ABSTRACT

Title: PARENTING AND STABILITY OF SELF-CONTROL

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The present study examined the stability of self-control and the relationship of parenting and self-control based on Gottfredson and Hirschi's general theory of crime. By using a four-wave longitudinal data coming from the D.C Family Strengthening Project, this paper adopts the appropriate statistical tool for latent variables (Mplus) to explore the rank stability of self-control among a minority dominated sample aged from 9 to 11. This study also does an exploratory test of the source of self-control. The causal impact of parenting factors such as supervision, discipline, and caring on self-control are tested by using a sample of children aged from 7 to 8. The results show that relative stability of observed self-control is moderate, while it becomes high when measurement errors are controlled. Also discipline and monitoring is the most important parenting variable to increase self-control level of children during their early ages.

PARENTING AND STABILITY OF SELF-COTNROL

By

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Chapter 1: Introduction

In 1990, Gottfredson and Hirschi published one of the most prominent but controversial criminological books "A General Theory of Crime". In this book, Gottfredson and Hirschi proposed that self-control, the stable individual difference in criminal potential, accounts for the variation in individual offending. Low self-control will result in crime and other various analogous behaviors when opportunities to engage in those behaviors are present.

The self-control theory can trace its origin back to classical theories such as Bentham's conception of human nature (1824). In that view, all human beings are self-interested so that they pursue the maximum of pleasure and avoid pain. Gottfredson and Hirschi think classical theory is a theory of social or external control that individuals' different costs in criminal acts depend on their location in or bond to society, but "what classical theory lacks is an explicit idea of self-control, the idea that people differ in the extent to which they are vulnerable to the temptations of the moment" (1990:p87). The level of self-control among individuals will affect their calculation of the consequences of their acts. Individuals with low self-control tend to fail to consider the negative and painful consequences of their acts although probably everyone can see the pleasure they bring.

Gottfredson and Hirschi further described the 6 elements of self-control: impulsivity, or the tendency to choose actions that offer immediate gratification; a preference for simple tasks; a preference for thrilling or risk seeking behaviors; a preference for physical as apposed to mental activity; Minimal tolerance for frustration and an insensitive or self centered orientation (1990:90-91). Although they list the above

6 dimensions of self-control, they mainly see those elements as forming a unitary concept. "There is considerable tendency for these traits to come together in the same people…it seems reasonable to consider them as comprising a stable construct useful in the explanation of crime" (1990:90-91).

Due to the popularity of this book, this general theory of crime has generated a huge body of empirical research of its central propositions. One of the mostly tested questions is whether self-control is the main and only source of explanation of crime and delinquent behaviors besides opportunity. Criminologists are especially interested in effects of self-control when controlling the main factors from other rivalries such as social control theories, strain theories, and social learning theories (Nagin and Paternoster, 1993; Polakowski, 1994; Evans, Cullen, Burton, Dunaway and Benson 1997). A Meta-analysis of self-control theory (Pratt and Cullen, 2000) shows that low self-control is an important predictor of crime and analogous behaviors. But contrary to Gottfredson and Hirschi's argument, the variables from social learning theory are still significant after controlling for self-control.

The general theory of crime also played an important role in explaining the stability or continuity of criminal and delinquent behavior. Previous researches found that the existence of criminal behavior stability is undisputable and proposed several explanations for the strong correlation of previous and future offending (Heckman, 1981; Nagin and Paternoster, 1991, 2000). One way to explain the relative stability of criminal behavior is the "persistent heterogeneity" argument which states that time stable individual differences in criminal potential that are attained early in the life course can

explain offending. "State dependence" argument however believes that life-course events and circumstances are important causal factors to explain criminal involvement.

The general theory of crime is based on the argument of population heterogeneity. it claims that although the absolute level of self-control of each individual can vary some degree over time, the difference in propensity to crime are "sufficiently stable over time that they need not be continually reassessed" (1990: p215). The number of crimes committed can decline with age but the tendency to commit crime may not change at all. They also believe that stability of self-control would hold across space and time.

This affirmative assertion on stability of self-control contrasts to the recent life-course researchers as well who study crime and delinquency through a life-course perspective. These researchers believed that crime should be age-graded, and that one's criminal trajectory can even change given the occurrence of life events such as marriage, employment and military service known as turning points (Sampson and Laub 1993, 2003).

Although the stability of self-control is crucial to the explanation of the well-known fact of continuity and change of criminal behavior, with a few exceptions, it is much less tested compared to other propositions in the general theory of crime (Arneklev et al, 1998; Turner and Piqeuro, 2002; Burt, Simons, and Simons, 2006).

What has also less been considered is the theory's arguments about the major cause of low self-control. According to Gottfredson and Hirschi (1990), the major cause of low self-control is ineffective child-rearing. Several conditions appear necessary to produce a socialized child: parental supervision, recognition of deviant behavior and punishment of deviant behavior. To date, several criminological studies (Polakowski,

1994; Cochran et al., 1998; Gibbs et al., 1998) examined the effect of parenting on self-control but their findings were not consistent and didn't reach clear-cut conclusions. Some recent researches (Hay, 2001; Hope et al 2003; Wright and Beaver, 2005) treated self-control as a dependent variable and deliberately test the hypothesis that effective parenting increases self-control. Hay (2001) and Hope et al (2003) both found support for Gottefredson and Hirschi that child rearing variables such as monitoring, supervision and discipline increase self-control. Wright (2005) instead found that parenting measures have a weak and inconsistent effect when controlling for genetic influences.

The present study is dedicated to addressing the hypothesis of relative stability of self-control and also explores the cause of low self-control. In Chapter Two, the literatures on the stability of self-control proposition are examined including their contributions and limitations. Then, parenting practice as the cause of self-control is discussed. In Chapter Three, I will explain the data and the methods used in this study. The data are collected from the D.C. Strengthening Families Project initiated in 1998. The discussion about the strength and limitation of this data will also be included in the chapter. Chapter Four provides the findings and results. And finally, in Chapter Five, a discussion is conducted on the current study. Also the implication and suggestions for future studies will be offered.

Chapter 2: Literature Review

Stability of self-control

One of the most consistent findings in criminology is the positive correlation of previous offending and future criminal or deviant behavior (McCord, 1980, 1991; Farrington, 1998). While the existence of the correlation is of little debate, it is not undisputable in terms of the interpretation of the correlation among criminologists. Some researchers (Heckman, 1981; Nagin and Paternoster, 1991, 2000; Nagin and Farrington 1992) found that there are two possible causes of the strong correlation. One is the difference between individuals in a propensity latent trait to commit crime. Heckman (1981:150) describes those two distinct processes as follows:

> One is that individuals who experience the event are altered by their experience in that the constraints, preferences, or prices (or any combination of the three) that govern future outcomes are altered by past events. Such an effect of past outcomes is termed structural state dependence. A second explanation is that individuals differ in some unmeasured propensity to experience the event and this propensity is either stable over time or, if it changes, values of the propensity are autocorrelated. Broadly defined, the second explanation is a consequence of population heterogeneity.

In the population heterogeneity process, the difference in individuals' criminal propensity can result from different personality traits such as impulsivity, conditionability and conscience (Wilson and Herrnstein, 1985) or from differences in child rearing practices (Gottfredson and Hirshi, 1990). Once formed in the early life, this latent difference would remain stable across the lifetime. Therefore, the repeated offending

occurred in different time points are simply a realization of latent traits among potential criminals.

As Nagin and Paternoster (1991) pointed out, the population heterogeneity interpretation of the positive association between past and future criminality is a fundamental premise of Gottfredson and Hirschi's general theory of crime. Therefore, the test of the stability of the latent trait (self-control) is very crucial to the population heterogeneity postulate. If self-control is found to be stable or relatively stable across life-time after it is defined, it will render support to the population heterogeneity statement. The stable difference between individuals' criminal behavior is due to the stable difference of latent criminal propensity. If the stability of self-control could not hold, it will cast doubt on the population heterogeneity hypothesis and give more support to state dependence process because if the latent trait is not stable, there must be something else contributing to the continuity of deviant or criminal behavior. For example, cumulative continuity states that delinquency incrementally "knifes off" future opportunities such that delinquents have fewer options for conventional life (Laub and Sampson, 1993).

The stability of self-control is also an important theoretical piece in the well-known debate between Gottfredson and Hirschi and Sampson and Laub in 1990s (Sampson and Laub, 1993, 1995; Laub and Sampson, 1993; Hirschi and Gottfredson, 1995; Cohen and Vila, 1996). The main departure between Gottfredson and Hirschi's general theory of crime and Sampson and Laub's age-graded theory of crime has to do with how stable the individual difference in crime propensity (low self-control) is across the life course. Since self-control is a stable phenomenon that forms in the early life,

Hirschi and Gottfredson (1995) discount the causal effect of other institutions on criminal propensity and criminal behavior. Meanwhile, Sampson and Laub (1995) argued that the propensity for criminal activities over the life course can be sharply mitigated by 1) attachments that form through marriage and labor-force participation; 2) the absence of disruption in relations between individuals and institutions that provide social capital; and 3) the ability to overcome structural disadvantages.

Although the self-control stability hypothesis is an essential element of Gottfredson and Hirschi's theory and an important argument between persistent trait theories and life-course theories, there have been few studies on the stability of self-control, especially with the sample of children whose self-control level has been recently stabilized according to the general theory of crime. Therefore, the following reviews will focus on two sets of studies: 1) Studies addressing stability of personality traits similar to self-control and 2) Studies of stability of self-control with adolescents or older populations.

Literature Review on Stability of Personality Traits

When placed in a bigger picture, studies on stability or continuity of different personality traits over time are never new and have already generated plentiful findings. According to Caspi and Roberts (1999), there are four different types of personality trait stability: intra-individual differences in stability, ipsative stability, mean-level stability and rank-order or relative stability.

Intra-individual stability concerns within-individual changes which is how each individual changes over time. Ipsative stability examines the salience of a certain trait

within an individual over time. Mean-level consistency indicates whether groups of people will increase or decrease on a given trait over time.

This current paper is going to focus on the last type of stability: relative or rank-order stability which refers to relative ordering of individuals on a given trait maintaining stability over time. It should be noted that the existence of relative stability doesn't rule out the possibility of within-individual changes or mean-level changes. For example, the mean level of individuals' self-control may increase during childhood, adolescents and peak in adulthood due to the maturation effect or life experiences, but the rank order of each individuals' self-control within a group could remain the same over time. In fact, Gottfredson and Hirschi (1990, p107) indicate that individuals can experience absolute changes in the self-control level:

> "Combining little or no movement from high self-control to low self-control with the fact that socialization continues to occur throughout life produces the conclusion that the proportion of the population in the potential offender pool should tend to decline as cohorts age"

Rather, Gottfredson and Hirshi argued for the stable rank positions on self-control between individuals after earlier 8 to 10 years. By far, the most common way to assess relative stability is through test-retest correlations or stability coefficients (Roberts and Delvecchio, 2000). Crook (1941) reviewed seven studies on the rank-order stability of personality traits over a period as short as several weeks and as long as 6 years. He found that the test-retest correlations averaged above 0.8 over several weeks. It decreases after initial months but begins to stabilize around .5 after the first year.

Adding more longitudinal studies to what Crook had reviewed, Conley (1984) examined 29 longitudinal studies on the relation between traits consistence (such as

extraversion, neuroticism, and psychoticism) and time. Like Crook, he also found that trait consistency tended to be higher over a shorter period of time. For example, the correlation of measure of extraversion is approximate 0.7 over a 10 year period, and .98 over a 1 year period.

Roberts and Delvecchio (2000) conducted a meta-analysis on 124 longitudinal studies on stability of personal traits with test-retest intervals greater than 1 year. They categorized the test-retest coefficient into different age ranges associated with developmental transitions: infancy and toddlerhood (birth to age 3), preschool (ages 3 to 6), middle childhood (ages 6 to 12), adolescence (ages 12 to 20), young adulthood (ages 20 to 40), and middle age (ages 40-60). They found that overall the trait consistency increased in a linear, steplike pattern until the ages 50-59. Specifically, the estimated population correlation of trait consistency is 0.45 for age 6-11.9 and 0.47 for age 12-17.9. The results show that personality traits appear to become more stable over the life course. For example, the test-retest coefficients for basic personality traits average around 0.5-.80 in middle to late adulthood, while the stability coefficients over equivalent periods are around 0.3-.5 during adolescence. Finally, they examined the gender difference on trait consistency and found that there is no difference between males and females on the trait consistency.

Shoda et al, (1990) studied the stability and predictive utility of preschoolers' ability to delay gratification. The results show that children's ability to delay gratification at age 4 was significantly related to their ability to cope with frustration and stress in adolescence. Children who delayed longer in preschool were rated by their parents as being more likely to show self-control in frustrating situations, and less likely

to yield to temptations. These findings point out the stability of highly self-regulatory ability from preschool through adolescence. Caspi and Silva (1995) identified one dimension of temperament which they labeled as "lack of control". They found that children with this temperament at age 3 scored higher on measures of impulsivity, danger-seeking, and aggression at age 18.

Olson, Schilling and Bates (1999) explored the stability of impulsivity in school-aged children. Previous studies on impulsivity are mostly cross-sectional and although some longitudinal studies have shown that individual differences in impulsivity develop rapidly in early childhood, little is known about the consistency of impulsivity in middle childhood. This study uses the data from the Bloomington Longitudinal Study and examined the stability of impulsivity level of children between age 6 and age 8. The results showed that measures of impulsivity on tasks requiring concentration, planning, and willingness to delay immediate gratification showed meaningful levels of temporal continuity. For example, the correlation coefficient of children's willingness to wait for a delayed reward and Inhibitory Control are 0.39 and 0.24 respectively across age 6 and age 8. On the other hand, measures of impulsivity derived from overt behavior in situations requiring compliance are not stable between two time points.

