THE DEVELOPMENT OF SELF-CONTROL: EXAMINING SELF-CONTROL THEORY’S STABILITY THESIS*

CARTER HAY
WALTER FORREST
College of Criminology and Criminal Justice
Florida State University

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Research on self-control theory consistently supports its central prediction that low self-control significantly affects crime. The theory includes other predictions, however, that have received far less scrutiny. Among these is the argument that self-control is developed early in childhood and that individual differences emerging then persist over time. The purpose of this study is to provide a rigorous test of the stability thesis. First, we examine the extent of stability and change in self-control for a national sample of U.S. children age 7 to age 15. Second, we consider whether parenting continues to affect self-control during adolescence—a period after the point at which self-control differences should be fixed. The analysis revealed strong absolute and relative stability of self-control for more than 80 percent of the sample, and this stability emerged in large part as early as age 7. Contradicting the theory was a smaller portion of respondents (roughly 16 percent) who experienced substantial absolute and relative changes in self-control even after the age of 10. Moreover, parental socialization continued to affect self-control during adolescence, even after

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accounting for both prior self-control and exposure to parental socialization.

In the past two decades, Gottfredson and Hirschi’s (1990) self-control theory has inspired extensive new research on the causes of crime and deviance, with most studies supporting the theory. Specifically, low self-control significantly affects such things as drunken driving (Keane, Maxim, and Teevan, 1993; Piquero and Tibbetts, 1996), self-reported juvenile delinquency (LaGrange and Silverman, 1999; Paternoster and Brame, 1998), official juvenile delinquency (Brownfield and Sorensen, 1993; Polakowski, 1994), and criminal behavior and analogous acts among adults (Evans et al., 1997; Grasmick et al., 1993). Moreover, the associations between self-control and these outcomes have been substantively important. In their meta-analysis of prior research, Pratt and Cullen (2000) conclude that low self-control has an average effect size that qualifies it as “one of the strongest known correlates of crime” (952).

These results clearly support the theory’s central prediction that low self-control significantly affects crime. It is important, however, that the theory includes other predictions that have received much less scrutiny. For example, only a handful of studies have examined the argument that variation in self-control is explained primarily by parental socialization (Hay, 2001; Pratt, Turner, and Piquero, 2004; Turner and Piquero, 2005). Similarly, few studies have tested the theory’s implicit argument that the effects of low self-control depend on one’s access to criminal opportunities (Grasmick et al., 1993; LaGrange and Silverman, 1999).

Another unresolved issue—and the one that is the focus of this research—involves the stability of self-control. Gottfredson and Hirschi (1990) argue that self-control is developed early in childhood as a result of parental socialization, and that individual differences emerging then persist over time. To be clear, their position is one of relative stability—absolute levels of self-control may change over time, but one’s self-control relative to similarly-aged others should be stable. In Hirschi and Gottfredson’s words, “the differences observed at ages 8 to 10 tend to persist.... Good children [those with self-control] remain good. Not so good children remain a source of concern to their parents, teachers, and eventually to the criminal justice system” (2001: 90).

Testing this prediction about the stability of self-control offers the chance to further assess a theory that has in recent decades energized research on the causes of crime. As noted above, though self-control clearly is a strong predictor of crime, little is known about the process by which it develops over time. The stability hypothesis also has implications for criminological theory more generally. If self-control is fixed early in
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life, then the adolescent and adult roles and relationships that most theories emphasize emerge after criminal propensity has become fixed. Such a conclusion would bolster those theories concerned with the earliest stages of the life course, including theories put forth by Moffitt (1993) and Wilson and Herrnstein (1985). A finding of lower stability in self-control, on the other hand, would support the many theories that see adolescence and adulthood not simply as a time when existing trends are continued, but as periods of formative development in and of themselves (for example, Sampson and Laub, 1993).

Despite the theoretical importance of this issue, empirical scrutiny of it has been rare. Only four tests appear in the published literature (Arneklev, Cochran, and Gainey, 1998; Burt, Simons, and Simons, 2006; Raffaelli, Crocket, and Shen, 2005; Turner and Piquero, 2002). This scarcity is understandable, with early research prioritizing the theory’s central prediction that self-control affects crime. Also important, however, is that the stability thesis is genuinely difficult to test, given the need for longitudinal data that contain repeated measures of self-control.

The purpose of this study is to provide a comprehensive, rigorous test of the stability thesis. Using data from a national sample of children in the United States, we test two hypotheses regarding the stability of self-control from roughly age 7 to age 15. The first involves the most straightforward interpretation of the stability thesis: Whether the starting point for self-control is high or low, the vast majority of individuals should exhibit significant stability in self-control over the course of the study period. We go beyond earlier studies by considering that self-control may not develop in a uniform pattern for all individuals in the sample. Considering this is central to evaluating the stability thesis, because the average pattern for a sample (which is revealed in prior studies by a single stability coefficient) may obscure significant variation among individuals. Self-control may be highly stable for some individuals, but less so for others, and a rigorous test of the stability hypothesis should use methods that can detect such patterns.

A second hypothesis involves the role that parental socialization plays in adolescence in explaining variations in self-control. Gottfredson and Hirschi (1990) argue that parental socialization will be consequential for self-control primarily before age 10. After that point, however, it should have little impact on self-control—if individual self-control rankings are in fact stable beyond age 10, then dynamic factors (such as parental socialization) that explain initial variation in self-control should not explain variation at later points in the life course, once prior differences are accounted for. These arguments lead to a second hypothesis to be tested: Parental socialization occurring after age 10 should have little
effect on self-control, once an analysis accounts for the child’s prior level of self-control and exposure to parental socialization.

These two hypotheses are tested with data from the National Longitudinal Study of Youth, and self-control is measured with items from the Behavior Problems Index, which has been used in several tests of self-control theory (Pratt, Turner, and Piquero, 2004; Raffaelli, Crockett, and Shen, 2005; Turner and Piquero, 2002). Before further discussing the data and measures, we describe self-control theory and its stability thesis in greater detail. We then review the studies that have tested it, noting the ways in which new research can build upon those efforts.

**SELF-CONTROL THEORY AND THE STABILITY THESIS**

Self-control theory is grounded in the classical view of human behavior: “All human conduct can be understood as the self-interested pursuit of pleasure or the avoidance of pain” (Gottfredson and Hirschi, 1990: 5). Crime is perceived as a universally desirable way of pursuing self-interest because it provides “immediate, easy, and short-term pleasure” (41). Thus, consistent with the general control perspective, this theory asks not what causes crime, but rather, what constrains it. For Gottfredson and Hirschi, the answer is self-control—“the tendency to avoid acts whose long-term costs exceed their immediate or short-term benefits” (Hirschi and Gottfredson, 2001: 83). Those who lack self-control will be less able and willing to resist the immediate pleasures associated with criminal behavior.

Inadequate parental socialization is argued to be the principal cause of low self-control. Specifically, parents who fail to monitor the child’s behavior, recognize deviant behavior when it occurs, and punish such behavior will have children with low self-control. Affection for or investment in the child is seen as the principle factor motivating parents to satisfy these three conditions. In Gottfredson and Hirschi’s words, “the person who cares for the child will watch his behavior, see him doing things he should not do, and correct him” (1990: 97).

