Yang, P. (1999). The Asian Values Scale: Development, factor analysis, validation, and reliability. *Journal of Counseling Psychology*, 46, 342–352.
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford Press.
- Korea Youth Panel Survey (2010). Retrieved February 3, 2010, from http://panel.nypi.re.kr/eng/cho_subject.asp
- Lacourse, E., Nagin, D., Tremblay, R., Vitaro, F., & Claes, M. (2003). Developmental trajectories of boys' delinquent group membership and facilitation of violent behaviors during adolescence. *Development and Psychopathology*, 15, 183–197.
- LaGrange, T. C., & Silverman, R. A. (1999). Low self-control and opportunity: Testing the general theory of gender differences in delinquency. *Criminology*, 37, 41–72.
- Lee, M., & Larson, R. (2000). The Korean 'examination hell': Long hours of studying, distress, and depression. *Journal of Youth and Adolescence*, 29, 249–271.
- Longshore, D., Turner, S., & Stein, J. A. (1998). Reliability and validity of a self-control measure: A rejoinder. *Criminology*, 36, 175–182.
- Marcus, B. (2004). Self-control in the general theory of crime: Theoretical implications of a measurement problem. *Theoretical Criminology*, 8, 33–55.
- Meldrum, R. C. (2008). Beyond parenting: An examination of the etiology of self-control. *Journal of Criminal Justice*, 36, 244–251.
- Mitchell, O., & MacKenzie, D. L. (2006). The stability and resiliency of self-control in a sample of incarcerated offenders. *Crime and Delinquency*, 52, 432–449.
- Morash, M., & Moon, B. (2007). Gender differences in the effects of strain on three types of delinquency: A test of theory outside of the United States. *Youth & Society*, 38, 300–321.
- Muthen, L., & Muthen, B. (2010). *Mplus user's guide* (6th ed.). Los Angeles: Muthen & Muthen.
- Muthen, B. (2004). Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In D. Kaplan (Ed.), *Handbook of quantitative methodology for the social sciences* (pp. 345–368). Newbury Park, CA: Sage.
- Muthen, B. (2002). Beyond SEM: General latent variable modeling. *Behaviormetrica*, 29, 81–117.
- Muthen, B., & Muthen, L. (2000). Integrating person-centered and variable-centered analysis: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research*, 24, 882–891.
- Nagin, D., & Tremblay, R. (2005). Developmental trajectory groups: Fact or a useful statistical fiction? *Criminology*, 43, 873–904.
- Nagin, D. (1999). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods*, 4, 139–157.
- Nagin, D., Farrington, D., & Moffitt, T. (1995). Life-course trajectories of different types of offenders. *Criminology*, 33, 111–139.
- Piquero, A. R., MacIntosh, R., & Hickman, M. (2000). Does self-control affect survey response? Applying exploratory, confirmatory and item response theory analysis to Grasmick et al.'s self-control scale. *Criminology*, 38, 897–929.
- Piquero, A. R., & Rosay, A. B. (1998). The reliability and validity of Grasmick et al.'s self-control scale: a comment on Longshore et al. *Criminology*, 36, 174–157.
- Pratt, T. C., & Cullen, F. T. (2000). The empirical status of Gottfredson and Hirschi's general theory of crime: A meta-analysis. *Criminology*, 38, 931–964.
- Pratt, T. C., Turner, M. G., & Piquero, A. R. (2004). Parental socialization and community context: A longitudinal analysis of the structural sources of self-control. *Journal of Research in Crime and Delinquency*, 41, 219–243.
- Rebellon, C. J., Straus, M. A., & Medeiros, R. A. (2008). Self-control in global perspective: An empirical assessment of Gottfredson and Hirschi's general theory within and across 32 national settings. *European Journal of Criminology*, 5, 331–362.
- Romero, E., Gomez-Fraguela, J. A., Luengo, M. A., & Sobral, J. (2003). The self-control construct in the general theory of crime: An investigation in terms of personality psychology. *Psychology, Crime & Law*, 9, 61–86.
- Sampson, R., & Laub, J. (2003). Life-course desisters? Trajectories of crime among delinquent boys followed to age 70. *Criminology*, 41, 555–592.
- Sampson, R., & Laub, J. (1995). Understanding variability in lives through time: Contributions of life-course criminology. *Studies on Crime and Crime Prevention*, 4, 143–158.
- Sampson, R., & Laub, J. (1993). *Crime in the making: Pathways and turning points through life*. Cambridge, MA: Harvard University.

- Schmeichel, B. J., & Baumeister, R. F. (2004). Self-regulatory strength. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 84–98). New York: Guilford Press.
- Smith, T. R. (2004). Low self-control, staged opportunity, and subsequent fraudulent behavior. *Criminal Justice and Behavior*, 31, 542–563.
- Tittle, C. R., Ward, D. A., & Grasmick, H. G. (2004). Capacity for self-control and individuals' interest in exercising self-control. *Journal of Quantitative Criminology*, 20, 143–172.
- Tittle, C. R., Ward, D. A., & Grasmick, H. G. (2003). Gender, age, and crime/deviance: A challenge to self-control theory. *Journal of Research in Crime and Delinquency*, 40, 426–453.
- Turner, M. G., Piquero, A. R., & Pratt, T. C. (2005). The school context as a source of self-control. *Journal of Criminal Justice*, 33, 327–339.
- Turner, M. G., & Piquero, A. R. (2002). The stability of self-control. *Journal of Criminal Justice*, 30, 457–471.
- Vazsonyi, A. T., & Belliston, L. M. (2007). The family → low self-control → deviance: A cross-cultural and cross-national test of self-control theory. *Criminal Justice and Behavior*, 34, 505–530.
- Vazsonyi, A. T., & Crosswhite, J. M. (2004). A test of Gottfredson and Hirschi's general theory of crime in African American adolescents. *Journal of Research in Crime and Delinquency*, 41, 407–432.
- Vazsonyi, A. T., Pickering, L. E., Junger, M., & Hessing, D. (2001). An empirical test of A General Theory of Crime: A four-nation comparative study of self-control and the prediction of deviance. *Journal of Research in Crime and Delinquency*, 38, 91–131.
- Wang, G. T., Qiao, H., Hong, S., & Zhang, J. (2002). Adolescent social bond, self-control and deviant behavior in China. *International Journal of Contemporary Sociology*, 39, 52–68.
- Winfrey, L. T., Jr., Taylor, T. J., & Esbensen, F. (2006). Self-control and variability over time: Multivariate results using a 5-year, multisite panel of youths. *Crime and Delinquency*, 52, 253–286.
- Wright, J. P., & Beaver, K. M. (2005). Do parents matter in creating self-control in their children? A genetically informed test of Gottfredson and Hirschi's theory of low self-control. *Criminology*, 43, 1169–1198.
- Yun, I. (2008). *Wengu Zhixin*: Review the old and know the new. *Asia Pacific Journal of Police & Criminal Justice*, 6, 3–23.
- Yun, I., & Walsh, A. (2012). The stability of self-control among South Korean Adolescents. *International Journal of Offender Therapy and Comparative Criminology*. (in press)