The stability of self-regulation which is the internal capacity to regulate affect, attention and behavior to respond effectively to both internal and environmental demand is addressed by some previous studies (Murphy et al, 1999; Raffaelli et al 2005). Murphy and colleagues (1999) studied the stability of self-regulation in a group of children aged 6 to 8 and followed them longitudinally. The correlations between test-retest of attention focusing, inhibitory control impulsivity and behavioral self-regulation across four years

are 0.67, .63, 0.74 and .41 respectively. Raffaelli, Crockett, and Shen (2005) studied a national sample of children aged from 4-5. Two extra waves of data were collected after each 4 year when the children were 8-9 and 12-13. The results showed that the correlations between self-regulation scores from time1 to time 2 (4 year period) is 0.49, and is 0.5 from time 2 to time 3 (4 years period). In addition, both boys and girls exhibit similar patterns.

Literature review on the relative stability of self-control

Until this point, only a few articles directly focus on the testing of relative stability of self-control. Arneklev, Cochran and Grainey (1998) conducted the first longitudinal test of the stability of self-control as it is conceptualized by Gottfredson and Hirschi. The respondents are college students. They use Grasmick et al.'s (1993) scale to operationalize the dimensions of self-control. The time span in their study is one semester.

In this study, the authors investigated both relative stability and the intra-individual stability. To assess the former stability, they examined the correlations among self-control and the six dimensions at time1 and time2. The correlation between two self-control measurements is 0.82 while the correlations of the 6 dimensions over time are all smaller than 0.8 and ranged from 0.646 to 0.787. To test if there is significant within individual change, HLM is applied to assess variation over time. Self-control was modeled as a function of the baseline score (intercept) and a slope indicating change and the HLM did not find significant within individual change. They reached their conclusion that most of the test of stability does not demonstrate significant individual changes;

therefore, they can tentatively conclude that the construct self-control appears to be stable over a short period of time.

Overall, this exploratory study renders support for stability of self-control at least for a sample of college students. However, this study also has limitations in that the time span between the two surveys is relatively short (one semester). Therefore, their study may give an optimal chance toward the stability hypothesis. Second, they use attitudinal measures to measure self-control which is in contrast to the argument by Hirschi and Gottfredson. They (1993) commented on two different empirical tests of the validity of self-control (Grasmick et. Al, 1993; Keane, Maxim and Teevan, 1993) and favor the latter one since it adopted the behavioral measures for self-control.

The second attempt to address the stability of self-control comes from Turner and Piquero (2002). They used seven waves' data (four behavioral measures and three attitudinal measures) from the NLSY with the respondents mean age from 6 to 19. They compared the self-control level of within and between offenders and non-offenders groups using independent t-test for two population means. The stability of self-control across gender and race was also examined. This study only gave partial support to Gottfredson and Hirshi's argument of relative stability of self-control. The results showed that 1) for relative stability between offender and nonoffender groups, self-control differences between offenders and non-offenders remained significantly different across 6 of the 7 waves. However, offenders and nonoffenders are converging on levels of self-control across time. 2) With regard to relative stability within each group, although individuals scoring in the top quartile in two behavioral self-control assessments scored higher on every attitudinal self-control assessment, the results were not consistently

significant which gave mixed support for Gottfredson and Hirschi . 3) Males consistently manifested lower self-control than females.

This study did a much better job in terms of measures of self-control, number of waves and interval length between each wave compared to that of Arneklev et al (1998). But it is still limited in several ways: first, the authors pointed out correctly that great self-control differences should exhibit between offenders/non-offenders, and their results support this argument, but they mainly focus on the offender/non-offender dichotomy differences and did a less satisfying job exploring the stability of self-control within these two groups. For example, when testing relative stability within each group, the top quartile self-control measures are compared to the score of the rest individuals not within this group. This analysis strategy (t-test) is not a very rigorous one for the stability hypothesis within groups; therefore the findings are not general enough to conclude the relative stability of *each individual* within the two groups.

Second, Turner and Piquero admitted that like most other studies of Gottfredson and Hirsch' theory, this paper did not explore the source of self-control. They also hoped future efforts can examine the stability of self-control within a non-white sample population.

Burt, Simons and Simons (2006) conducted the most thorough examination on the stability postulate up to present. The sample is African American adolescents aged 10 or older. Using a two-year period longitudinal data, they assessed the relative stability of self-control in three ways: cross-tabulation of four groups of quartiles; rank-order stability coefficients and ranking position changes across the two waves. Overall, their findings disagree with Gottfredson and Hirschi's assertion of high stability. Fewer than

half of the individuals remained in the same quartile group over the four time points. The stability coefficient is also moderate (r=0.48). When the ranking positions of each individual across time compared, more than half of the group moved more than one standard deviation. This study contributes to the researches of stability of self-control in several ways: compared to previous studies which adopted rough offender and non-offender classifications, this one is the first to test the relative stability of *each individual* in a real sense. The selection of non-white sample characteristic also adds generalizability to previous studies.

In sum, previous researches have explored the relative stability of self-control and other similar personality traits (See Table 1 for the summarization of previous studies). The findings have shown that personality traits appear to become increasingly stable over the life course (Roberts and Delvecchio, 2000; Fraley and Roberts, 2005). Moreover, stability of individual differences in basic personality traits, as commonly quantified by test-retest correlations often average around 0.5-0.8 in middle to late adulthood (Costa & McCrae, 1994). The stability coefficients over equivalent periods of time in adolescence tend to be 0.3-0.5 (Roberts and Delvecchio, 2000).

For those individual traits close to self-control such as self-regulation and impulsivity, the test-retest consistency coefficients are between 0.27-0.74 (Murphy et al 1999; Olson et al 1999; Raffaelli et al 2005).

With respect to the latent trait of self-control, three previous literatures directly test the relative stability hypothesis of self-control and explored the stability effect across gender and race. They found partial support for Gottfredson and Hirschi. On one hand, the difference of self-control level between two groups (male and female; offender and

nonoffender) remains significant over time. Between individual differences on self-control also significantly exist over time. On the other hand, this existing stability of self-control is found to be lower than what Gottfredson and Hirshi have predicted. Because of the scarcity on this research topic, it would be beneficial to test the stability hypothesis combining the merits of previous literatures with suitable analytic method (e.g., statistical tools for latent variables such as self-control).

Table 1: Summary of Literatures of stability of self-control and similar personality traits

Study	Sample	Age	Duration	Research Design	Results
Arneklev et al. (1998)	College Students (n=175); 45.7% male; 79.5% White.	Range from 17-47. Mean age is 22.8.	Test-Retest☹a semester)	1) Dependent t test from T1 to T2. 2) HLM to test significant within individual changes.	1) No significant change from T1 to T2. 2) No significant within group variation
Turner and Piquero (2002)	NLSY (n=513); 48.3% male; 32% White, 46.6% Black.	Mean=6.91 (Wave 1) Mean=19.05 (Wave 6)	7 waves (biennial)	1) Independent t tests between offenders and non offenders. 2) Independent t test between top25% and lower 75% within each group.	1) Group difference significant over time. 2) No consistent within group difference.
Olson et al (1999)	N=80; 50.5% male;	6 (wave1) 8 (wave2)	2 years	Correlation coefficients of impulsivity over time.	R=0.44 on inhibitory control; r=0.39 on delayed reward.
Murphy et al (1999)	N=94 (first wave) N=64 (forth wave)	4-6 (first wave) 10-12 (forth wave)	6 years	Correlation coefficients of regulation scales	r=0.63, 0.74 and 0.41 for inhibitory control, impulsivity and self-regulation.
Raffaelli et al (2005)	NLSY (n=646); 52% male; 40.4% White, 36.2% Black.	4-5 (wave 1) 8-9 (wave 2) 12-13 (wave 3)	4 years	Correlation coefficients of self-regulation over time	r=0.47 to 0.50 for following two waves.
Burt et al (2006)	N=779; 100% Black	10-12 (wave 1) 12-14 (wave2)	2 years	Correlation coefficients of self-control over time	r=0.48

Origin of Self-Control

According to Gottfredson and Hirschi, "The major "cause" of low self-control appears to be ineffective child-rearing" (1990:97). In order to teach children self-control during early childhood, parents have to meet three conditions in their child-rearing practice: 1) monitor the child's behavior; 2) recognize the child's deviant behavior when it occurs and 3) punish the child's deviant behavior. The prerequisite of these three practice is parents' affection or care for their children. These four requirements form a system to properly socialize children. Either link of the system going problematic can results in inadequate childhood socialization. Gottfredson and Hirschi then argue that "it should be possible to use this child-rearing model to explain other family correlates of criminal and otherwise deviant behavior" (1990:100). They identified several family factors such as parental criminality, family size, and single-parent family as important structural factors that affect the parent's ability to socialize their children. For example, they found that "one of the most consistent findings of delinquency research is that the larger the number of children in the family, the greater the likelihood that each of them will be delinquent' (1990:102). Using their child-rearing model, they explain the reason may be that monitoring and punishment are more difficult in large family even the affection for each child may be unaffected by numbers.

The focus on child-rearing as the source of self-control is consistent with previous studies in criminology. Back in the 1950's, Glueck and Glueck (1950) found that parental discipline, supervision and affection are correlates of delinquency. The parents of delinquents tend to have higher likelihood to have criminal records themselves. One important component of Hirschi's social control theory (1969) is attachment, especially

the attachment to parents. Sampson and Laub (1993) also found that family structural background factors such as household crowding, parental criminality and family disruption affected delinquency through family process variables such as attachment and supervision.

Various researches were conducted on self-control as a mediating variable between demographic or parenting variables and criminal behavior (Cochran et al, 1998; Gibbs et al., 1998; Polakowski, 1994). Polakowski (1994) found that parental supervision at age 8 to 10 significantly predicted level of self-control. The other two studies used the sample from undergraduate students and reached different conclusions. Cochran et al (1998) didn't find an effect of parental monitoring and discipline on low self-control while Gibbs et al did (1998). Several studies up to this point explicitly treat self-control as a dependent variable based on Gottfredson and Hirschi's theory. Hay (2001) tested the hypothesis that effective parenting should be negatively related to low self-control by employing a sample of high school students. The respondents were questioned about their impression of parent's habits. After controlling for age, gender and race, the regression result of parenting factors on low self-control were generally consistent with the general theory of crime. A combined measure of parental monitoring and discipline was significantly and negatively related to low self-control. The strength of this relationship was however moderate. One limitation of Hay's study is the age of the respondents who were high school students. As they admitted, all respondents were likely to report their parent's habit with recent experiences in mind. "This may be problematic, given Gottfredson and Hirschi's argument that what matters most for self-control (and, thus, for

later involvement in crime and deviance) is parenting during the first seven to eight years of life' (Hay, 2001:715-716).

Another recent study on the origin of self-control is from Hope, Grasmick and Pointon (2003). Their research attempted to bring a full range of family structure variables together to see their effects on the parenting variables and in turn, affect one's level of self-control. They also explored the relation of some correlates of delinquency to self-control. The data was collected on nine through eleven grade students in two public schools. They found that both parental supervision and attachment were strong predictors of self-control. Also, most of the structural family background variables exerted their influence on self-control through the family process variable of attachment and supervision. Therefore, their finding provides considerable support for Gottfredson and Hirschi's contention that family socialization practices are key determinants of self-control. But as in Hay's study, the respondents in this research are adolescents which contradicts the idea in general theory of crime that self-control is established in the early time of life. Although they discounted this limitation by arguing that parenting variables would remain fairly stable over time, but this assumption was not empirically validated and measuring parenting practice at childhood from an adolescent sample would inevitably increase measurement errors. Also, their measure of parenting practice does not cover parental discipline, an important component of child-rearing practice in self-control theory.

In addition to the stability hypothesis we discussed in the earlier section, Burt, Simons and Simons (2006) also examined the effect of supportive, inductive parenting practices known as authoritative parenting on self-control and whether self-control is the

mediator of parenting on delinquency. The findings revealed that authoritative parenting did explain part of the variance in self-control. However, other social influences such as deviant peers, pro-social peers and attachment to teachers are also significantly associated with the changes in self-control. These results indicate that parenting is not the exclusive causes of self-control and self-control is malleable and responsive to social interactional influences.

In sum, previous researches generally support Gottfredson and Hirschi's theory that child-rearing is an important determinant of self-control (See Table 2 for the summarization of previous literature). But most of the studies are cross-sectional which only allows the conclusion of correlation instead of causality. Except for Burt et al (2006) which used a sample of children aged 10 and 12, most of the previous literatures use the college student or high school student samples which are not suitable to test the etiology of low self-control. Also, some studies failed to provide a full measure of important parenting variables including supervision, monitoring, discipline and attachment. Therefore, it would be useful to assess this research question by a longitudinal study with a sample of children at their early ages.

Table 2: Summary of Literatures of Parenting and Self-control

Study	Sample	Age	Duration	Research Design	Results
Burt, Simons, and Simons (2006)	Adolecents (n=779)	10 and 12 (wave 1) 12 and 14 (wave 2)	2 years	Negative binomial models	Social influences affect self-control above and beyond authoritative parenting.
Hope et al (2003)	High schooler (n=1139)		Cross-sectional	OLS regression	Parental supervision and attachment are strong predictors of self-control.
Hay (2001)	High schooler (n=197) 41% White	Adolescents	Cross-sectional	Regression	Monitoring and discipline decrease the low self-control level.
Gibbs et al (1998)	College students (n=262) 47.3% Female 89.3% White	18 or older	Cross-sectional	Path Model, regression	The coefficient of parental management and self-control is 0.26.
Cochran et al (1998)	Undergraduates (n=448) 76.1% White 52.5%femal	18 or older	Cross-sectional	Regression	Parenting supervision has no effect while attachment is positively related to self-control.
Polakowski (1994)	Cambridge Study (n=411) All males	10, 14, 16, 18, 21, 24 for six waves	14 years	Lisrel	Parental supervision at age 8-10 decrease the level of low self-control at age 12-14.