The stability thesis involves the argument that this learning process occurs early in life, and that individual differences emerging then will persist. In *A General Theory of Crime*, “early in life” was described simply as the period “before differences in criminal behavior... are possible” (Gottfredson and Hirshi, 1990: 177). Hirschi and Gottfredson are more specific in a later work, clarifying that “by the age of 8 or 10, most of us learn to control [antisocial] tendencies.... Others, however... continue to employ the devices of children.... [These] differences observed at ages 8 to 10 tend to persist from then on” (2001: 91).
Key to this argument is the distinction between absolute and relative stability. Absolute stability exists if people experience no within-individual changes in self-control as they age—the absolute level of self-control at one age is equal to the absolute level of self-control at a later age. Relative stability, on the other hand, pertains to one’s level of self-control relative to similarly-aged others. Relative stability occurs when there are no between-individual changes in self-control—one’s self-control ranking in a sample remains roughly the same over time. By all appearances, the stability thesis pertains primarily to the issue of relative stability—beyond age 10, a person’s position in the self-control distribution for his or her age cohort should remain the same. Indeed, Gottfredson and Hirschi (1990) indicate that absolute self-control may not necessarily be stable. It likely increases with age because “socialization continues to occur throughout life” (107).

There is an additional prediction that follows from these arguments, and it relates to the causes of self-control. If individual self-control rankings are in fact stable beyond age 10, then dynamic factors (such as parental socialization) that explain initial variation in self-control should do little to explain variation at later stages of the life course, once prior differences are accounted for. After all, any changes over time in self-control rankings should be “small... [and] accounted for in large part by misidentification or measurement error” (108). Moreover, the theory appears to suggest that parental socialization is not dynamic—it should be quite stable, given that it is seen as a function of parental levels of self-control (Gottfredson and Hirschi, 1990: 100). Thus, with both self-control and exposure to parental socialization subject to little change after the child reaches age 10, there should be minimal covariation between the two, once prior levels of self-control and parental socialization are accounted for.

To date, there are just four tests of self-control theory’s stability thesis. Each assesses the extent of stability by examining correlations between self-control scores measured at different times. These stability coefficients indicate the degree to which the relative ranking of individuals is maintained over time. A study by Arneklev and his colleagues (1998) found strong evidence of short-term stability. Their analysis, which relied on data from a sample of college students surveyed at the beginning and end of an academic semester, revealed a correlation of .82 between time 1 and time 2 levels of self-control. Turner and Piquero (2002), on the other hand, used data from a national probability sample to examine changes in self-control over a longer period, from roughly age 7 to age 19. Dividing the sample between offenders and nonoffenders, they observed moderate stability, with within-group correlations ranging between .33 and .68.
Studying a sample of African-American children age 10 to age 12, Burt, Simons, and Simons (2006) found a correlation of .48 between time 1 and time 2 measures of self-control, with 2 years separating the two periods. Additionally, they observed that from time 1 to time 2, roughly half of all respondents experienced a change in their self-control ranking that moved them from one quartile of the distribution to another. A final study (Raffaelli, Crockett, and Shen, 2005) did not explicitly test self-control theory, but instead examined the stability of self-regulation, a concept similar to self-control. Psychologists have long been interested in the origins and development of self-regulation (Bronson, 2000), but such research has generally examined only the first 6 to 8 years of life. Raffaelli and colleagues (2005) provide an exception by examining changes in self-regulation from age 4 to age 14. Their analysis revealed a correlation of .49 between self-control levels at ages 4 and 8 and of .50 for ages 9 to 13.

Taken together, these studies suggest that self-control is moderately stable during a period in which Gottfredson and Hirschi predict that it would be highly stable. Moreover, the finding that stability coefficients did not increase as children aged (Raffaelli, Crockett, and Shen, 2005) contradicts the idea that self-control is fixed beyond age 8 or 10. There are, however, two clear ways in which research can go beyond these studies to provide a more comprehensive evaluation of the stability hypothesis.

The first involves considering that self-control may not follow a uniform developmental progression across the population. By examining bivariate correlations between self-control levels at different times (that is, stability coefficients), these studies identified an overall level of stability across an entire sample. This approach is problematic if a sample is comprised of unique clusters that exhibit distinct patterns of development. By focusing on a single correlation, researchers assume that a pattern of moderate stability for the sample as a whole accurately describes most individuals in that sample. On the contrary, the overall pattern may obscure significant variation among individuals—some may be characterized by overwhelming stability and others by notable changes.

A growing body of research confirms this sort of developmental variability by revealing that many traits and behaviors are not characterized by a single developmental trajectory that applies to all individuals (Broidy et al., 2003; Jackson, Sher, and Schulenberg, 2005; Maughan et al., 2003; Nagin and Tremblay, 1999). This theme of developmental variability also is central to a number of taxonomic theories of crime (Moffitt, 1993; Patterson, DeBaryshe, and Ramsey, 1989) as well as life-course (Elder, 1994) and holistic, interactionist perspectives (Magnusson, 1995) on human development. Gottfredson and Hirschi
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(1990; Hirschi and Gottfredson, 2001) clearly see the development of self-control in different terms—beyond age 10, all individuals (whether high or low in self-control) should have self-control trajectories that are roughly similar to those of others (at least to the point that they do not traverse one another), therefore leaving the original self-control rankings unchanged. Thus, whereas some theories predict developmental variability, Gottfredson and Hirschi predict more uniform development (beyond age 10) across individuals. Considering the accuracy of this prediction is central to evaluating the stability thesis.

A second issue to consider involves the role that parental socialization plays in explaining the stability or change in self-control during adolescence. Gottfredson and Hirschi’s (1990: 109) assertion of such strong stability is consistent with the idea that by age 10, differences in self-control reflect individual, personality traits that largely cannot change beyond the early years of development. As noted, however, the few studies to date suggest that self-control may be only moderately stable. Moreover, even if self-control is seen as a trait with a presumed biological basis (see Wright and Beaver, 2005), recent research in neurology suggests that significant brain development continues well into adolescence (National Institute of Mental Health, 2001). This suggests that parents—and perhaps other socializing agents—can continue to influence their child’s level of self-control well after the age of 10. This possibility has been considered only minimally to date, with a study by Burt, Simons, and Simons (2006) suggesting that self-control remains responsive to parenting through the early stages of adolescence.

THE PRESENT STUDY

The purpose of this study is to provide the most rigorous test to date of self-control theory’s stability thesis. Two hypotheses are tested in an analysis of self-control from age 7 to age 15. The first is that the vast majority of individuals should have a self-control trajectory that is marked by significant stability. We initially test this hypothesis in the same way that prior studies have—by examining correlations between self-control scores measured at different points in time. These stability coefficients provide a straightforward assessment of the average level of stability across a sample. We go beyond this approach, however, by using a group-based modeling approach to consider whether the sample contains distinctive clusters of individual patterns of development, such that self-control is stable for some individuals, but not for others.

Our second hypothesis involves the role that parental socialization plays during adolescence in explaining levels of self-control. Gottfredson
and Hirschi argue that parental socialization is the chief cause of differences in self-control, but that its importance is limited to the years prior to age 10. The resulting hypothesis is that patterns of parental socialization occurring in adolescence should not explain differences in self-control at that time, once the analysis accounts for a child’s prior level of self-control and earlier exposure to parental socialization.

DATA

These hypotheses are tested with data from the Child and Young Adult Supplement of the National Longitudinal Study of Youth (NLSY79). The NLSY79 is a national longitudinal study of more than 12,000 men and women who were between 14 and 21 years old in 1979. The project was supported by the United States Department of Labor and was administered by the National Opinion Research Center. Its purpose was to assess the period of life in which youths complete high school and enter the labor force. The study was designed to oversample blacks, Hispanics, and economically disadvantaged non-Hispanic whites, who were expected to be at greater risk for experiencing problems in the transition from adolescence to adulthood.

The Child and Young Adult Supplement is a longitudinal study of the children born to mothers from the original NLSY79 sample. Interviews with mothers and their children have been conducted approximately every 2 years since 1986 to the point that the study now includes information on more than 11,000 children. In addition to containing detailed measures of the cognitive, emotional, and physiological development of children, the study includes assessments of child behavioral problems and their home environments, including extensive measures of parental socialization. With its large sample size, comprehensive measurement, and frequency of data collection, the Child and Young Adult Supplement offers an excellent opportunity to observe the progression of self-control from early childhood, through late childhood, and into middle adolescence.

Our analysis examines change across five data points that span a 9-year period from roughly age 7 to age 15. This period captures the years both leading up to and then following the critical age of 10 that marks the point

1. With appropriate weighting, the Child and Young Adult Supplement is representative of a national sample of children born to mothers who were themselves aged between 14 and 21 in 1979. Because appropriate weights are available only for cross-sectional analyses or analyses that are based on children in a single birth cohort, all analyses reported in this paper (which use data from multiple waves of the survey and numerous birth cohorts) were conducted without the use of sample weights.
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at which differences in self-control should be fixed. At the five data points that are studied, respondents are classified into 2-year age ranges (6 to 7, 8 to 9, 10 to 11, 12 to 13, and 14 to 15) to minimize the impact of slight variations in age and the timing of interviews. For simplicity, we refer to these ranges by the maximum age in each range.

The data for each subject’s 9-year stretch come from the child and young adult surveys administered every other year between 1986 and 2002. For a case to be included in our sample, we required that it contain data on self-control for at least four of the five age periods being considered. This created a maximum sample size for the analyses of 3,793, with all children born between 1977 and 1990. The sample sizes sometimes fluctuate across different analyses because of variations over time in the NLSY79 survey. Most notably, the Behavior Problems Index (used to measure self-control) was phased out for 15 year olds after 1994. Additionally, the parental socialization items were introduced into the survey in 1990 and 1992, and were not used for 15 year olds after 1994. The main result of these features of the NLSY is that it lowers our sample sizes for analyses of 15 year olds. We nevertheless have retained these analyses because the sample sizes remain at acceptable levels (always above 600) and because the loss of cases did not significantly alter the composition of the sample with respect to such things as age, sex, and average levels of parental socialization and self-control. Moreover, extending the analysis as far into adolescence as possible provides greater insight into the accuracy of the hypotheses.

MEASURES

SELF-CONTROL

The measurement of self-control has been a central issue in tests of self-control theory. Two types of measures are most common: attitudinal measures (like the measure used by Grasmick et al. [1993]) in which respondents rate themselves on various indicators of self-control and, alternatively, behavioral measures that assess individual involvement in noncriminal behaviors thought to be manifestations of low self-control.

2. For example, subjects’ average level of self-control over the study period was identical (2.60 on a scale with a maximum of 3.00) for both the full sample and the sample that excludes cases with missing data at age 15. The only apparent effect of this loss of cases was a slight change in the racial composition of the sample, with blacks representing 34 percent of the full sample and 37 percent of the sample in the analysis of self-control at age 15. As noted below, for these analyses, we include race as a control variable.
Hirschi and Gottfredson (1993) have argued for the latter, emphasizing that self-reports of self-control may have significant measurement error because “the level of self-control itself affects survey responses” (48). Behavioral measures may, however, produce relationships between self-control and crime that are tautological. Both types of measures have been commonly used, and prior research suggests that the two are significantly related to one another (Evans et al., 1997) and have similar effects on crime and deviance (Pratt and Cullen, 2000; Tittle, Ward, and Grasmick, 2003).

In the present study, a behavioral measure of self-control is used. This was done in part because studies with young children (as young as age 6 in our sample) practically require a behavioral measure—attitudinal measures with young children likely would have poor validity and reliability. Also important, however, is that each wave of the NLSY included items from the Behavior Problems Index (BPI), a well-validated inventory (see Zill and Peterson, 1990) used to measure self-control in several prior studies (Pratt, Turner, and Piquero, 2004; Raffaeelli, Crockett, and Shen, 2005; Turner and Piquero, 2002). The BPI is a 32-item scale created by Peterson and Zill (1986) that measures internalizing and externalizing problem behavior among children and adolescents. It is a composite of six subscales (antisocial, anxious or depressed, headstrong, hyperactive, dependent, and peer conflicts). Mothers rate their children on the thirty-two items according to how often each statement applies, with possible responses including “often true,” “sometimes true,” and “not true.”

From the thirty-two BPI items, we first excluded thirteen that come mainly from the subscales that measure depression (such as “child feels worthless and inferior”) and dependence (such as “child clings to adults”). Gottfredson and Hirschi (1990) never identify these behaviors as likely outcomes of low self-control. One additional item (“child hangs around with kids who get into trouble”) was omitted because it relates too closely to delinquent peer association, the central variable in a different theory (Akers, 1998). Although we omitted these items because of these conceptual and theoretical concerns, doing so likely had minimal effect on the findings. Correlations between alternative scales that contained or omitted these questionable items always exceeded .90 and often were as high as .99.

The remaining nineteen items have strong face validity as behavioral measures of low self-control because they involve behaviors Gottfredson and Hirschi (1990) explicitly identify as likely outcomes of low self-control. These behaviors include impulsivity (those low in self-control have “a concrete ‘here and now’ orientation” [89]), self-centeredness (“people with low self-control [are] self-centered, indifferent, or
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insensitive to the needs of others” [89]), difficulty getting along with others (those with low self-control “have difficulty acquiring and retaining friends” [94]), an inability to regulate attention and emotions (those low in self-control are prone to “sudden changes of plan and loss of temper in response to what appear to others as minor frustrations” [93]), and an inability to avoid various noncriminal forms of deviance, including lying and disobedience at school (91–94).

The nineteen BPI items are shown in appendix A, along with the item factor loadings and Cronbach’s alphas for each wave of the survey. In constructing the scale, items were coded such that high values indicate high levels of self-control. The items were averaged for each individual, and self-control scores were computed for each child at ages 7, 9, 11, 13, and 15. As the figures in appendix A indicate, these nineteen items coalesce. For example, confirmatory factor analyses reveal that all items have high loadings on a common factor in each wave of the survey. Also, the Cronbach’s alphas at each wave are very high as well, with an average of .88 across the different waves of the survey.

PARENTAL SOCIALIZATION

Gottfredson and Hirschi (1990) argue that the key predictor of self-control is the extent to which parents consistently control the child’s behavior. Several studies (for example, Hay, 2001; Pratt, Turner, and Piquero, 2004) support their emphasis on parental control (as indicated by such things as monitoring and discipline), but also suggest that parental warmth and attachment encourage self-control, perhaps by making children more sensitive to parents’ expectations (Baumrind, 1991; Feldman and Weinberger, 1994; Hay, 2001; Hope and Chapple, 2005). The parental socialization measure for this study is a composite scale that incorporates aspects of both parental control and warmth. Specifically, we used five maternal self-report items that asked mothers how many of the child’s friends are known by name and sight, whether they know who the child is with when he or she is away, and how frequently they hug or kiss the child, praise the child, or compliment the child to other adults. To facilitate the construction of a common scale, each item was coded on a 3-point scale, with high scores indicating parenting behaviors that should encourage self-control. For example, for the item measuring knowledge of the child’s friends, responses were coded 1 if the mother knew half or fewer of the child’s friends, coded 2 if she knew most of the friends, and 3 if she knew all of them. Similarly, for the item measuring physical affection, responses were coded 1 if the mother showed affection less than
once per day, coded 2 if one to two times per day, and 3 if three or more times per day. These five items were averaged to produce an overall measure of effective parental socialization for ages 7, 9, 11, 13, and 15 (with an alpha that ranges from .65 to .74 across the age groups).