Overview of the Present Study

In this study, we will investigate the development of self-control by exploring the effects of children rearing skills on the level of self-control from age 7 to 9 and by examining relative stability of self-control for children aged 9 or older (the sample ages are decided by the original data this study relies on and are also consistent with the arguments of the theory). Benefiting from the longitudinal dataset and suitable statistical analysis tool, this present study addresses several limitations of previous research.

First, longitudinal dataset with four different waves will be used to test the causes of self-control which gives better indication on causality. Hay (2001) and Hope et al (2003) both used cross-sectional data which only give correlations between parenting variables and level of self-control.

Second, the samples used in this study are more consistent with Gottfredson and Hirschi's theory. They argue that individuals' self-control is established early in life, prior to adolescence. This study then looks at the relationship of parenting and self-control when ages of the sample are around seven at the first survey. Also, the sample ages used for stability postulate are nine years to eleven years because the theory states that individuals' self-control becomes relatively stable after age eight.

Third, a statistical tool Mplus which is suitable for longitudinal data with one or more latent variables (e.g., self-control, parenting skills) will be used to provide a better modeling of the data.

Hypotheses

Based on the literature review stated above, the present study focuses on two research questions:

H_1: The level of self-control level should be relatively stable between individuals after Children reach age 8.

H_2: Effective parenting practice is the cause of self-control.

Chapter 3: Data and Methods

Data

The data for this paper is from a randomized trial of Strengthening Families Programs among children of primarily African American families in the Washington D.C. metropolitan area (Gottfredson, Kumpfer, Polizzi-Fox, Puryear, Beatty and Vilmenay, 2006)[1]. Strengthening Families Program was originally developed in the mid-1980's by Dr. Kumpfer of the University of Utah. It is one of the prevention programs designed to address identified risk factors targeting elementary school aged children. This program involves the participation of whole families by combining three components: a parent skills training program; a children's skills training program and a family skills training program. Data collected combined to create parent survey (parenting factor; child behavior factor; parental alcohol and drug use; child's illegal drug use), children survey (parental relationship factor; rebellious behavior; positive peer associations). For the children survey, it is administered into two different types: younger children survey (aged seven and eight) and older children survey (aged nine to eleven). Compared to the younger children survey, the older children survey contains some additional items used to measure risk factors such as friend's exposure to drugs, impulsivity etc. Those items are not included in the younger children survey. All the data were collected at four time points: prior to randomization (baseline), immediately following the intervention (post-test), 6 months following the completion of the intervention (booster 1) and 18 months following the completion of the intervention (booster2). For this study's purpose, the

[1] Please also see Polizzi-Fox, Gottfredson, Kumpfer, and Beatty (2004) for detailed recruitment strategy and the representativeness of the neighborhoods included in this program.

older children self-reported survey will be used to test the stability of between-individual self-control. To test the second hypothesis on the origin of self-control, parent survey and the younger children survey will be utilized since they contain information on early child-rearing practice and self-control prior to adolescence.

Sample Characteristics

Seven hundred and fifteen families around the D.C. metropolitan area enrolled in the Strengthening Washington D.C Families project. Each family had one child between the ages of seven and eleven, and some families have more than one child who participated into this program. In that case, parents identified the child to have the most problematic behavior as target child. Seven hundred and fifteen primary parents completed the baseline parent survey, and most (93.5%) of the primary parents are the targeted children's biological mother. Five hundred and eight individuals completed the older youth survey, and 453 kids completed the younger children report. From the 508 older children the study restricted the analyses to a subsample of 465 to test the relative stability hypothesis. The restriction is based on the condition that each youth should age 9 or older (43 children who aged 8 or younger or missed age information are excluded). Of the 465 older children, 49.2% are male, and 73.8% are African American. Independent t-tests are applied to see whether there is significant difference with regard to gender and ethnic background between the selected 465 youth and the excluded 43, and no such discrepancy is found. Younger children survey is designed for children aged 8 or younger at time of the baseline. To test the causality hypothesis, this study combines the parent survey and younger children survey together. The parent survey provides measures of self-control and parental discipline and monitoring while the latter contains measures

of parental supervision and attachment. Because the parent were asked to respond only about one child, designated as the "target child", the sample of children was restricted to only the target child for matching purpose. The combination of two surveys reduced the subsample to 334 targeted children. Their mean age is 7.35. 40.4% of the youth are female and 63.8 % of them are African American. Independent t tests are taken to compare the selected 334 kids with the excluded 119 kids, no significant difference is found with regard to the gender and ethic background. Table 3 is the summary of applied samples and the two hypotheses. The demographic characteristics of the total sample and the selected subsample for each of the survey are shown in Table 4. Since the number of participants decreased across the four assessment time for the older youth survey and the combined parent and young children survey, Table 5 provides the demographic information of the subsamples used at each wave for the two hypotheses.

Table 3: Summary of Hypotheses and Samples

Hypothesis	Sample
Stability Hypothesis	Older Children Survey
Causality Hypothesis	Combination of Young Children Survey and Parent Survey

Table 4: Sample Characteristics of the Three Surveys

		Parent survey		Older Children Survey		Young Children Survey	
		Total	Selected	Total	Selected	Total	Selected
Sample Size (n)		715	334	508	465	453	334
Age (wave 1)							
	Median	34.3	33.2				
	Mean			9.82	9.96	7.35	7.35
	Standard Deviation			0.99	0.86	0.54	0.53
Sex							
	Female	93.50%	94%	49.90%	50.70%	43.90%	40.40%
	Male	6.50%	6%	50.10%	49.30%	56.10%	59.60%
Race							
	African-American	75.10%	70.2%	73.60%	73.80%	63.70%	63.80%
	White	14.40%	16.6%	9.30%	8.80%	12.20%	11.60%
	Hispanic	7.30%	9.3%	5.50%	6.00%	6.70%	7.80%
	Other	3.10%	3.9%	11.50%	11.30%	17.30%	17%

Table 5: Sample Characteristics across Four Waves

		Parent survey				Older Children Survey				Young Children Survey			
		pretest	posttest	**boster1**	**boster2**	**pretest**	posttest	**boster1**	**boster2**	**pretest**	posttest	**boster1**	**boster2**
n		334	217	175	64	465	312	258	80	334	217	175	64
Age													
	Median	33.2	34.6	36.6	36.5								
	Mean					9.96	10.32	10.93	11.94	7.35	7.86	8.35	9.30
	Standard Deviation					0.86	1.03	1.06	1.09	0.53	1.01	.81	.89
Sex													
	Female	94%	93.5%	94.3%	98.7%	50.70%	53.2%	54.5%	59.5%	40.40%	48%	42%	42%
	Male	6%	6.5%	5.7%	1.6%	49.30%	46.8%	45.5%	40.5%	59.60%	52%	58%	58%
Race													
	African-American	70.2%	67.1%	65.7%	69.8%	73.80%	71.8%	76.1%	65.8%	63.80%	61.8%	57.5%	61.7%
	White	16.6%	19.4%	21.7%	20.6%	8.80%	10.2%	10.6%	16.5%	11.60%	13.6%	16.9%	21.7%
	Hispanic	9.3%	10.6%	9.7%	6.3%	6.00%	7.5%	4.7%	3.8%	7.80%	9.5%	5.6%	5.0%
	Other	3.9%	2.8%	2.8%	3.2%	11.30%	10.6%	8.7%	14.0%	17%	15.1%	20.1%	11.7%

Measurement

Self-Control

Previous research on the general theory of crime applies either attitudinal or behavioral indicators to measure self-control (Grasmick et al. 1993; Keane, Maxim, and Teevan, 1993). Hirschi and Gottfredson (1993) argued that compared to attitudinal measures, behavioral measures are more suitable to operationalize self-control because they are better indicators of an individual's true self-control level. The D.C. SFP data collected behavior measures on children' self-control through two different surveys: The older Children Survey and Parent Survey. The Older Children Survey provides self-reported self-control level from children aged 9 and older while the Parent Survey contains the measures of self-control for children age from 7.

This study does not operationalize self-control as what is commonly constructed in previous studies (Grasmick et al, 1993). Instead, the SPF data provided various information on children's impulsivity and volatile temple which are two important parts of the underlying construct of self-control. Although it is ideal to have measures on six dimensions of self-control, I would argue that the impulsivity and temper scale in this study also did a satisfying job to represent the underlying trait of self-control.

Empirically, several previous studies have examined the effect of impulsivity and temper on the prediction of criminal and analogous behaviors, and found both of the factors to be significant (Arneklev, Grasmick, Tittle and Bursik, 1993; Piquero

and Rosay, 1998). Impulsivity has been playing an important role in explaining criminal and deviant behaviors (Hindelang, 1973; Eysenck and Eysenck 1977, 1985. Wilson and Herrnstein 1985). Impulsivity is closely related to later maljustment and delinquency (Farrington, Loeber, Van Kammen, 1990). Arneklev *et al.* (1993) explored the relation between low self-control and some imprudent behaviors such as smoking, drinking and gambling. In their study, in addition to the construct of self-control, the effects of the 6 components of self-control are also examined. They found that impulsivity, risk-taking, temper, and self-centerness all have predictive power of impudent behavior. In addition, unlike the commonly used Grasmick (1993) self-control scale, which has only four items for each subscale, the impulsivity items in the older children survey are selected from Eysenck and Eysenck's impulsivity scale. They (1977) applied factor analysis on the items used to measure impulsiveness, and found that impulsiveness in their scale in a broad sense breaks down into four dimensions: narrow impulsiveness, risk taking, nonplanning, and liveliness. According to their studies, those four factors are replicable on different samples and across gender. Narrow impulsiveness, risk-taking and nonplanning are three dimensions that constitute the latent trait self-control in the general theory of crime.

Therefore, the combination of Eysenck's impulsivity scale and the volatile temper subscale should be competent to measure self-control. It is also supported by the factor analysis conducted later on the combined items of impulsivity and temper which shows one underlying factor.

To test the relative stability hypothesis, the older children survey data (age 9 or older) is used. The two subscales representing self-control are defined as follows:

Impulsivity Subscale in Older Children Survey

The impulsivity scale is constructed from the Impulsiveness, Venturesomeness and Empathy Scale created by Eysenck (1985). It is indicated by 14 items (e.g., 'Get bored easily than most people doing the same old things?', 'Need to use a lot of self-control to keep yourself out of trouble?'). Chrobach's (1951) reliability coefficients of the scale are 0.78, 0.80, 0.80 and 0.84 separately for pretest, posttest, booster1 and booster2. Most correlations among the 14 variables are significant ($p<0.05$).

Temper Subscale in Older Children Survey

Temper subscale is indicated by four variables (i.e. 'control my temper when people are angry with me', 'End fights with my parents calmly', 'Ignore other children when they tease me or call me names', 'Ignore classmates who are clowning around in class') which are reproduced from the Social skills Rating System, Student Form, Elementary Level, Grades 3-6 created by Gresham and Elliott (1990). Chronbach's (1951) reliability coefficients are moderate (0.62 for pretest, 0.70 for posttest, 0.69 for booster1, and 0.67 for booster2). All correlations between the 4 variables are significant ($p<0.05$). These two subscales in Older Children Survey are reproduced in Appendix A.

Those 18 items from impulsivity and temper subscales are combined to constitute the self-control measure for stability hypothesis. The response format for

all 18 items is recoded as 0 (yes) or 1 (No). Negative worded items are recoded so that higher scores represent higher level of self-control. The Self-control score is the sum of each item score. As scree plots in a factor analysis conducted later indicate that the measure of self-control can be considered unidimentional (See Appendix D). The possible range of scores of self-control is between 0 and 18. The higher score indicates the higher level of self-control each child possesses. The means and standard deviations of self-control in the older youth samples are presented in Table 6. Further histogram plots indicate that the shape of self-control approximates normality.

Table 6: Descriptive Statistics for Older Children's Self-Control

	Mean	**Standard Deviation**	**Observed Range**	**Maximum Possible Range**
Self-control (Time1)	7.97	3.82	17	0-18
Self-control (Time 2)	7.88	4.27	17	0-18
Self-control (Time3)	6.70	3.82	15	0-18
Self-control (Time4)	7.75	4.14	17	0-18

Impulsivity Subscale in Parent Survey

Self-control measures for the causality hypothesis come from the parent survey. It contains measures of impulsivity and temper of children aged 7 and above. In the parent survey, impulsivity subscale is constructed by 6 items reproduced from The Social Skills Rating System by Gresham and Elliott (1990) and from POCA-R by Kellam (1990). Chronbach's (1951) reliability coefficients are 0.68, 0.72, 0.72 and 0.73 separately for pretest, posttest, booster1 and booster2.

Temper Subscale in Parent Survey

The items that constitute temper scale in parent survey are also taken from The Social Skills Rating System by Gresham and Elliott (1990) and from POCA-R by Kellam (1990). The temple subscale includes 6 items such as 'How often does your child control temper in conflict situations with peers', 'Control temper in conflict situation with adults' 'Your child is irritable' . Chronbach's (1951) reliability coefficients are 0.78, 0.73, 0.72, and 0.53 separately for four waves. These two subscales in Parent Survey are reproduced in Appendix B.

These above 12 items are combined to provide measures of self-control for the causality hypothesis. Self-control score is the average of the total item responses. All items are recoded as 0 (Always), 1 (Often), 2 (Sometimes) and 3 (Never). Negative worded items are recoded so that higher scores indicate higher self-control level. In order to explore the consistency of two different set of self-control measures for the two hypotheses, this study merged the Older Children Survey and Parent Survey by unique family id. The new dataset contains both sets of measures of self-control and the result shows that the two self-control scores are significant correlated (r=0.248).