**ANALYTIC METHOD**

The hypothesis that self-control is stable over time is tested with a semiparametric group-based method for modeling trajectories of individual development. Rather than identifying a single pathway that approximates the development of self-control for an entire population, the group-based approach allows multiple, divergent developmental pathways. This method, outlined by Nagin and Land (1993) and advanced by Nagin (1999, 2005) is intended to identify relatively homogenous clusters of individuals who follow similar developmental pathways over time. This is achieved using a multinomial modeling approach that models the developmental trajectory of each individual as a function of age and membership in one of a finite number of latent groups that are intended to approximate a continuous population distribution (that is, censored normal, logistic, or Poisson distributions). Three parameters are estimated: the developmental trajectory of each group, the posterior probabilities of group membership for each individual included in the analysis, and the estimated percentage of the population in each latent trajectory group.

3. The items dealing with physical affection, praise, and complimenting the child to others were open-ended items that asked for the raw frequency of these events in the last week. As expected the frequencies were quite high for some respondents. To reduce skew and to make these items comparable with the other two items (that are ordinal) to be included in this scale, the raw counts were collapsed into three categories corresponding to the levels that most consistently divided the sample into thirds across the different waves of the study.

4. The model to be estimated is

\[ y_{it}^* = \beta_0 + \beta_1 \text{Age}_{it} + \beta_2 \text{Age}_{it}^2 + \epsilon_{it} \]

where \( y_{it}^* \) is a latent variable (self-control) for a given individual \( i \) at time \( t \) conditional on his or her membership in group \( j \). Age refers to his or her age at time \( t \) whereas \( \text{Age}^2 \) is his or her age squared at time \( t \). The model thus specifically tests for change in the level of self-control over time by estimating the linear and quadratic effects of age. Because the measure of self-control used in this paper ranged from 1 to 3, we ran these analyses using the censored normal distribution. Therefore, in the equation above, the latent variable \( y_{it}^* \) is related to the observable yet censored indicator of self-control as follows:

- \( y_{it} = 1 \) if \( y_{it}^* < 1 \)
- \( y_{it} = y_{it}^* \) if \( 1 \leq y_{it}^* \leq 3 \) and
- \( y_{it} = 3 \) if \( y_{it}^* > 3 \)
The number of trajectory groups must be specified before estimation. In the absence of expectations about the number of distinctive developmental trajectories of self-control, the optimal number of groups is best identified through an iterative process in which groups are added, one at a time, to the model. The Bayesian Information Criteria (BIC) can be used to help verify the model specification that most closely and efficiently describes patterns that exist in the data (Jones, Nagin, and Roeder, 2001; Nagin, 2005).

We should note the recent debate on the appropriate uses and interpretation of this method. Sampson and Laub (2003, 2005; Sampson, Laub, and Eggleston, 2004) have expressed concern that group-based models invite reification, whereby the groups identified in such models (such as “life-course-persistent offenders”) come to be treated as concrete entities. This exaggerates group differences by suggesting that individuals from different groups are qualitatively different, that the causes of their behavior are distinct, and that different (and perhaps draconian) policies are needed for the most undesirable groups. Sampson and Laub (2003, 2005) argue that evidence of qualitatively distinct groups with unique etiologies is quite limited, but that unreflective use of group-based models may advance a different conclusion. Nagin and Tremblay (2005) emphasize, however, that reification is an interpretation problem. They emphasize that “group” is used within this method simply to refer to clusters of individual trajectories that follow a similar developmental pattern, and that different groups reflect different points on a continuum rather than distinct, concrete entities. Moreover, individuals within a group do not necessarily move in lockstep with one another; a trajectory is merely an average for a group’s individuals.

Our use of group-based models avoids reification altogether and seems to fit within Sampson and Laub’s (2005: 911) view of “proper, even important, uses” of this method. Our interest is not in whether different

Individuals are assigned to the groups for which the posterior probability of group membership is largest. This posterior probability is calculated as

$$\hat{P}(j|Y_i) = \frac{\hat{P}(Y_i|j)\hat{\pi}_j}{\sum_j \hat{P}(Y_i|j)\hat{\pi}_j}$$

The numerator consists of the product of the predicted probability of observing the self-control trajectory of individual $i$ given his or her membership in group $j$ and the estimated proportion of the population in group $j$. Thus, respondents are assigned to the group to which they are considered most likely to belong given their scores on the dependent variable (self-control). These statistics also provide a useful metric of the accuracy of the group-based trajectory model and form the basis of several tests for model accuracy (Nagin, 2005).
trajectories reflect distinct types of individuals, but instead in whether self-control trajectories of differing slopes exist in the first place. Gottfredson and Hirschi (1990) predict that beyond age 10 trajectories with vastly different slopes will not exist—each individual will follow a pattern roughly similar to that of others, at least to the point that the differences that emerged by age 10 will remain largely intact. A group-based modeling approach is ideally suited to testing this prediction, because it explicitly tests for the presence of variability in self-control development. By using this theory-driven approach, our analysis follows Sampson and Laub’s (2005: 911) recommendation that group-based modeling should be “inextricably linked to, and the servant of, theory.”

RESULTS

HYPOTHESIS ONE

The first hypothesis to consider is that our sample should be characterized by substantial stability in self-control. We examine this first with the approach used in earlier studies—by examining correlations between self-control scores measured at different times. These stability coefficients indicate the extent of relative stability—the extent to which the relative ranking of individuals is maintained over time. Table 1 shows these correlations for the five ages (ages 7, 9, 11, 13, and 15) considered in this study. These correlations reveal two key patterns. First, self-control is moderately stable over the short term, but less so over the long term. For example, self-control at age 7 has a correlation of .64 with self-control at age 9, but its correlation with self-control at later ages drops continuously, reaching .43 for self-control measured 8 years later at age 15. This drop in stability is observed even when focusing only on those age 9 or older—those for whom self-control should be most stable. A second pattern is that short-term stability (stability over a 2-year period) does not appreciably increase as the children age. For example, stability in self-control from age 7 to age 9 ($r = .64$) is essentially the same as stability from age 9 to age 11 ($r = .67$), 11 to 13 ($r = .65$), and age 13 to age 15 ($r = .65$).5

Overall, these correlations are moderate and fall short of the strong stability Gottfredson and Hirschi (1990) assert. As noted earlier, however,

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5. An additional descriptive analysis also pointed to nontrivial changes in self-control rankings. For each respondent, we computed the difference between one’s self-control percentiles at ages 11 and 15, and then examined the frequency distribution of those differences. Thirty-one percent of respondents experienced a change in their self-control percentile (either up or down) of at least 25 percentile points.
an analysis of stability coefficients does not address an important possibility—a pattern of moderate stability for the sample as a whole may obscure substantial variation for unique clusters of the population. To consider this, we used the group-based modeling strategy.

We estimated trajectories of self-control for as many as eleven clusters of children. BIC estimates from these models (shown in table 2) indicate that the addition of each group, up to ten, provided a more complete description of the sample patterns; that is, as we increased the number of groups, additional clusters of children emerged whose self-control levels followed a common progression. These results clearly justify using a group-based trajectory model rather than a method that approximates the average stability of self-control for the sample. A goal of this method, however, is to offer a parsimonious compromise between the chaos of thousands of individual trajectories and the dogmatism of a single trajectory. Although a ten-group model captures the sample’s variability more accurately than models with lesser groups, an eight-group model provides the same substantive conclusions. In the interests of parsimony, the results reported below relate to an eight-group model. (All results are available upon request.)

Figure 1 shows the eight estimated trajectories of self-control for children age 7 through age 15. Each trajectory is given a hyphenated label that indicates its initial level of self-control and the nature of its change over time (for example, high-stable). For each trajectory, figure 1 also reports the estimated percentage of children in each group.

These trajectories can be assessed in reference to both absolute and relative stability. Regarding the former, there is strong evidence of absolute stability in self-control. Figure 1 reveals four clusters of individuals—very high-stable (12 percent of the sample), high-stable (42 percent), medium-stable (26 percent), and low-stable (4 percent)—marked by nearly no change from age 7 to age 15 in absolute levels of self-control. Taken together, these groups comprise 84 percent of the sample. The fact that these highly stable groups largely contain those with the highest levels

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6. Average posterior probabilities for the eight groups range from .75 to .92, and therefore exceed the recommended value of at least .7 for all groups (Nagin, 2005: 88). Additionally, it should be noted that identifying the various individual characteristics that may explain respondents’ membership in one group or another is beyond the scope of this study, and also raises concerns about the reification issue (Sampson and Laub, 2005). It is the case, however, that females, whites, and those exposed to high average levels of parental socialization over the study period were overrepresented in the high-stable and very high-stable groups. The analyses used to test the next hypothesis indicate that racial-ethnic differences in self-control disappear in multivariate models.
of self-control in the sample supports Gottfredson and Hirschi’s argument that successful development of self-control occurs very early in life. Indeed, for these three groups absolute levels of self-control appear to be established even before the age of 10 that is specified by self-control theory.

Table 1. Self-Control Stability Coefficients (sample size in parentheses)

<table>
<thead>
<tr>
<th>Age</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>.64</td>
<td>.59</td>
<td>.52</td>
<td>.43</td>
</tr>
<tr>
<td></td>
<td>(3,414)</td>
<td>(3,431)</td>
<td>(3,422)</td>
<td>(669)</td>
</tr>
<tr>
<td>9</td>
<td>—</td>
<td>.67</td>
<td>.59</td>
<td>.53</td>
</tr>
<tr>
<td></td>
<td>(3,670)</td>
<td>(3,661)</td>
<td>(908)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>—</td>
<td>.65</td>
<td>.57</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3,678)</td>
<td>(925)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>—</td>
<td>.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(916)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Bayesian Information Criteria (BIC) Results for Estimating the Probability that a \(j\)-Group Model is the Correct Model \((n = 3,793)\)

<table>
<thead>
<tr>
<th># of Groups</th>
<th>BIC</th>
<th>Probability Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-6,617.95</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>-4,129.8</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>-3,441.23</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>-3,202.15</td>
<td>0.00</td>
</tr>
<tr>
<td>5</td>
<td>-3,056.86</td>
<td>0.00</td>
</tr>
<tr>
<td>6</td>
<td>-2,971.42</td>
<td>0.00</td>
</tr>
<tr>
<td>7</td>
<td>-2,868.11</td>
<td>0.00</td>
</tr>
<tr>
<td>8</td>
<td>-2,831.46</td>
<td>0.00</td>
</tr>
<tr>
<td>9</td>
<td>-2,804.21</td>
<td>0.00</td>
</tr>
<tr>
<td>10</td>
<td>-2,770.96</td>
<td>1.00</td>
</tr>
<tr>
<td>11</td>
<td>-2,778.58</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Note: The probability correct column reports the estimated probability that a model with \(j\) groups is the correct model from a set of \(J\) different models (see Nagin, 2005: 70).
THE DEVELOPMENT OF SELF-CONTROL

Figure 1. Trajectories of Self-Control ($n = 3,793$)

The remaining subjects (roughly 16 percent) are divided into clusters that show varying degrees and directions of absolute change in self-control. One group (low-increasing) that includes 5 percent of the sample shows a pattern of gradual, steady increases in absolute self-control that continue through the end of the study period at age 15. The three remaining groups (representing 11 percent of the sample) followed an unexpected pattern—their absolute levels of self-control dropped during the study period. The medium-decreasing group (9 percent of the sample), for example, experienced a gradual but steady drop that continued through age 15. Additionally, the high-decreasing group (1 percent of the sample) experienced a sharp decrease (significant at $p \leq .01$) that was most notable from age 11 to age 15. Last, the low-curvilinear group (representing 1 percent of the sample) experienced a steady drop in absolute self-control from age 7 to age 13, but then a relatively sharp increase from age 13 to age 15. Although these groups comprise only 11 percent of the overall sample, these patterns nevertheless contradict Gottfredson and Hirschi’s (1990: 107–8) claim that, once gained, self-control cannot be lost. In the conclusion, we return to this issue, noting some of the theory and research in psychology suggesting that self-control can decline over time.
The key issue for the stability hypothesis is whether these patterns regarding absolute stability have significant implications for relative stability—that is, do they involve shifts in self-control that shift individuals' relative positions in the self-control distribution after the age of 10? This question is assessed by considering whether the trajectories traverse one another; if so, this would indicate a certain degree of re-shuffling of the self-control rank ordering. Figure 1 shows that the trajectories for the two groups highest in self-control (very high-stable and high-stable) do not traverse any others. Thus, the individuals in these two groups, 54 percent of the sample, are marked by nearly perfect relative stability—as early as age 7, they are higher in self-control than nearly all others in the sample, and this remains the case through age 15.

The remaining 46 percent, however, fit into groups whose trajectories traverse the line for at least one other group. For the medium-stable and low-curvilinear groups, 26 percent and 1 percent respectively, this occurs despite their overall pattern of absolute stability. That is, members of these groups experience a small change in their relative position in the distribution as a result of the changes occurring with other smaller clusters. They thus provide examples of strong but not perfect relative stability. For example, the line for the medium-stable group is traversed around age 13 by that of the low-increasing group that contains 5 percent of respondents. This group had a level of self-control near 2.0 at age 7 (well below the average of 2.6), but its self-control increased steadily to 2.6 by age 15 (a difference that is significant at $p \leq .001$). This increasing trajectory intersected the lines for three other groups, with two of these intersections occurring after age 11.

The clusters that showed decreases in absolute self-control also did so in a way that affected the relative stability of self-control—their trajectories traversed the lines of several other groups, therefore producing changes in the different groups' positions in the distribution. The largest of these is the medium-decreasing group at 9 percent. For these children, self-control levels fell from an average level of about 2.4 at age 7 to near 2.2 by age 15 ($p \leq .001$), with its trajectory crossing those of two other groups. The decrease in self-control was more extreme (also significant at $p \leq .001$) for the high-decreasing group, which is just 1 percent of the sample. At age 7, this group had an average self-control level that ranked near the top. From that point forward, however, their downward trajectory traversed the lines for six other groups, leaving them at age 15 with the lowest average self-control of any group. This drop was most notable from age 11 to age 15, the period after which self-control should theoretically be fixed.
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Taken together, these results suggest strong support for this hypothesis for a majority of the sample, but much less support for a smaller portion. Roughly 84 percent was marked by nearly perfect absolute stability in self-control from age 7 to age 15. A majority of this portion (54 percent of the overall sample) also was marked by perfect relative stability—from the beginning of the study period, these individuals have more self-control than others in the sample, and this remains the case through age 15. There was, however, evidence of change in both absolute and relative levels of self-control for a much smaller portion of the sample. The groups displaying absolute changes accounted for roughly 16 percent and their trajectories always traversed the trajectory of one or more other groups. Relative changes are therefore occurring—there is a reshuffling to some degree of subjects’ self-control rankings.

HYPOTHESIS TWO

Attention then turned to whether parental socialization explains variation in self-control beyond childhood into adolescence. If Gottfredson and Hirschi are correct, parental socialization during adolescence should do little to explain differences in self-control at that time, once previous differences are accounted for.