Parent practice

Parenting practice is the independent variable in causality hypothesis. The measures of children rearing are reported in the Parent Survey and Younger Children Survey. They contain three subscales. This first one is the discipline and monitoring subscale which is modeled after questions from the Oregon Youth Study (Gottfredson

et al., 1996)[2]. This subscale includes 10 items such as 'How often do you consistently enforce household rules and expectations?' and 'how often do you ignore your child when he/she is misbehaving'. The response format is recoded as 1 (Never), 2 (Almost), 3 (Sometimes) and 4 (Always). Higher score indicates better discipline and monitoring. Chronbach's (1951) reliability coefficients are 0.64, 0.58, 0.58, and 0.65 separately for four waves.

The other two subscales are taken from the Young Children Survey. Supervision subscale is reproduced from the What About You Survey (Gottfredson and Gottfredson, 1990). This subscale includes 12 items such as 'Do your parents usually know if you do something wrong?' and 'Do your parents usually keep close track of how well you are doing in school?' The response format is recoded as 1 (True), 2 (False). Higher score indicates better parental supervision. Chronbach's (1951) reliability coefficients are 0.64, 0.74, 0.75, and 0.50 separately for four waves.

The Closeness or Attachment to both parents subscale is reproduced from the Seattle Social Development Project (Hawkins, Catalano, Morrison, O' Donnell, Abbott and Day, 1992). This subscale contains 8 items such as 'I enjoy spending time with my father' and 'I would like to be the kind of person my father is'. The response format is recoded as 1 (Disagree very much), 2 (Disagree), 3 (Agree), 4 (Agree very much). Higher score indicates higher attachment to parents. Chronbach's (1951) reliability coefficients are 0.85, 0.79, 0.84, and 0.90 separately for four waves. The three parenting skill subscales are reproduced in Appendix C.

[2]Although this subscale is called discipline and monitoring subscale, there is only one monitoring item in this scale: How often do you monitor child behavior. However, having this item included increases the Chronbach's reliability coefficient.

A factor analysis later conducted showed that these three are distinct variables (See Appendix E), therefore, these three are treated as independent variables and will be examined the effects on self-control separately. All these three variables are predicted to be positively related to self-control according to the second hypothesis.

Control variables

Although Gottfredson and Hirschi argued that child-rearing is the main cause of self-control, they do leave the door open by stating 'family child-rearing practices are not the only causes of crime' (1990:101). Gender and age is used here as a control variable for the effect of child-rearing on self-control. Gender is coded as a binary variable (male=1; female=0). Age is a continuous variable.

Table 7 presents the means and standard deviations of self-control, parental practice and control variables for the causality hypothesis.

Table 7: Descriptive statistics for Parenting and Self-Control in the Second Hypothesis

	Pretest		Posttest		Booster1		Booster2	
Sample Size (N)	334		217		175		64	
	Mean	SD	**Mean**	SD	**Mean**	SD	**Mean**	SD
Demographic variables								
Gender	.40		.48		.42		.42	
Age	7.35	0.53	7.86	1.01	8.35	.81	9.30	.89
Parenting variables								
Discipline and Monitoring	22.00	5.50	21.20	4.90	21.60	5.20	21.63	5.20
Supervision	14.30	2.30	13.50	2.10	13.50	3.70	13.50	3.70
Attachment	24.10	6.30	24.80	5.90	25.50	5.80	24.70	7.10
Self-Control	1.69	.56	1.84	.53	1.81	.49	1.88	.45

Analysis Strategies

Before introducing the analysis methods of this study, two things should be addressed. First, self-control is a latent variable which means it is not directly observed and estimated by a number of related variables (impulsivity, temper). Therefore, a latent variable modeling is more suitable to deal with the research questions in this study. In addition, measurement error on latent variables resulting from data collection would also be an issue. The measurement error would cause attenuation in correlations, bias estimates of variance, and regression slopes for independent variables. One traditional way to correct for correlation attenuation is to divide it by the square root of the product of two variables' reliability. We determine what the correlation between two variables would be if the reliabilities of the two variables are perfect. This approach is a little problematic because reliabilities of variables are usually estimated from a sample rather than exactly known to researchers. Therefore, advanced statistical techniques are required to taking into account measurement error, and latent variable modeling is appropriate to deal with this problem.

To test the first research hypothesis, this study first looked at the proportion of individuals who shift their percentile rank order among the group by 5%, 10%, and etc. This statistics will give a straightforward picture on how many individuals stay relative stable or change over time. Then correlations between the four time self-control scores will be provided. As indicated earlier, a latent variable model will be used to taking into account the measurement error. Here, self-control level of each

individual over four time points will be estimated by a single class growth model using M plus® (Muthé n and Muthé n, 2005). Mplus is a statistical modeling program that provides researchers with a wide choice of models, estimators, and algorithms. The generality of the Mplus modeling framework comes from the unique use of both continuous and categorical latent variables. Compared with other statistical tool such as HLM, Mplus has advantages of allowing more general modeling (Muthén, 2005)

Growth models examine the development of individuals on one or more outcome variables. In this study, the outcome variable is a continuous latent variable-self control. Figure 1 shows the latent growth model in Mplus. The rectangles represent observed variables; the circles represent latent variables and the arrows represent regression relationships between variables. The dot rectangle describes the latent growth model applied to the first hypothesis testing. The single class growth model with intercept only, intercept plus slope, intercept plus slope plus quadratic slope will be compared on model fit and the best model will be selected (see Table 7).

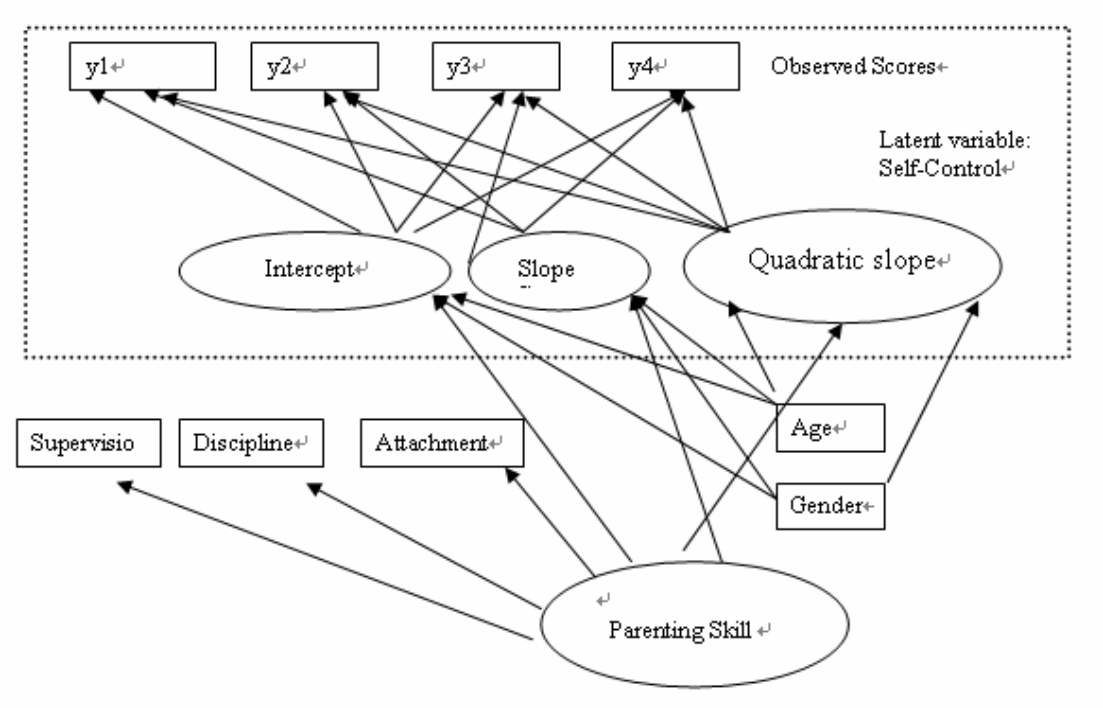


Figure 1: Single Class Growth Model

As the following Table 8 shows, the third model is tested to be the best model[3]. The selected latent growth model is defined by three latent factors. The intercept represents the initial status; the slope represents the linear growth rate over time; and the quadratic slope represents the non linear growth rate over time. The intercept, slope and quadratic slope of each individual's self-control level then will be provided by Mplus. The formula to calculate the estimated self-control score of each individual is as follows: self-control = intercept + slope * time score + quadratic slope * (time score) ^{2} where time score is the scaled time points measured from the first test. Therefore, based on a unit of four months, the time scores for the four waves are 0, 1, 2.5, and 5.5 respectively.

[3] This model selection and the following one for the causality hypothesis are mainly based on empirical evidences since there has been no definitive theoretical guidance on the subject matter.

Table 8: Selection of Single Class Growth Model for Hypothesis 1

	Model Fit			Likelihood Ratio Test	
	χ^2	df	P	Model comparison	$\Delta\chi^2$
Intercept	66.069	8	.000		
Intercept+Slope	51.833	5	.000	1 vs. 2	14.236(3)
Intercept +Slope+Quadratic Slope	16.640	1	.000	2 vs. 3	35.193(4)

After obtaining those more accurate estimates, relative stability of self-control will be illustrated by the correlations of estimated self-control measures.

As shown in the Figure 1, to test the second hypothesis, parenting variables are added into single class growth model as covariates. Age and gender are also added as control variables. The effect of parenting variables on both intercept and slope of self-control can be calculated which give indications of 1) how parenting variables determine children's level of self-control at the starting points 2)how parenting variables determine the rate of change on self-control for each individual.

Again, to decide the measurement model, this study compares single class growth models with intercept only, intercept plus slope, intercept plus slope plus quadratic slope on model fit and the best model will be selected (see Table 9)

.

Table 9: Selection of Single Class Growth Model for Hypothesis 2

	Model Fit			Likelihood Ratio Test	
	χ^2	df	P	Model comparison	$\Delta\chi^2$
Intercept	631.97	8	.000		
Intercept+Slope	335.43	5	.000	1 vs. 2	304.54(3)
Intercept +Slope+Quadratic Slope	59.376	1	.000	2 vs. 3	276.06(4)
i +s+qs (s@0;qs@0)[4]	69.916	6	.000	3 vs.4	10.54 (5)

Once the model is decided, the regression effects of all covariates are estimated at each time points. The estimates are also standardized for the convenience of comparison.

Advantage and limitation of the data

The SFP data is secondary data which is not intended to be collected to measure the construct of self-control. But it has several merits for the purpose of this study.

First, this data is longitudinal and covers the information of youth aged from age 9 to 12 which is the time period when self-control is hypothesized to begin to stabilize. Second, majority of the participants in this data is African-American youth. Except for Burt et al (2006), there are few previous researches targeting on the stability of self-control of minority group therefore Turner and Piquero (2002)

[4] The latent growth model with intercept, slope and quadratic slope is better than the one with intercept and slope only. But since the correlation of intercept with quadratic slope, correlation of slope with quadratic slope is so small, they causes the negative variances of slope and quadratic slope in estimated model. Therefore, the final model sets the variance of slope and quadratic slope to zero.

suggested that future research may examine the stability of self-control within non-white population. Also, the data provide plentiful information on child-rearing practice in the parent survey; it gives the opportunity to tentatively explore the origin of self-control.

One of the limitations of this data is that the follow-up data did not measure individuals in adulthood. Although Gottfredson and Hirschi insisted that the stability hypothesis will still hold up to the adulthood it would be beneficial to empirically test it during this period since most life-events as turning points suggested by Sampson and Laub occur in adulthood. However, this data allows an opportunity to invalidate Gottfredson and Hirschi's stability statement if this hypothesis does not hold for children aged 9 to 11.

Chapter 4: Findings

Relative Stability of Self-Control

As stated in earlier sections, test-retest correlations or stability coefficients are the most common way to assess relative stability (Roberts and Delveccio, 2000); however, it is useful to first give some descriptive information about the rank order change of self-control. To assess the magnitude of movement along the self-control hierarchy, each observed score at four time points is ranked ordered by means of fractional rank. Therefore, the 465 observed self-control scores ranging from 0 to 17 are now converted to rank percentile values. For example, an individual with fractional rank 17.1 means the self-control level of this person is located at the bottom 17.1% of the self-control distribution of the dataset. We examined the differences in ranking calculated by subtracting the children's wave1 ranks from their ranks at following three waves.

The results in Table 10 present the percentage and cumulative percentage of rank order changes of the observed self-control scores. The difference of the fractional ranks are categorized into 7 categories: within 5% change, 5%-10% change, 10%-20% change, 20%-30% change, 30%-40% change, 40%-50% change and more than 50% change. During the pre-post test (4 months), almost one-fifth of the youth change their self-control fractional rank by less than 5%. Sixty percent of the youth's self-control ranks fluctuate within 20% and there are around 10 percent children whose rank changes are higher than 50%. The rank order change from time 1 to time

3 and from time 1 to time 4 demonstrate similar patterns. During the 10 months from pretest to booster1, 17.5 percent of the individuals move their ranks within 5%. Almost half of the children shift the fractional ranks within 20% and a little more than ten percent children change their ranks greater than 50%. Between the first and the fourth wave, 17.5 percent youth change their rank within 5%. More than half of the children shift the fractional rank within 20% and less than ten percent youth change their ranks greater than 50%.