As a first step in testing this hypothesis, we examined self-control levels at ages 13 and 15 with OLS equations that estimate the contemporaneous relationship between parental socialization and self-control while controlling for levels of self-control and parental socialization at the preceding wave (2 years earlier). The results for the two equations are shown in table 3 and point to the continuing influence of parental socialization during adolescence. Although prior self-control is a strong predictor of self-control at each of these ages (with betas of .62 and .63), the contemporaneous relationship between parental socialization and self-control is significant at each age as well. Moreover, rather than declining with age, this relationship is greater at age 15 ($B = .21$) than at age 13 ($B = .11$). Taken together, these results indicate that though the distribution of self-control rankings remains fairly intact (as evidenced by the strong effect of prior self-control), the reshuffling that does occur is significantly linked to patterns of parental socialization. In short, parenting still matters for self-control beyond childhood.

A further analysis examined the robustness of this conclusion. The OLS equations do not account for the possibility that the significant relation-
ships between parental socialization and self-control may be attributable to time-stable differences between respondents that are not fully captured by the control for prior self-control. In short, there could be a problem with persistent unobserved heterogeneity (Nagin and Paternoster, 1991).

Table 3. Results for OLS Regressions Estimating the Relationship between Parental Socialization and Self-Control

<table>
<thead>
<tr>
<th></th>
<th>Self-control, age 13 ($n = 3,378$)</th>
<th>Self-control, age 11</th>
<th>Parental socialization, age 11</th>
<th>Parental socialization, age 13</th>
<th>Parental socialization, age 15 ($n = 905$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$b$</td>
<td>$t$</td>
<td>$B$</td>
<td>$b$</td>
</tr>
<tr>
<td>Self-control, age 11</td>
<td>.62**</td>
<td>.65</td>
<td>33.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization, age 11</td>
<td>.01</td>
<td>.01</td>
<td>.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization, age 13</td>
<td>.11*</td>
<td>.08</td>
<td>6.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-control, age 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization, age 13</td>
<td>-.05</td>
<td>-.04</td>
<td>-1.59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization, age 15</td>
<td>.21**</td>
<td>.15</td>
<td>6.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Both equations included controls for sex and race.

* $p \leq .01$  ** $p \leq .001$

To account for this, the association between parental socialization and self-control was reexamined using a hierarchical linear model (HLM) that enabled us to separate the effects of time-stable factors from our time-varying measure of parental socialization. To that end, a three-level model was estimated in which time periods were nested within individuals and individuals nested within households. Thus, the level 1 model addresses within-individual changes in self-control and the level 2 and 3 analyses explain time-stable differences in self-control between individuals and households.

To assess the impact of changes in parental socialization on changes in self-control, the level 1 analysis included a measure of the difference between the parental socialization score for each child at each age and his or her average for the entire period (from age 7 to age 15). The values have been coded such that positive scores indicate an increase in parental socialization for that year for that child (relative to his or her average across the study), and negative values indicate a decrease in parental socialization. Because this deviation score has a mean value of 0 for every individual, it necessarily is uncorrelated with time-stable individual differences (including one’s average level of self-control across the study period) that could confound the relationship between parental socialization and self-control (see Brame, Bushway, and Paternoster, 1999). This deviation score therefore provides an unbiased estimate of
how changes in parental socialization impact self-control from age 7 to age 15 (see also Horney, Osgood, and Marshall, 1995). It is significant that though an effect of this variable will indicate within-individual changes in absolute self-control that are linked to within-individual changes in parenting, it has obvious implications for relative self-control—subjects' rankings in the self-control distribution. A positive effect of this variable on self-control will indicate that within-individual increases in parental socialization lead to increases in absolute self-control, whereas within-individual decreases in parental socialization lead to absolute decreases in self-control. With children’s absolute levels of self-control changing in these highly varied ways, there necessarily will be changes in self-control rankings.

The level 1 model included two additional variables to determine whether changes in parental socialization have effects that extend beyond age 10. A dummy variable was created that is coded 1 when respondents are age 7 or age 9 and 0 when they are age 11, 13, or 15. This was included in the equation along with an interaction term that is the product of this dummy variable and the measure of changes in parental socialization. Because this product term had no value when children were aged 11, 13, and 15, the effect of changes in parental socialization from age 11 to 15 is evident from the main effect of the parental socialization change measure. The effect of changes in parental socialization from age 7 to age 9, on the other hand, equals the sum of the coefficients for the parental socialization change score and the interaction term. The inclusion of the age dummy also controls for changes in self-control due to aging.

The level 2 analysis included the average level of parental socialization for each individual from ages 7 to 15 in addition to measures of sex and race-ethnicity (African American and Hispanic). The results of the level 2 analysis therefore point to the effects of sociodemographic characteristics and time-stable differences in parental socialization on enduring differences in self-control between individuals in the sample. To allow for the possibility that parental socialization might affect self-control in some families more than in others—for example, as a result of hereditary differences in self-control (Wright and Beaver, 2005)—we estimated average parental socialization as a random-coefficient that varies across households (see appendix B for estimated models).

Table 4 provides the results for this analysis, which reinforce the substantive conclusion reached in the OLS analysis. Specifically, parenting continues to affect self-control into adolescence. The main effect for changes in parental socialization is strong and significant ($t = 4.94, p \leq .001$), indicating that changes in parenting from age 11 to age 15 continue to impact self-control during that period. Thus, when parents
increased their quality of parental socialization, their children’s self-control increased; when parental socialization decreased, so did child self-control. Moreover, there is no indication that changes in parenting from ages 7 to 9 matter more than changes from ages 11 to 15—there is a negative coefficient for the interaction between changes in parental socialization and the age 7 to age 9 dummy variable. Taken together, these results indicate that this hypothesis should be rejected. Contrary to what self-control theory predicts, changes in parental socialization during adolescence continue to produce changes in self-control, which necessarily affects an individual’s position in the self-control distribution.8

Table 4. HLM Analysis for Estimating the Effect of Changes in Parental Socialization on Self-Control

<table>
<thead>
<tr>
<th></th>
<th>b</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.23**</td>
<td>69.71</td>
</tr>
<tr>
<td>Between-household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Level 3, n = 2232)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Level 2, n = 3787)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization</td>
<td>.19**</td>
<td>14.77</td>
</tr>
<tr>
<td>(Individual mean)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>.02</td>
<td>1.07</td>
</tr>
<tr>
<td>Black</td>
<td>.02</td>
<td>1.59</td>
</tr>
<tr>
<td>Male</td>
<td>-.07**</td>
<td>-9.09</td>
</tr>
<tr>
<td>Within-individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Level 1, n = 9373)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization</td>
<td>.05**</td>
<td>4.94</td>
</tr>
<tr>
<td>change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental socialization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>change x age 7 through 9</td>
<td>-.01</td>
<td>-.31</td>
</tr>
<tr>
<td>Age 7 through 9</td>
<td>-.02**</td>
<td>-3.74</td>
</tr>
<tr>
<td>Variance components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-household</td>
<td>.42</td>
<td></td>
</tr>
<tr>
<td>Parental socialization</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>(Individual mean)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-individual</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>Within-individual</td>
<td>.19</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05  **p < 0.01