Table 10: Rank Order Change of Observed Self-Control Level across Four Waves

	Time1-Time2 (n=310)		Time 1-Time 3 (n=218)		Time 1-Time 4 (n=69)	
	Percentage	Cumulative Percentage	Percentage	Cumulative Percentage	Percentage	Cumulative Percentage
5% change	20.3	20.3	17.5	17.5	17.5	17.5
5-10% change	12.9	33.2	14.8	32.3	17.5	35.0
10-20% change	26.8	60.0	17.9	50.2	21.3	56.3
20-30% change	15.2	75.2	14.8	65.0	13.8	70.0
30-40% change	11.9	87.1	14.4	79.4	15.0	85.0
40-50% change	4.5	91.6	9.3	88.7	7.5	92.5
More than 50% change	8.4	100.0	11.3	100.0	7.5	100.0

Therefore, consistent with what the hypothesis has expected, a fair amount (more than half) of individuals stays relative stable on self-control level shifting their fractional ranks within less than 20%. When the duration time increases, the percentage of children who maintain their relative rank change within 5% reduced a little bit which suggested the relative stability of self-control slowly decreases through the time span. On the other hand, there exist a small group of children (less then 12 percents) whose self-control ranks alter greatly between each wave. To illustrate the extent of change, one boy decreases his rank from the highest 98.28% at wave1 to one of the lowest 7.9% at wave2, while a girl accomplishes the highest jump from 2.15% at wave1 to 74.84% at wave 2 to 79.96% at wave 3 and finally reached 95% at the last wave.

To assess the strength of the relative stability of self-control, Table 11 provides the correlations of the observed self-control level over the four waves. All the correlations are significant ($P<0.001$) and suggest moderate stability across this period of time (0.561, 0.425, and 0.469 respectively).

Table 11: Spearman Correlations between Observed Self-Control at Four Waves

	Self-Control at Time 2	Self-Control at Time 3	Self-Control at Time 4
Self-Control at Time 1	.561**	.425**	.469**
	(.000)	(.000)	(.000)
N	310	257	80
Self-Control at Time 2		.569**	.550**
		(.000)	(.000)
N		218	71
Self-Control at Time 3			.516**
			(.000)
N			69

****** $p<0.01$

While the preliminary rank order descriptive statistics and correlation coefficients of observed self-control score allow one to see if there has been significant rank order changes, this data has suffered from measurement errors and decreasing valid sample size at each wave. Because of these limitations, this study uses Single Class Latent Growth Model which provides a more accurate estimated individual score on latent variables (e.g., Self-control in this hypothesis) with measurement errors corrected. Self-control is modeled as a function of the intercept score, slope indicating linear change and quadratic slope indicating curvilinear change. Mplus provides the estimated intercept, slope and quadratic slope for each

individual, and therefore the estimated score is a function of intercept (i), slope (s) and quadratic slope (qs): $y=i + s*t+ qs*t^2$.

Table 12 provides the simple statistics of the estimated self-control score for the four time points and Figure 2 illustrates the mean of self-control for both raw scores and estimated scores. As the picture shows, the estimated mean are very close to the observed mean at each time point. Therefore, while accounting for the measurement errors and being more accurate, the estimated scores maximally represent the original data.

Table 12: Descriptive of Estimated Self-Control Scores

	Mean	***Standard Deviat***	***Observed Range***	***Maximum Possibl Range***
Self-control (Time1)	7.97	2.87	13.24	0-18
Self-control (Time 2)	7.96	2.67	13.51	0-18
Self-control (Time3)	6.63	3.08	14.86	0-18
Self-control (Time4)	7.99	2.68	13.73	0-18

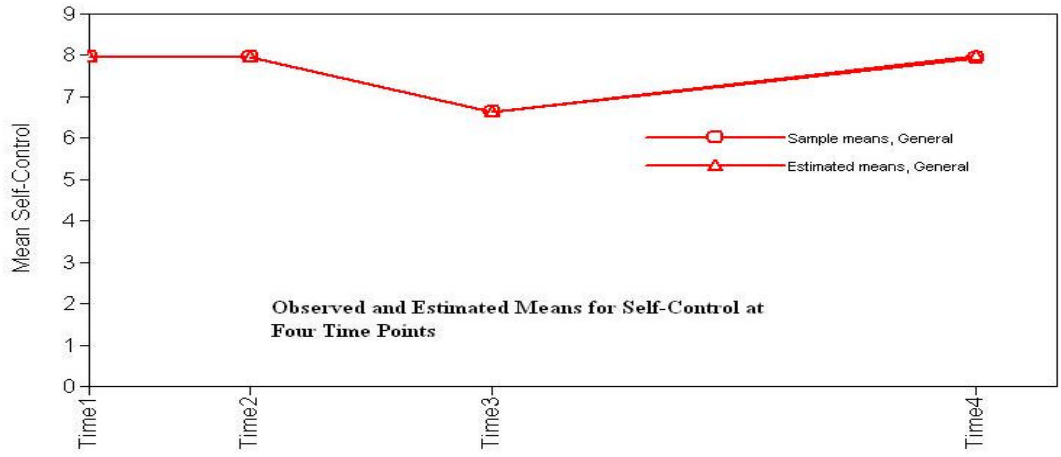


Figure 2: Observed and Estimated Means of Self-Control at Four Waves

Given the estimated scores of each individual's self-control, relative stability are again analyzed using correlation coefficients (See Table 13). All the correlations between self-control at different time are significant (P<0.001) and they (except for one) demonstrate to be above 0.8.

Table 13: Correlations between Estimated Self-Control at Four Waves

	Time 2	Time 3	Time 4
Self-Control at Time 1	.934**	.633**	.896**
N	465	465	465
Self-Control at Time 2		.867**	.996**
N		465	465
Self-Control at Time 3			.910**
N			465
Self-Control at Time 4			1.00**
N			465

** p<0.01

Child-Rearing and Self-Control

In the analysis strategy section, we have picked the best single growth model to assess the effect of child-rearing on self-control (intercept/slope/quadratic slope). Table 14 provides the regression results of parenting variables and control variables on self-control at four different time points (See Appendix F for the Mplus output).

At the first time point when the average age of children is 7.4, all three parenting factors have positive effects on the starting point of self-control level (intercept). Of those parenting factors, discipline and monitoring is the only one to have significant effect (0.02). Therefore, children who have been more disciplined and monitored by their parents tend to have higher level of self-control at time 1 than those who experiences less. Among the two control variables, male has a negative effect on the intercept of self-control which means boys possess lower level of self-control than females at the time of the first interview. The mean self-control level of an average girl (with mean level of discipline, supervision, attachment and age) is 1.685, while an average boy has the mean self-control level of 1.456. Figure 3 and 4 demonstrate the impact of discipline on the self-control level at the first time point for both boys and girls. The other control variable age doesn't seem to be significant.

Regression results also show that discipline has a small negative effect on slope (-0.026). It indicates that those children who are less disciplined will catch up with the others slightly over time. The positive effect of discipline on quadratic slope (0.016) means that this catch up process will reach to an end and discipline then

slowly accelerate the growth of self-control again. Overall, 18.4% variation in intercept of self-control is explained by discipline and gender.

As shown in the table 14, the growth model is estimated again when centered at the second interview which is four months later after the baseline. The average age of children is 7.7. Parenting variables still have positive effects on the starting self-control level at time 2 while discipline is the only one to be significant (.018). A child who possesses one standard deviation discipline above average will maintain self-control level 0.09[5] higher than an average child whose discipline value is at the mean level. Male still exert a negative impact on self-control which indicates that boys have lower self-control level than girls at the second interview. Overall, 13.9% of variation in intercept of self-control is explained by discipline and gender.

When the model is centered at the third time point ten months after the first interview, discipline and male remain to be the two factors which hold significant effects on starting level of self-control. The estimate of discipline and male are relatively small (0.017 and -.157 separately). Gender and discipline explain 15% of the variation in intercept of self-control

Attachment turns out to have a positive effect on the slope of growth model, which indicates that if youth who are closer to their parents at the third interview tend to develop more self-control over time compared to those who are not.

Finally, the impact of each covariate on the intercept, slope and quadratic slope are estimated again when the model is centered at the last time point (almost

[5] The value comes from the product of discipline estimate (0.018) and the standard deviation of discipline ($\sqrt{25.895}$).

two years after the first interview). The mean age of children is 9.3. Discipline positively affects the starting level of self-control with an estimate of 0.044. It also has a small significant positive impact on both the slope (.053) and quadratic slope (.027). Therefore, discipline increases the growth rates of self-control among individuals. Children who are more disciplined not only have higher level of self-control at time four; they also develop self-control level more quickly than the rest later on. Up to 40.7% of the intercept variation is accounted by discipline and monitoring alone.

At the final interview, the gender differences of self-control are indiscernible. However, age tends to have a positive effect on the growth rate of self-control which means that youth who are older will build up self-control a little faster than younger children.

Overall, discipline and monitoring consistently has a positively impact on the starting level of self-control at all four different interview times. It also increases the growth rate of self-control later on at the final assessment. The other two parenting variables supervision and attachment fail to change both the starting level and the growth rate of self-control at any time points with only one exception (attachment at time 3).

Male is also an important factor to decide the starting level of self-control at the first three time points. When the average age of youth approximate 10, this gender difference diminishes at the last interview. Instead, age becomes important to determine the growth rates of self-control of individuals over time.

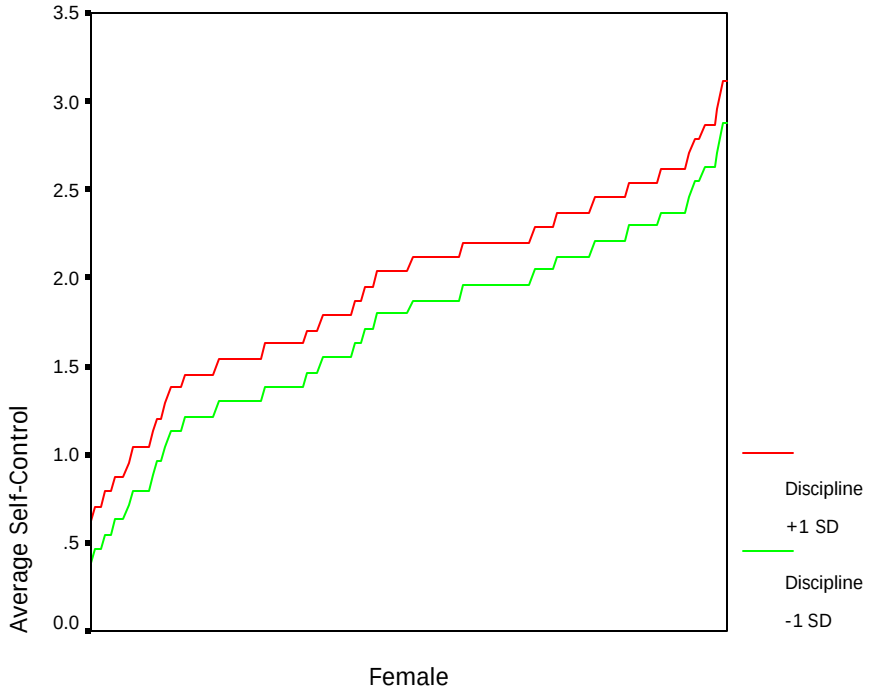


Figure 3: Discipline effect on the starting level of self-control for females

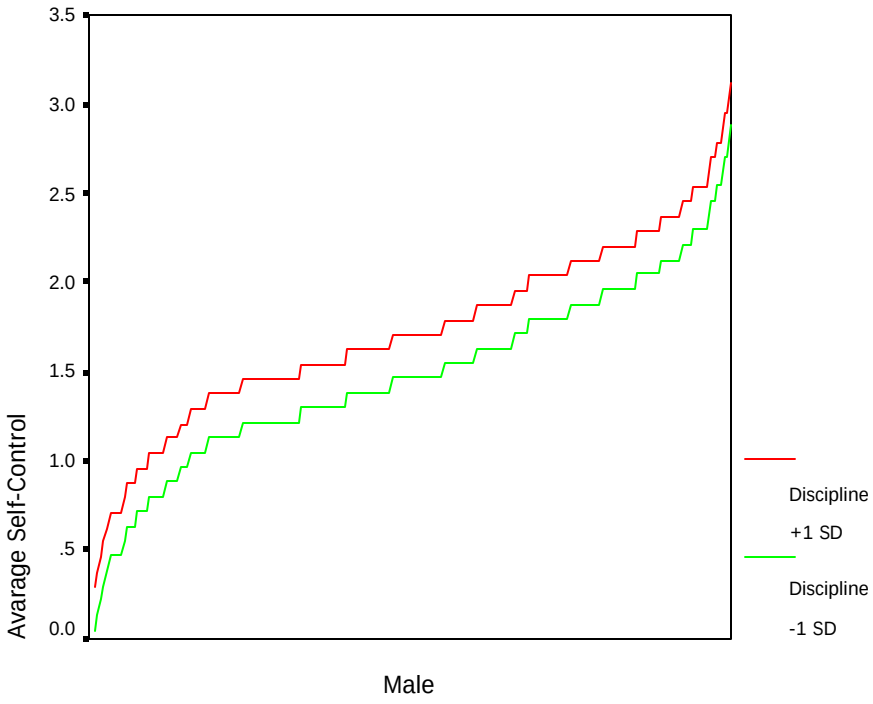


Figure 4: Discipline effect on the starting level of self-control for males

Table 14: Single Class Growth Model with Multiple Covariates

	Time1						Time 2					
	Intercept		Slope		Quadratic slope		Intercept		Slope		Quadratic slope	
	Estimate	β [a]	Estimate	β	Estimate	β	Estimate	β	Estimate	β	Estimate	β
Discipline and Monitoring	**.02****	.292	**-.026****	-.732	**.016****	.724	**.018****	.221	-.004	-.223	.013	.619
Supervision	.014	.034	.042	.485	-.036	-.692	.01	.057	.017	.421	-.027	-.602
Attachment	.002	.004	-.016	-.462	.008	.382	.002	.024	-.006	-.342	-.003	-.145
Age	-.061	-.145	.008	.195	.006	.022	-.067	-.129	.07	.567	-.067	-.492
Male	**-.229****	___	.006	___	.055	___	**-.196****	___	.114	___	.009	___
	R^2=0.184[6]						R^2=0.139					

***** p<0.05

******p<0.01

a: ß is the standardized coefficient of each covariate.

[6] This is the R-Square of the intercept at each time point because the variance of slope and quadratic slope are already set to zero. It indicates the amount of variation in the intercept that is explained by the covariates.

Table 14: Single Class Growth Model with Multiple Covariates (continued)

	Time3						Time 4					
	Intercept		Slope		Quadratic slope		Intercept		Slope		Quadratic slope	
	Estimate	β	Estimate	β	Estimate	β	Estimate	β	Estimate	β	Estimate	β
Discipline and Monitoring	**.017****	.223	-.007	-..328	.006	.34	**.044****	.571	**.053****	.749	**.027****	.756
Supervision	.038	.215	-.023	-.475	0.002	.05	.004	.015	-.002	-.008	.014	.117
Attachment	-.007	-.098	**.014****	0.736	.014	.84	.013	.212	.02	.344	.01	.325
Age	.028		.033	.253	-.054	-.467	.039	.083	**.217***	.502	**.115***	.523
Male	**-.157****	___	.139	___	.029	___	059	___	.228	___	.05	___
	R^2=0.15						R^2=0.407					

***** p<0.05
****** p<0.01

Chapter 5: Discussion and Conclusion

Gottfredson and Hirschi's general theory of crime has garnered a great deal of attention from criminologists since its introduction. This present study examined the stability of self-control in a longitudinal investigation of children who were assessed over an approximately two year period. The relationship between self-control and early child socialization is also investigated as outlined in the general theory of crime. This study is one of the first researches to examine the self-control theory by empirically incorporating latent growth modeling. On the basis of the comparison of three models indicating no change, linear change and quadratic change in self-control, the last model was selected because it provides a best fit to the data.

The general findings of this study partially support Gotffredson and Hirsch's assumption concerning the relative stability nature of self-control after its establishment in preadolescence. For example, for a child whose age is older than 8, we found evidence of moderate to strong stability in observed self-control during the two year period (test-retest coefficients range from 0.42 to 0.6). In addition, I examined the between-individual stability by compare each child's percentage rank of self-control at each wave, around half of the group stayed the same rank or vary no greater than 20%. However, almost 10% of the group changes their rank positions quite widely, with the rank variation greater than 50%.

Gottfredson and Hirschi didn't clearly specify a threshold of stability in their theory, but it could be inferred from their assertion "sufficiently stable over time that they need not be continually reassessed". Therefore, one might argue that the level of stability should be very high in their prediction. Other researchers testing the stability of self-

control (Arneklev et al, 1998) adopt 0.8 as an accepted minimal standard for reliability or consistency in measurement. Based on above standards, the correlation coefficients of observed self-control are not as strong as the theory predicts. But this finding is consistent with previous research on stability of self-control (Burt et al, 2006; Winfree et al, 2006) or other similar personality traits like impulsivity (Roberts and DelVecchio, 2000). Burt et al (2006) found the rank-order stability of self-control over two years is 0.48 in their African American children sample. Winfree, Tayler, He and Esbensen (2006) in their 4 year longitudinal studies found the year-to year correlations for self-control measures range from the lowest 0.44 to the highest 0.68. Therefore, this study adds support to the previous findings that observed self-control stability over several years is moderate.

The finding that the stability coefficients of self-control at different times are compatible with other similar personality traits (Raffaelli et al 2005; Murphy et al, 1999) also helps to link the role of self-control with other psychological traits. Goffredson and Hirschi have not clarified the relationship between self-control and other constructs that are well established in the psychological literature. But the definition of self-control as stable difference between individuals appears to be compatible with the concept of "trait". Also, previous literatures frequently refer self-control as a characteristic of "personality" (Nagian and Paternoster, 1993; Gibbs and Giever, 1995). Gorman and Baxter (2002) examined the construct of self-control from Goffredson and Hirschi's theory as a personality measure and found the similarity between self-control measure and existing personality scales. Romero et al (2003) also found that self-control overlaps with well-known personality constructs such as conscientiousness, impulsive sensation seeking.

Therefore, this study indirectly supports the notion that self-control is one type of personality by showing the similar stability of self-control and other personality traits.

Of top of the above findings, one unique contribution of this study is the incorporation of latent growth model to estimate the latent variable self-control with measurement errors controlled. The results show that test-retest coefficients of the estimated self-control are much higher when controlling measurement errors compared to those from observed self-control. All revised test-retest coefficients are higher than 0.85 except for one (0.633). This finding is very interesting because this is exactly what Gottfredson and Hirschi have predicted: "in the cross-sectional view of crime, differences across people and their life circumstances are sufficiently stable over time that day to day variability are uninteresting or likely to be nothing more than measurement error" (1990:p251). It is not new that with measurement errors by introducing latent variable model, rank stability of latent traits increased significantly. This is consistent with previous literature in other behavioral and social sciences such as Epidemiology and clinical studies (Muthen, 1992). The high stability of estimated self-control tentatively give support Gottfredson and Hirshi's population heterogeneity argument, but this conclusion is conservative given the two year time frame in the present study. Therefore, this finding supports the self-control theory but hasn't addressed the long-term stability.

The results also leave some room for state dependence argument in that the level of self-control appears to decay over time. In the present study, the stability coefficients generally decline with either observed or estimated self-control scores. Previous researches also found similar results. For example, Raffiaelli, Crochett and Shen (2005) found that although the individual difference in self-regulation is fairly stable overtime,

the magnitude of the stability coefficients decrease slightly in their 8 years period study. The r is 0.5 between the time 1 and time2 and decreased to 0.47 between time 1 and time 3. If the difference of latent propensity between individuals loses stability over a long run, state dependence might be the underlying reason of high correlation and continuity of current and future delinquency and criminal behavior.

The second research question in this study is whether effective parenting explains the starting level and changes of self-control of children. Disagreeing with some current scholars who argue that parents have little impact on young adolescents (Harris, 1998), Gottfredson and Hirschi believed that parents do matter and their influence on children's behavior exerts through the conduit of self-control. The origins of criminality of low self-control are to be found in the first eight to ten years of life, during which the child remains under the control and supervision of the family or a familial institution (Gottfredson and Hirschi, 1990, p272).

The findings concerned with effective parenting also reveal partial support to Gottfredson and Hirshi's theory. Parental discipline and monitoring is clearly related to self-control in the predicted direction. Individuals who are better monitored and disciplined consistently have higher level of self-control at each time point. Discipline and monitoring together with gender explained fair amount of variation of the starting self-control level at the first three waves. What is more, discipline and monitoring alone accounts for as high as 40.7% variance of the intercept at the last time point. The positive influence of monitoring and consistent discipline is well documented in previous literatures (Hay, 2001; Unnever, Cullen and Pratt, 2003). With respect to sex, the finding comports well with the theory: males reported lower levels of self-control than did

females in the first three waves controlling for all other parenting factors. What is inconsistent with the claims of self-control theory is that children's attachment to their parents and parental supervision are found to have no impact on an individual's self-control. Previous findings on the impact of supervision are mixed (Polakowski, 1994; Hope et al, 2003; but see Cochran et al, 1998) while attachment is consistently found to be positively related to self-control (Hope, 2003; Cochran, 1998). The inability to detect impact of these two parenting variables may results from the fact that these two variables are self-reported measures by young children alone. It would be better to add parent report on parental supervision and closeness with children in future studies. Nevertheless, at least some of the parenting factors capable of establishing children's self-control still direct our attention to the programs focused on strengthening families in terms of policy implications. Programs that teach and train parents to effectively monitor and discipline children consistently at early ages should be well designed and implemented.

Our finding regards to the effect of parenting, however, cast some doubts on one of Gottfredson and Hirschi's assertion. Although it is not claimed to be the exclusive cause, Gottfredson and Hirschi (1990: p97) are clear in their theory that "ineffective child rearing" is the "major" cause of low self-control. The results indicate that the variation of self-control at each wave explained by the parenting variables is moderate at best. Apparently, the major components of ineffective parenting as listed by Gottfredson and Hirschi are important causes but not the major or exclusive ones. A necessary next step is to identify specific factors that contribute to the establishment of self-control. One direction of the exploration could be generated from the previous studies of genetic influences. Growing behavioral genetic research has found that impulsivity, attention

deficit hyperactivity disorder (ADHD) closely related to the construct of self-control are highly heritable (Price, Simonoff, Waldman, Asherson and Plomin, 2001; Spencer et al, 2002) Unnever, Cullen and Pratt (2003) found ADHD, an individual difference with a strong generic component, is an alternative source of low self-control besides parental monitoring and punishment. Wright and Beaver (2005) took the generic influences into account when they considered whether parents matter in creating self-control in their children. They compared the effect of parental withdrawal and parental affection on self-control with and without controlling the clusterings of individuals within same household. They found parental withdrawal and parental affection seemed to be moderately or weakly related to self-control as in the predicted direction. But after the genetic influence was controlled, the parental effects either disappeared or became weak and inconsistent. These above studies indicate that genetic influence is also important to determine low self-control of children above and beyond parenting practice. Another direction to identify specific factors or process in the establishment of self-control could find root in Sampson and Laub's informal theory of social control (1993, 2003). Although their theory pays more attention to the impact of social bonds in early adulthood and later life, Burt, Simons and Simons (2006) found that the development and modification of social bonds also contributes to the gradual build up of self-control during adolescence.

Also on the research agenda is to classify the self-control development into multiple groups, because the growth trend and relative stability may vary for different groups. This study found a small group of individuals (around 10%) change their rank positions dramatically between two assessment points. Burt, Simons, and Simons (2006) also discovered that individuals ranked in the middle 50 percent of self-control changed

groups more frequently than those in the highest and lowest groups. Therefore, it is important to develop a theoretical framework that can identify the different groups demonstrating various levels of self-control stability. Finally, as far as I know, there are few studies on self-control theory that apply methods accommodating latent variables up to the present. An important next step would be to replicate the study with ethnically and geographically diverse samples to assess the stability and identify potential causes of self-control.

This study, however, is not without limitations. In Chapter three, I already discussed some limitations of the data. This study is also limited in that it doesn't explore the relationship of family structure and parenting. Gottfredson and Hirshi argued that child-rearing should mediate the effects of family structure factors on self-control. Therefore, it would be ideal to thoroughly examined parenting as the cause of self-control with the full family structure model included.

Notwithstanding the above limitations, this study provides a useful contribution to the present body of researches on Gottfredson and Hirschi's general theory of crime. This study indicates that the stability of observed self-control is moderate and compatible to other closely related psychological traits. When with measurement error taken into consideration, however, self-control demonstrates high stability level as Gottfredson and Hirschi have predicted. This study also supports the importance of parenting practice while also leaves room for additional and alternative factors to determine the self-control level in children at their early ages.

Appendices

Appendix A: Self-controls scales in Older Children Survey

Impulsivity subscale

(1) Sometimes get so restless that you can't sit in a chair long?

(2) Generally say things without stopping to think?

(3) Often get into trouble because you do things without thinking

(4) Usually work quickly without checking your answers?

(5) Usually think carefully before doing anything?

(6) Sometimes break the rules without thinking about it?

(7) Mostly speak without thinking things out?

(8) Often get involved in things you later wish you could get out of?

(9) Get bored more easily than most people doing the same old things?

(10) Planning takes fun out?

(11) Get very annoyed if someone keeps you waiting?

(12) Need to use a lot of self-control to keep yourself out of trouble?

(13) Get very restless if you have to stay around home for any length of tome?

(14) Sometimes put down the first answer that comes into your head during a test when forget to check it later?

All response options are (1) Yes, (2) No.

All the variables are recoded as 0=yes; 1=No

Temper subscale

1) Ignore other children when they tease me or call me names.

2) Ignore classmates who are clowning around in class.

3) Control my temper when people are angry with me.

4) End fights with my parents calmly.

All response options are (1) Often (2) Sometimes (3) Never.

All variables are recoded as 0=Often or sometimes; 1=Never

Appendix B: Self-controls scales in Parent Survey

Impulsivity subscale

In the past three weeks, how often has each statement been true for your child?

(1) Is easily distracted?

(2) Can't sit still?

(3) Runs around a lot, climbing on things?

(4) Is always "on the go" or acts as if driven by a motor?

(5) Interrupts or intrudes on others?

(6) Blurts out answer before the question is complete?

1=Never; 2=Sometimes; 3=Often; 4=Always

All variables are recoded as 0=Always; 1=Often; 2=Sometimes; 3=Never so that higher scores indicate higher self-control.

Temper subscale

How often now, and in the past month, would you say your child

1) Controls temper in conflict situations with peers?

2) Controls temper in conflict situations with adults?

3) Responds well to pushing?

4) Responds well to teasing?

5) *Is irritable

6) *Loses temper

The responses for the first four items are 1=Never; 2=Sometimes; 3= Half the time; 4=Very frequently; 5=Almost always. They are recoded as 0=Never; 1=Sometimes; 2=Half the time; 3=Very frequently or almost always so that higher scores indicate higher self-control.

* The latter two items are originally coded as 1=Never; 2=Sometimes; 3=Often; 4=Always. They are recoded as 0=Always; 1=Often; 2=Sometimes; 3=Never so that higher scores indicate higher self-control.

Appendix C: Parenting Practice Scale in Parent Survey

Discipline and monitoring subscale

1) How often do you give in to child's demands or excuses not to complete work?
2) *How often do you consistently enforce household rules and expectations?
3) How often do you threaten to punish your child and then do not actually punish him/her?
4) How often does your child talk you out of being punished after s/he has done something wrong?
5) How often do you let your child out of punishment early?
6) How often is your child not punished when s/he has done something wrong?
7) How often the punishment you give your child depends on your mood?
8) How often you ignore your child when s/he is misbehaving?
9) *How often do you feel competent that you can change child behavior
10) *How often do you monitor child behavior?

Variables with asterisk are coded as (1) Never (2) Once a month (3) Once a week (4) 3-4 times a week (5) daily. The rest variables are coded as (1) Never (2) Almost Never (3) Sometimes (4) Often (5) Always.