8. One potential limitation of the HLM analysis is that it assumes that error terms are independently and identically distributed according to the normal distribution (for example, Nagin, 2005; Nagin and Tremblay, 2005). Because violation of the normality assumption may lead to biased estimates, semi-parametric estimation methods often are recommended (Brame, Bushway, and Paternoster, 1999; see also Nagin, 2005; Nagin and Tremblay, 2005). We therefore ran the analysis presented in table 4 using an extension of the group-based trajectory model outlined earlier. Although the results obtained from this analysis relate to the effects of the independent variables within each of the eight latent trajectory groups shown in figure 1, they confirm the results shown in table 4. For the majority of respondents, changes in parental behavior are associated with changes in self-control even after age 10.
DISCUSSION AND CONCLUSION

The purpose of this study has been to test self-control theory’s arguments regarding the stability of self-control. This was done first by examining self-control trajectories for a sample of U.S. children that aged from roughly 7 to 15 during the study period. This analysis revealed strong evidence of absolute stability in self-control—84 percent of the sample fit into trajectories in which absolute levels of self-control remained essentially the same from age 7 to 15. This group of 84 percent also showed very high levels of relative stability—their position in the self-control distribution remained largely unchanged during the course of the study period. For 54 percent of the sample (in the high-stable and very high-stable groups), this was unequivocally the case. The individuals in these clusters had levels of self-control that exceeded essentially all others in the sample at age 7, and this remained the case all the way through age 15. An additional 30 percent of the sample (divided among the medium-stable and low-stable groups) experienced strong but not perfect levels of relative stability. The individuals in these two groups experienced small changes in their relative positions in the distribution as a result of notable changes in self-control among two small groups (the low-increasing and high-decreasing groups) representing about 6 percent of the sample. Taken as a whole, for this 84 percent of the sample, support for the stability thesis was perhaps greater than what even Gottfredson and Hirschi would have expected. Absolute and relative stability was the dominant pattern, and this was evident as early as age 7, earlier than the stability thesis suggests.

The remaining 16 percent of the sample followed a variety of trajectories. Five percent had self-control rankings at the bottom of the distribution at age 7 but near the top by age 15. This group therefore was successfully developing self-control, but at a slower rate and later point than the theory predicts. Also evident, however, was a pattern in which self-control decreased during the study period. Indeed, in one small group (little more than 1 percent of the sample) self-control moved from near the top of the distribution at age 7 to the very bottom by age 15.9

Do these patterns, taken together, support or reject the stability thesis? The theory does not specify what proportion of individuals must show stability for the theory to be supported, but the strong absolute and

9. One possibility that we cannot dismiss is that these cases showing absolute and relative changes in self-control may settle into a pattern of significant stability at some point after age 15. This would suggest that Gottfredson and Hirschi may be correct that relative stability in self-control is the rule for essentially all individuals eventually.
relative stability seen among 84 percent of the sample is impressive. We would, however, caution against ignoring the change that occurred among the remaining 16 percent. Gottfredson and Hirschi (1990) never suggest that there will be exceptions to the rule of stability, and they certainly do not foresee exceptions that involve major shifts in self-control rankings. Thus, evidence of any change is a departure from the theory. Additionally, given that crime itself—especially serious crime—is prevalent among only a small portion of the population, it seems unwise to ignore extreme patterns simply because they are infrequent (see Wolfgang, Figlio, and Sellin, 1972).

One issue that requires elaboration involves the 11 percent of respondents who fit into trajectories marked by absolute decreases in self-control during the study period. This pattern contradicts Gottfredson and Hirschi’s (1990: 107–8) argument that once gained, self-control is almost never lost. It also raises the question of how self-control can be lost. A finding that we elaborate upon momentarily is that self-control remained responsive to parental socialization throughout the study period. Thus, decreases in self-control could be explained by decreases in parental socialization, which could arise from any number of problems encountered by subjects’ parents, including economic hardship, a divorce or a decline in marital quality, or health problems (including mental health problems). In short, given the enduring responsiveness of self-control to parental socialization, circumstances that interfere with quality parenting can reduce self-control.

It also should be emphasized, however, that a line of theory in psychology explicitly allows for reductions in self-control. Baumeister and his colleagues (1994; Schmeichel and Baumeister, 2004) advocate the self-regulatory strength model that sees self-control less as a physical trait that is constant and more as a resource that can be depleted. This idea is best understood with the analogy of a muscle and its strength—although perhaps high at first, strength depletes over time as muscles become burdened, and is restored only after a period of rest. According to this view, self-control resources are depleted when they are burdened by stimuli that require emotional, physical, or cognitive self-regulation. These arguments have been supported in experimental studies—performing tasks that burden one’s self-control resources leads to lower self-control, relative to what is seen for a control group (Baumeister et al., 1998; Muraven, Tice, and Baumeister, 1998).

In moving beyond experiments, one might hypothesize that absolute reductions in self-control occur when children encounter stressful circumstances—perhaps at home, in their neighborhoods, or at school—that burden their self-control resources. If such stress endures, a long-term
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reduction in one’s observed level of self-control may result. Although this is an interesting possibility, considering it was beyond the scope of this study. Such research clearly would be informative, however, if other tests of the stability thesis reveal cases with long-term reductions in self-control. The point to emphasize for now is that our findings suggest not simply that self-control can change during adolescence, but that once gained, it can be lost.

After examining trajectories of self-control from age 7 to age 15, our analysis then considered the question of whether parental socialization continued to affect self-control during adolescence. Given that individual differences in self-control are seen as fixed by age 10, self-control theory emphasizes that the effects of parental socialization on self-control are largely limited to the years before then. Our analysis consistently supported the opposite conclusion: parenting continued to affect self-control during adolescence, even after accounting for previous self-control and previous exposure to parental socialization. To be clear, past self-control was a very strong predictor of present self-control. This relationship was not so strong, however, that it prevented parenting from affecting self-control from age 11 to age 15. Thus, children with parents who increased their quality of parental socialization during this period displayed an increase in self-control, and those with parents who decreased their quality of parental socialization displayed a decrease in self-control. While our level 1 HLM analysis targeted within-individual changes in self-control, the overall sum of such changes logically implies changes in self-control rankings that are explained in part by changes in parental socialization. In short, parenting still matters for self-control during adolescence.

These findings have significant implications not only for the stability thesis and self-control theory, but also for criminological theory more broadly. They at least partially undermine the stability thesis by suggesting that self-control develops in more varied ways than it suggests. First, it appears that once gained, self-control can be lost. Second, although self-control often emerges early in life and is stable from that point forward, it is sensitive to socialization into adolescence. This suggests that self-control is not necessarily stable beyond age 10 even for those showing strong stability; instead, it may be that self-control remains stable for many largely because the factors affecting self-control, especially parenting, tend to be fairly stable as well. When things such as the quality of parental socialization change, self-control may change as well.

Regarding self-control theory more broadly, the most significant implication of these findings is that they partially call into question a purely trait-based conception of self-control. “Trait” carries with it a clear
connotation of something that appears early in life, is highly stable, and is perhaps rooted in biological characteristics (see Caspi, Roberts, and Shiner, 2005). Although much research suggests that this view of self-control (and of related characteristics, such as impulsivity) is valid to some degree (Caspi, Roberts, and Shiner, 2005; Wright and Beaver, 2005), it may not fully capture the concept of self-control. Alternative conceptions allow that self-control reflects in part a skill that can be learned or forgotten, or employed or not employed, depending on one’s circumstances (McCabe, Cunnington, and Brooks-Gunn, 2004; Tittle, Ward, and Grasmick, 2004). Similarly, self-control might reflect a resource that can be both accumulated and depleted (Baumeister, Heatheron, and Tice, 1994). In either case, this allows for greater variability over time—successful development of self-control may occur at varying ages and rates for different individuals. Moreover, losses in self-control could occur (for those who become isolated from good socialization or burdened by situations that tax self-control resources), but restoring self-control might be possible as well. None of this implies that self-control is not often stable or does not partially reflect physical traits. The suggestion instead is that a purely trait-based conception appears incompatible with the varying developmental patterns observed here.