Supervision subscale

1) Usually know how well I am doing in school
2) Keep close track of how well I am doing in school
3) *Let me stay away from the house when I want
4) Usually know if I do something wrong
5) *Usually let me go wherever I want after school
6) Almost always know where I am and what I am doing
7) Would be very angry if I smoked cigarettes
8) I would be punished at home if my parents knew I broke a school rule
9) *It is ok with my parents if I drink beer or wine once in a while
10) I would be in big trouble with my parents if I smoked marijuana

11) *Smoking cigarettes or drinking beer is OK with my parents as long as I stay away from other drugs
12) An adult is usually at home when I get home from school

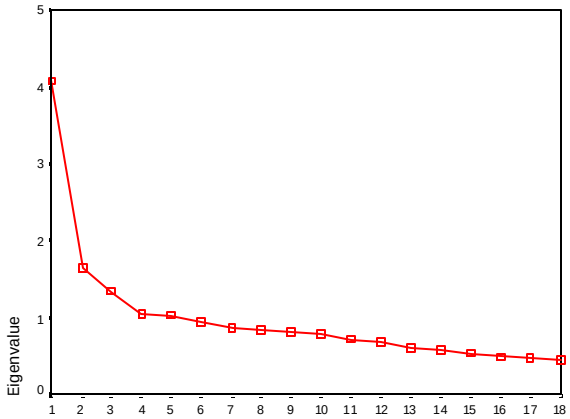
All response options are (1) True (2) False. Variables with asterisk are recoded so that higher scores reflect poorer parenting.

Closeness to parents scale

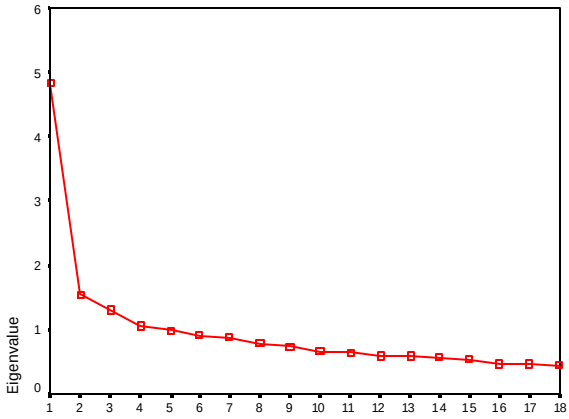
1) I feel very close to my father
2) I enjoy spending time with my father
3) I would like to be the kind of person my father is
4) I share my thoughts and feelings with my father
5) I feel very close to my mother
6) I enjoy spending time with my mother
7) I would like to be the kind of person my mother is
8) I share my thoughts and feelings with my mother

All response options are (1) Disagree very much (2) Disagree (3) Agree (4) Agree very much.

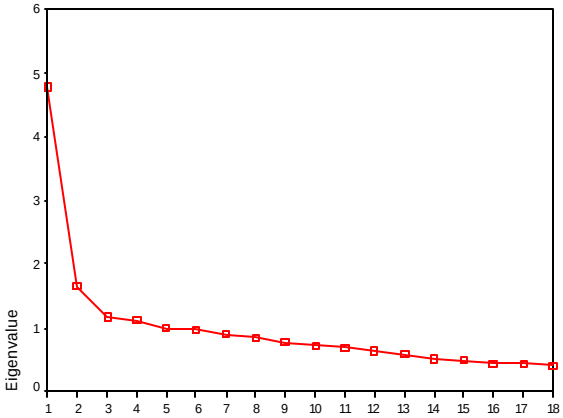
Appendix D: Factor Analysis of Self-Control Scale in Older Children Survey



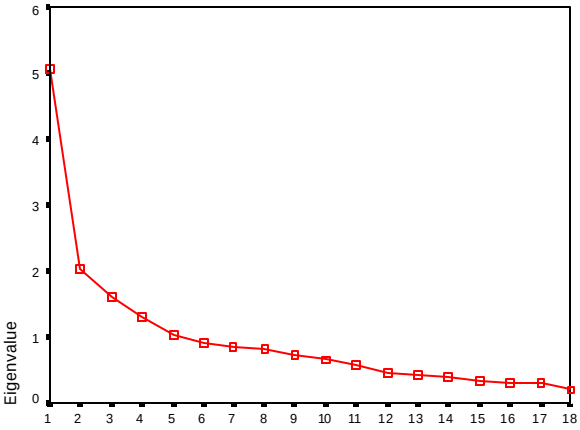
Scree Plot at Time 1



Scree Plot at Time 2

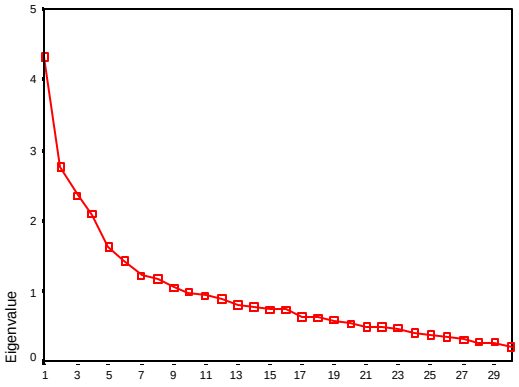


Scree Plot at Time3

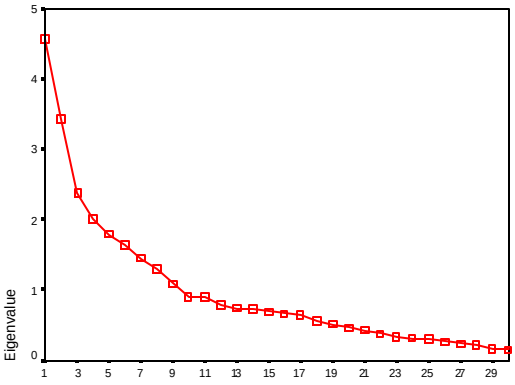


Scree Plot at Time 4

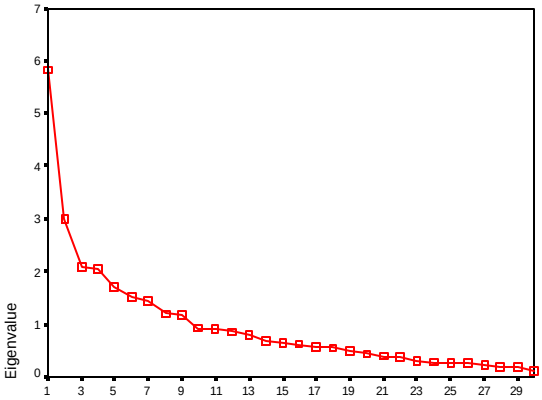
Appendix E: Factor Analysis of Parenting Scale in Combined Younger Children and Parent Survey



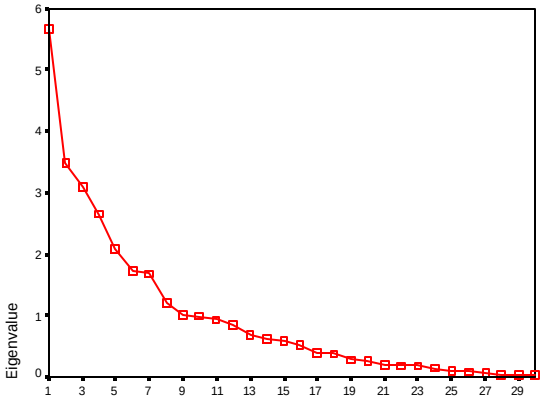
Scree Plot at Time 1



Scree Plot at Time 2



Scree Plot at Time 3



Scree Plot at Time 4

Appendix F: Mplus Output of Causality Hypothesis

```
Mplus VERSION 4.0
MUTHEN & MUTHEN
07/26/2006   8:24 PM

INPUT INSTRUCTIONS

data: file is "C:\Ying\Thesis\Data\Parenting data\Parenting.dat";
 VARIABLE: Names are   race1 male unqfamcd age1 age2 age3 age4 selfcon1
 selfcon2 selfcon3 selfcon4
  discpln1 discpln2 discpln3 discpln4 surpv1 surpv2 surpv3 surpv4 attach1
  attach2 attach3 attach4
 ;
 Missing are all (99);
 IDVARIABLE=unqfamcd;
 USEVAR=discpln1 surpv1 attach1 age1 male selfc1a selfc2a selfc3a selfc4a ;

 Centering=grandmean(discpln1 surpv1 attach1 age1);

 define:  selfc1a=selfcon1/12;
        selfc2a=selfcon2/12;
        selfc3a=selfcon3/12;
        selfc4a=selfcon4/12;
 analysis: type is Meanstructure Missing;
 model: i s qs| selfc1a@0 selfc2a@0.3 selfc3a@0.8 selfc4a@1.8;
 s@0;  qs@0;

 i-qs on discpln1 surpv1 attach1 age1 male;
 output: sampstat patterns tech1 MOD residual stand;
 plot: type is plot1 plot2 plot3;
 series=selfc1a (0) selfc2a(0.3) selfc3a(0.8) selfc4a(1.8);

*** WARNING in Model command
 All continuous latent variable covariances involving S have been fixed to 0
 because the variance of S is fixed at 0.
*** WARNING in Model command
 All continuous latent variable covariances involving QS have been fixed to 0
 because the variance of QS is fixed at 0.
*** WARNING in Output command
 SAMPSTAT option for TYPE=MISSING requires H1.
 TYPE=H1 is turned on automatically.
  3 WARNING(S) FOUND IN THE INPUT INSTRUCTIONS


SUMMARY OF ANALYSIS

Number of groups                                 1
Number of observations                         334

Number of dependent variables                    4
Number of independent variables                  5
Number of continuous latent variables            3

Observed dependent variables
```

Continuous
SELFC1A SELFC2A SELFC3A SELFC4A

Observed independent variables
DISCPLN1 SURPV1 ATTACH1 AGE1 MALE

Continuous latent variables
I S QS

Variables with special functions

ID variable UNQFAMCD
Centering (GRANDMEAN)
DISCPLN1 SURPV1 ATTACH1 AGE1

Estimator ML
Information matrix OBSERVED
Maximum number of iterations 1000
Convergence criterion 0.500D-04
Maximum number of steepest descent iterations 20
Maximum number of iterations for H1 2000
Convergence criterion for H1 0.100D-03

Input data file(s)
C:\Ying\Thesis\Data\Parenting data\Parenting.dat

Input data format FREE

SUMMARY OF DATA

Number of patterns 15

SUMMARY OF MISSING DATA PATTERNS

MISSING DATA PATTERNS

```
          1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
SELFC1A   x  x  x  x  x  x  x  x  x  x  x  x  x  x  x
SELFC2A   x  x  x  x  x  x  x  x
SELFC3A   x  x  x  x              x  x
SELFC4A   x  x  x     x           x     x
DISCPLN1  x  x  x  x  x  x  x  x  x  x  x  x  x  x  x
SURPV1    x  x     x  x  x  x  x  x  x  x  x  x  x  x
ATTACH1   x        x  x  x  x     x  x  x  x  x     x
AGE1      x  x  x  x  x  x     x  x  x  x  x     x  x
MALE      x  x  x  x  x  x  x  x  x  x  x  x  x  x  x
```

MISSING DATA PATTERN FREQUENCIES

Pattern	Frequency	Pattern	Frequency	Pattern	Frequency
1	45	6	66	11	6
2	1	7	1	12	77
3	1	8	1	13	2
4	99	9	8	14	1
5	3	10	22	15	1

COVARIANCE COVERAGE OF DATA

Minimum covariance coverage value 0.100

PROPORTION OF DATA PRESENT

Covariance Coverage

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	0.997				
SELFC2A	0.650	0.650			
SELFC3A	0.527	0.437	0.527		
SELFC4A	0.192	0.150	0.165	0.192	
DISCPLN1	0.997	0.650	0.527	0.192	1.000
SURPV1	0.994	0.647	0.524	0.189	0.997
ATTACH1	0.985	0.641	0.521	0.186	0.988
AGE1	0.988	0.647	0.527	0.192	0.991
MALE	0.997	0.650	0.527	0.192	1.000

Covariance Coverage

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	0.997			
ATTACH1	0.988	0.988		
AGE1	0.988	0.979	0.991	
MALE	0.997	0.988	0.991	1.000

SAMPLE STATISTICS
ESTIMATED SAMPLE STATISTICS

Means

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
1	1.685	1.844	1.812	1.898	0.000

Means

	SURPV1	ATTACH1	AGE1	MALE
1	0.000	0.002	0.000	0.593

Covariances

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	0.311				
SELFC2A	0.170	0.276			
SELFC3A	0.175	0.143	0.263		
SELFC4A	0.147	0.120	0.127	0.231	
DISCPLN1	-0.707	-0.551	-0.299	-0.919	30.266
SURPV1	-0.052	0.031	-0.063	0.129	-0.313
ATTACH1	0.272	0.105	-0.062	-0.019	-1.767
AGE1	-0.019	-0.007	0.002	0.022	0.118
MALE	-0.060	-0.040	-0.038	0.009	0.070

Covariances

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	5.385			

ATTACH1	-2.520	39.598		
AGE1	-0.112	-0.283	0.281	
MALE	0.076	-0.349	0.002	0.241

Correlations

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	1.000				
SELFC2A	0.580	1.000			
SELFC3A	0.612	0.532	1.000		
SELFC4A	0.548	0.476	0.517	1.000	
DISCPLN1	-0.231	-0.191	-0.106	-0.348	1.000
SURPV1	-0.040	0.026	-0.053	0.116	-0.025
ATTACH1	0.078	0.032	-0.019	-0.006	-0.051
AGE1	-0.065	-0.025	0.009	0.085	0.041
MALE	-0.218	-0.156	-0.150	0.038	0.026

Correlations

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	1.000			
ATTACH1	-0.173	1.000		
AGE1	-0.091	-0.085	1.000	
MALE	0.067	-0.113	0.006	1.000