We also should consider the implications of these findings for criminological theory more generally. A significant debate in criminology over the past few decades involves the causal significance of adolescent and adult roles and relationships. Whereas most theories view adolescence and adulthood as formative periods in which key causal factors develop, self-control theory and a few other perspectives (Moffitt, 1993; Raine, Brennan, and Mednick, 1994; Wilson and Herrnstein, 1985) view them as periods in which characteristics that were fixed in childhood (or earlier) start to have implications for crime. In this sense, self-control theory is “part of a trend in criminology that pushes the causes of crime further back in the life course” (Grasmick et al., 1993: 5). Thus, in some sense, a test of the stability thesis is not simply a test of self-control theory, but also a test of the idea that much of what needs to be known about the causes of crime is ascertainable in the child’s first decade of life. Our conclusion on this issue is straightforward: for this one key aspect of criminal propensity (self-control), the first decade of life is highly consequential for its development, but the period of adolescence remains important as well.

In noting these conclusions, several limitations to our analysis should be taken into account. The first involves our measure of self-control, which was a behavioral measure drawn from survey questions answered by the child’s mother. The risk with a behavioral measure is that variation across respondents and over time may reflect variations in the opportunities
THE DEVELOPMENT OF SELF-CONTROL

available to engage in these behaviors rather than variation in self-control itself. This is an important concern, but we should emphasize that the specific measures used in this study present little risk of this possibility. Whereas some studies (such as Tittle, Ward, and Grasmick, 2003) focused on behaviors that depend heavily on opportunities (such as alcohol use, driving while intoxicated, and incurring debt), the BPI focuses on generic actions for which opportunities are ubiquitous for all children (such as “acts without thinking,” “argues too much,” and “cannot pay attention”). Thus, if opportunity is fairly constant both across respondents and over time, it should not bias the measurement of self-control. An additional measurement concern, however, is that mothers’ assessments of these behaviors may be inaccurate, and that the observed self-control trajectories are an artifact of their biases. Some mothers may continue to perceive children in similar ways despite changes in the child’s behavior; alternatively, some mothers who experience changes in their own lives may perceive behavioral changes in children who are quite stable. One way to avoid this possibility is to measure self-control with survey items answered by the child, but this approach has its own limitations. For example, the individual’s level of self-control likely affects the validity and reliability of their survey responses (Piquero, MacIntosh, and Hickman, 2000), and this approach likely could not be used with young children who are less cognitively capable of providing accurate survey information. Last, it should be noted that our behavioral measure of self-control could not disentangle self-control ability from the desire to exercise self-control, an interesting distinction that Tittle and his colleagues (2004) raise.

Additional limitations relate to our measure of parental socialization, which does not completely match Gottfredson and Hirschi’s (1990) view of the three requirements for effective parenting: supervising behavior, recognizing deviance when it occurs, and consistently punishing deviance. Of these three, our measure captures primarily supervision, but then also incorporates the extent of attachment and warmth because of research suggesting that these things directly increase self-control (Baumrind, 1991; Feldman and Weinberger, 1994). In defense of our measure, it was strongly related to self-control, which is what Gottfredson and Hirschi (1990) would expect for a valid measure of parental socialization. Related to this issue is that our examination of factors that affect self-control was limited to assessing the effects of parenting. Pratt and his colleagues (2003) and Turner and Piquero (2005) have documented other predictors (neighborhoods and schools) of variation in self-control, and these merit greater attention in future research.

Last, we should emphasize two limitations related to our sample. First, the sample was not perfectly representative of U.S. children, but instead
oversampled those from disadvantaged groups. It is possible that research with more representative samples could generate different findings. Second, this study was limited by not being able to assess respondents beyond the age of 15. We therefore were focused on the transition from childhood to adolescence, the period in which involvement in crime first emerges. A later transition—from adolescence to early adulthood—obviously has important implications for crime as well. Events and relationships that mark this transition—including entry into college or the labor force, marriage, and parenthood—are thought to decrease crime by increasing bonds to conventional society (Sampson and Laub, 1993). These things, however, also may have implications for an individual's self-control. The roles and responsibilities associated with adulthood often are oriented toward the future, so their presence or absence may contribute to absolute or relative changes in self-control. Considering this was beyond the scope of our study but should be an important priority in future research.

In concluding, we note simply that, like most tests of criminological theory, this one provided neither uniform support nor uniform rejection of the key hypotheses. Instead, the findings suggest a strong element of truth to Gottfredson and Hirschi's claims of stability, but that stability in self-control is not the rule for everyone. By all appearances, however, research on the stability thesis is much nearer to its commencement than its conclusion. Continued research on this issue should yield significant insight into the ways in which self-control emerges and develops over time.

REFERENCES


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THE DEVELOPMENT OF SELF-CONTROL


Carter Hay is an assistant professor in the College of Criminology and Criminal Justice at Florida State University in Tallahassee. His research examines the causes of individual involvement in crime and delinquency, particularly those causes related to the family environment. His prior publications have appeared in such journals as *Criminology, Journal of Research in Crime and Delinquency, Sociological Perspectives*, and *Theoretical Criminology*. 
Walter Forrest is a doctoral candidate in the College of Criminology and Criminal Justice at the Florida State University. His current research and teaching interests focus on the development of criminal and delinquent behavior over the lifespan, criminological theory, and the links between ethnicity and crime.
### Appendix A. Wording and Factor Loadings for the Behavior Problems Index Items Used to Measure Self-Control, across All Waves of the Survey

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<td>Argues too much</td>
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<td>Difficulty concentrating, cannot pay attention</td>
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<td>Easily confused, seems to be in a fog</td>
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<td>Bullies or is cruel or mean to others</td>
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<td>Disobedient</td>
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<tr>
<td>Does not seem to feel sorry after misbehaves</td>
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<td>Trouble getting along with other children</td>
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<td>Impulsive, or acts without thinking</td>
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<td>Not liked by other children</td>
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<td>Difficulty getting mind off certain thoughts</td>
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<td>Restless or overly active, cannot sit still</td>
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<td>Stubborn, sullen, or irritable</td>
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<td>Very strong temper and loses it easily</td>
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<td>Breaks-destroys own or another’s things</td>
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<td>Trouble getting along with teachers</td>
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Appendix B.
The HLM analysis involved estimating the following models:

Level 1 (within-individual):
\[ y_{ih} = \pi_{0ih} + \pi_{1ih}(Parental_{Soc\_ih}) + \pi_{2ih}(Age_{6-9\_ih}) + \pi_{3ih}(Parental_{Soc\_ih} \times Age_{6-9\_ih}) + \epsilon_{ih} \]

Level 2 (between-individual):
\[ \pi_{0ih} = \beta_{00i} + \beta_{01i}(Parental_{Soc\_ih}) + \beta_{02i}(Male_{ih}) + \beta_{03i}(Black_{ih}) + \beta_{04i}(Hispanic_{ih}) + \tau_{0ih} \]
\[ \pi_{1ih} = \beta_{10i} \]
\[ \pi_{2ih} = \beta_{20i} \]
\[ \pi_{3ih} = \beta_{30i} \]
\[ \pi_{4ih} = \beta_{40i} \]

Level 3 (between-household):
\[ \beta_{00i} = \gamma_{000} + u_{00i} \]
\[ \beta_{01h} = \gamma_{010} + u_{01h} \]
\[ \beta_{02h} = \gamma_{020} \]
\[ \beta_{03h} = \gamma_{030} \]
\[ \beta_{04h} = \gamma_{040} \]