MAXIMUM LOG-LIKELIHOOD VALUE FOR THE UNRESTRICTED (H1) MODEL IS -3845.698

THE MODEL ESTIMATION TERMINATED NORMALLY

TESTS OF MODEL FIT

Chi-Square Test of Model Fit

Value	17.393
Degrees of Freedom	11
P-Value	0.0967

Chi-Square Test of Model Fit for the Baseline Model

Value	241.130
Degrees of Freedom	26
P-Value	0.0000

CFI/TLI

CFI	0.970
TLI	0.930

Loglikelihood

H0 Value	-3854.395
H1 Value	-3845.698

Information Criteria

Number of Free Parameters	23
Akaike (AIC)	7754.790
Bayesian (BIC)	7842.446
Sample-Size Adjusted BIC	7769.488

(n* = (n + 2) / 24)

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.042
90 Percent C.I.	0.000 0.077
Probability RMSEA <= .05	0.603

SRMR (Standardized Root Mean Square Residual)

Value	0.068

MODEL RESULTS

	Estimates	S.E.	Est./S.E.	Std	StdYX
I |					
SELFC1A	1.000	0.000	0.000	0.422	0.772
SELFC2A	1.000	0.000	0.000	0.422	0.770
SELFC3A	1.000	0.000	0.000	0.422	0.818
SELFC4A	1.000	0.000	0.000	0.422	0.815
S |					
SELFC1A	0.000	0.000	0.000	0.000	0.000
SELFC2A	0.300	0.000	0.000	0.063	0.116
SELFC3A	0.800	0.000	0.000	0.169	0.329
SELFC4A	1.800	0.000	0.000	0.381	0.736
QS |					
SELFC1A	0.000	0.000	0.000	0.000	0.000
SELFC2A	0.090	0.000	0.000	0.011	0.020
SELFC3A	0.640	0.000	0.000	0.079	0.153
SELFC4A	3.240	0.000	0.000	0.399	0.772
I ON					
DISCPLN1	-0.023	0.005	-4.563	-0.055	-0.300
SURPV1	-0.004	0.012	-0.293	-0.008	-0.020
ATTACH1	0.003	0.005	0.689	0.007	0.047
AGE1	-0.054	0.053	-1.005	-0.127	-0.067
MALE	-0.226	0.057	-3.982	-0.536	-0.263
S ON					
DISCPLN1	0.030	0.013	2.350	0.142	0.783
SURPV1	-0.017	0.030	-0.543	-0.078	-0.181
ATTACH1	-0.014	0.012	-1.198	-0.066	-0.417
AGE1	0.108	0.133	0.809	0.509	0.270
MALE	0.072	0.144	0.500	0.341	0.167
QS ON					
DISCPLN1	-0.019	0.007	-2.612	-0.158	-0.867
SURPV1	0.016	0.018	0.868	0.129	0.299
ATTACH1	0.007	0.007	0.971	0.053	0.336
AGE1	-0.020	0.077	-0.256	-0.160	-0.085
MALE	0.044	0.084	0.529	0.359	0.176
Intercepts					
SELFC1A	0.000	0.000	0.000	0.000	0.000
SELFC2A	0.000	0.000	0.000	0.000	0.000
SELFC3A	0.000	0.000	0.000	0.000	0.000
SELFC4A	0.000	0.000	0.000	0.000	0.000

I	1.838	0.044	42.224	4.358	4.358
S	0.211	0.111	1.904	0.995	0.995
QS	-0.115	0.065	-1.769	-0.931	-0.931

Residual Variances

SELFC1A	0.121	0.016	7.762	0.121	0.404
SELFC2A	0.136	0.018	7.726	0.136	0.452
SELFC3A	0.110	0.017	6.572	0.110	0.415
SELFC4A	0.088	0.022	3.985	0.088	0.328
I	0.146	0.017	8.418	0.822	0.822
S	0.000	0.000	0.000	0.000	0.000
QS	0.000	0.000	0.000	0.000	0.000

R-SQUARE

Observed

Variable	R-Square
SELFC1A	0.596
SELFC2A	0.548
SELFC3A	0.585
SELFC4A	0.672

Latent

Variable	R-Square
I	0.178
S	1.000
QS	1.000

RESIDUAL OUTPUT

ESTIMATED MODEL AND RESIDUALS (OBSERVED - ESTIMATED)

Model Estimated Means/Intercepts/Thresholds

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
1	1.704	1.772	1.850	1.873	0.000

Model Estimated Means/Intercepts/Thresholds

	SURPV1	ATTACH1	AGE1	MALE
1	0.000	0.002	0.000	0.593

Residuals for Means/Intercepts/Thresholds

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
1	-0.019	0.072	-0.038	0.025	0.000

Residuals for Means/Intercepts/Thresholds

	SURPV1	ATTACH1	AGE1	MALE
1	0.000	0.000	0.000	0.000

Model Estimated Covariances/Correlations/Residual Correlations

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	0.298				
SELFC2A	0.170	0.300			
SELFC3A	0.161	0.158	0.266		
SELFC4A	0.164	0.158	0.155	0.268	
DISCPLN1	-0.723	-0.489	-0.341	-0.950	30.266
SURPV1	-0.031	-0.045	-0.035	0.104	-0.313
ATTACH1	0.267	0.103	-0.074	-0.061	-1.767
AGE1	-0.019	-0.008	0.006	0.016	0.118
MALE	-0.058	-0.050	-0.034	0.011	0.070

Model Estimated Covariances/Correlations/Residual Correlations

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	5.385			
ATTACH1	-2.520	39.598		
AGE1	-0.112	-0.283	0.281	
MALE	0.076	-0.349	0.002	0.241

Residuals for Covariances/Correlations/Residual Correlations

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	0.012				
SELFC2A	0.000	-0.024			
SELFC3A	0.014	-0.015	-0.003		
SELFC4A	-0.017	-0.038	-0.028	-0.037	
DISCPLN1	0.015	-0.062	0.042	0.031	0.000
SURPV1	-0.021	0.076	-0.028	0.025	0.000
ATTACH1	0.005	0.002	0.012	0.042	0.000
AGE1	0.000	0.001	-0.004	0.006	0.000
MALE	-0.002	0.009	-0.004	-0.002	0.000

Residuals for Covariances/Correlations/Residual Correlations

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	0.000			
ATTACH1	0.000	0.000		
AGE1	0.000	0.000	0.000	
MALE	0.000	0.000	0.000	0.000

MODEL MODIFICATION INDICES

Minimum M.I. value for printing the modification index 10.000

	M.I.	E.P.C.	Std E.P.C.	StdYX E.P.C.

Means/Intercepts/Thresholds

[SELFC1A]	10.250	-0.195	-0.195	-0.357
[SELFC2A]	10.250	0.101	0.101	0.185
[SELFC3A]	10.250	-0.180	-0.180	-0.350
[SELFC4A]	10.251	1.217	1.217	2.352

TECHNICAL 1 OUTPUT

PARAMETER SPECIFICATION

NU

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
1	0	0	0	0	0

NU

	SURPV1	ATTACH1	AGE1	MALE
1	0	0	0	0

LAMBDA

	I	S	QS	DISCPLN1	SURPV1
SELFC1A	0	0	0	0	0
SELFC2A	0	0	0	0	0
SELFC3A	0	0	0	0	0
SELFC4A	0	0	0	0	0
DISCPLN1	0	0	0	0	0
SURPV1	0	0	0	0	0
ATTACH1	0	0	0	0	0
AGE1	0	0	0	0	0
MALE	0	0	0	0	0

LAMBDA

	ATTACH1	AGE1	MALE
SELFC1A	0	0	0
SELFC2A	0	0	0
SELFC3A	0	0	0
SELFC4A	0	0	0
DISCPLN1	0	0	0
SURPV1	0	0	0
ATTACH1	0	0	0
AGE1	0	0	0
MALE	0	0	0

THETA

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	1				
SELFC2A	0	2			
SELFC3A	0	0	3		
SELFC4A	0	0	0	4	
DISCPLN1	0	0	0	0	0
SURPV1	0	0	0	0	0
ATTACH1	0	0	0	0	0
AGE1	0	0	0	0	0
MALE	0	0	0	0	0

THETA

SURPV1	ATTACH1	AGE1	MALE

SURPV1	0			
ATTACH1	0	0		
AGE1	0	0	0	
MALE	0	0	0	0

ALPHA

	I	S	QS	DISCPLN1	SURPV1
1	5	6	7	0	0

ALPHA

	ATTACH1	AGE1	MALE
1	0	0	0

BETA

	I	S	QS	DISCPLN1	SURPV1
I	0	0	0	8	9
S	0	0	0	13	14
QS	0	0	0	18	19
DISCPLN1	0	0	0	0	0
SURPV1	0	0	0	0	0
ATTACH1	0	0	0	0	0
AGE1	0	0	0	0	0
MALE	0	0	0	0	0

BETA

	ATTACH1	AGE1	MALE
I	10	11	12
S	15	16	17
QS	20	21	22
DISCPLN1	0	0	0
SURPV1	0	0	0
ATTACH1	0	0	0
AGE1	0	0	0
MALE	0	0	0

PSI

	I	S	QS	DISCPLN1	SURPV1
I	23				
S	0	0			
QS	0	0	0		
DISCPLN1	0	0	0	0	
SURPV1	0	0	0	0	0
ATTACH1	0	0	0	0	0
AGE1	0	0	0	0	0
MALE	0	0	0	0	0

PSI

	ATTACH1	AGE1	MALE

ATTACH1	0		
AGE1	0	0	
MALE	0	0	0

STARTING VALUES

NU

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
1	0.000	0.000	0.000	0.000	0.000

NU

	SURPV1	ATTACH1	AGE1	MALE
1	0.000	0.000	0.000	0.000

LAMBDA

	I	S	QS	DISCPLN1	SURPV1
SELFC1A	1.000	0.000	0.000	0.000	0.000
SELFC2A	1.000	0.300	0.090	0.000	0.000
SELFC3A	1.000	0.800	0.640	0.000	0.000
SELFC4A	1.000	1.800	3.240	0.000	0.000
DISCPLN1	0.000	0.000	0.000	1.000	0.000
SURPV1	0.000	0.000	0.000	0.000	1.000
ATTACH1	0.000	0.000	0.000	0.000	0.000
AGE1	0.000	0.000	0.000	0.000	0.000
MALE	0.000	0.000	0.000	0.000	0.000

LAMBDA

	ATTACH1	AGE1	MALE
SELFC1A	0.000	0.000	0.000
SELFC2A	0.000	0.000	0.000
SELFC3A	0.000	0.000	0.000
SELFC4A	0.000	0.000	0.000
DISCPLN1	0.000	0.000	0.000
SURPV1	0.000	0.000	0.000
ATTACH1	1.000	0.000	0.000
AGE1	0.000	1.000	0.000
MALE	0.000	0.000	1.000

THETA

	SELFC1A	SELFC2A	SELFC3A	SELFC4A	DISCPLN1
SELFC1A	0.156				
SELFC2A	0.000	0.138			
SELFC3A	0.000	0.000	0.121		
SELFC4A	0.000	0.000	0.000	0.105	
DISCPLN1	0.000	0.000	0.000	0.000	0.000
SURPV1	0.000	0.000	0.000	0.000	0.000
ATTACH1	0.000	0.000	0.000	0.000	0.000
AGE1	0.000	0.000	0.000	0.000	0.000
MALE	0.000	0.000	0.000	0.000	0.000

THETA

	SURPV1	ATTACH1	AGE1	MALE
SURPV1	0.000			
ATTACH1	0.000	0.000		
AGE1	0.000	0.000	0.000	
MALE	0.000	0.000	0.000	0.000

ALPHA

	I	S	QS	DISCPLN1	SURPV1	
1	1.651	0.700	-0.594	0.000	0.000	

ALPHA

	ATTACH1	AGE1	MALE
1	0.002	0.000	0.593

BETA

	I	S	QS	DISCPLN1	SURPV1	
I	0.000	0.000	0.000	0.000	0.000	
S	0.000	0.000	0.000	0.000	0.000	
QS	0.000	0.000	0.000	0.000	0.000	
DISCPLN1	0.000	0.000	0.000	0.000	0.000	
SURPV1	0.000	0.000	0.000	0.000	0.000	
ATTACH1	0.000	0.000	0.000	0.000	0.000	
AGE1	0.000	0.000	0.000	0.000	0.000	
MALE	0.000	0.000	0.000	0.000	0.000	

BETA

	ATTACH1	AGE1	MALE
I	0.000	0.000	0.000
S	0.000	0.000	0.000
QS	0.000	0.000	0.000
DISCPLN1	0..000	0.000	0.000
SURPV1	0.000	0.000	0.000
ATTACH1	0.000	0.000	0.000
AGE1	0.000	0.000	0.000
MALE	0.000	0.000	0.000

PSI

	I	S	QS	DISCPLN1	SURPV1	
I	0.257					
S	0.000	0.000				
QS	0.000	0.000	0.000			
DISCPLN1	0.000	0.000	0.000	30.266		
SURPV1	0.000	0.000	0.000	-0.313	5.385	
ATTACH1	0.000	0.000	0.000	-1.767	-2.520	
AGE1	0.000	0.000	0.000	0.118	-0.112	
MALE	0.000	0.000	0.000	0.070	0.076	

PSI

	ATTACH1	AGE1	MALE
ATTACH1	39.598		
AGE1	-0.283	0.281	
MALE	-0.349	0.002	0.241

PLOT INFORMATION

The following plots are available:

Histograms (sample values, estimated factor scores, estimated values)
Scatterplots (sample values, estimated factor scores, estimated values)
Sample means
Estimated means
Sample and estimated means
Adjusted estimated means
Observed individual values
Estimated individual values

Beginning Time: 20:24:15
Ending Time: 20:24:16
Elapsed Time: 00:00:01

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