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Low Self-Control, Peer Rejection, Reactive Criminal Thinking, and Delinquent Peer Associations: Connecting the Pieces of the Crime Puzzle

Glenn D. Walters[1]

Abstract

Purpose The present series of studies were designed to test the control model of criminal lifestyle development which integrates aspects of low self-control, general strain, differential association, and criminal thinking.

Methods Participants for the first study were 411 boys from the Cambridge Study of Delinquency Development, and participants for the second study were 3817 children from the National Longitudinal Survey of Youth-Child (NLSY-C) sample.

Results In the first study (Cambridge), peer-rated popularity (peer rejection) and teacher-rated low self-control were cross-lagged, with results showing that while low self-control predicted peer rejection, peer rejection did not predict low self-control. In the second study (NLSY-C), findings revealed that (1) peer rejection predicted deviant peer associations but not vice versa, (2) delinquency and reactive criminal thinking mediated the peer rejection–peer delinquency relationship, and (3) negative affect (depression, anxiety, loneliness) alone did not mediate the peer rejection–peer delinquency relationship nor did it alter the indirect effects of delinquency and reactive criminal thinking on this relationship.

Conclusions The results of these two studies suggest that theoretical integration is possible and that reactive criminal thinking plays an important role in mediating relationships involving such traditional criminological variables as low self-control, strain created by peer rejection, and peer delinquency.

Keywords Low self-control · Peer rejection · Peer delinquency · Reactive criminal thinking

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Introduction

The state of theory in criminology and criminal justice has frequently been described as fragmented and disjointed [1]. A principal reason for this is the relatively large number of single-variable theories used to explain crime [2]. Some of these theories—differential association [3] and the general theory of crime [4], in particular—have made significant and lasting contributions to criminological scholarship and practice. Still, no single construct, regardless of how powerful or important, can fully account for a behavior as complex as crime. Several scholars have called for theoretical unification in criminology and criminal justice [5, 6]. These calls have gone largely unheeded, not because researchers do not see the need for integration but because of problems associated with the unification process itself [7]. Like the pieces of a puzzle, these single-variable theories require integration to realize their full potential. This means finding a way to integrate the different theories, identifying a unifying set of principles or conceptual mechanisms, and then testing these principles or mechanisms. Liska et al. [8] describe three types of integration: side-by-side (horizontal), end-to-end (sequential), and up-and-down (deductive). The current paper utilizes the end-to-end or sequential approach to integration whereby causal conditions are ordered along a continuum of proximal and distal relationships. Whether some of these putative causes are properly ordered is the research question that guided the two studies presented in this paper.

Walters [9] offers an overarching theory of criminal behavior in which statistical procedures (mediation and moderation, primarily) are used to integrate concepts from different criminological theories. This theory is comprised of two developmental models: a moral or proactive model and a control or reactive model. According to Walters [9], the moral model captures the planned, calculated, and instrumental aspects of crime and the control model represents the impulsive, irresponsible, and emotional aspects. Although these two models have overlapping features, they can and have been studied separately. Figure 1 lays out the principal constructs and pathways found in the control model of criminal lifestyle development. The biological (disinhibited or difficult temperament: [10, 11]) and environmental (weak parental monitoring and poor parental socialization: [12]) antecedents of the control model, despite their absence from Fig. 1, are of cardinal significance in the development of low self-control [4], the core concept in the control model. Low self-control gives rise to delinquency through a process of weak behavioral restraint [13, 14], and weak behavioral restraint can lead to weak cognitive restraint or what is known in lifestyle theory as reactive (impulsive,
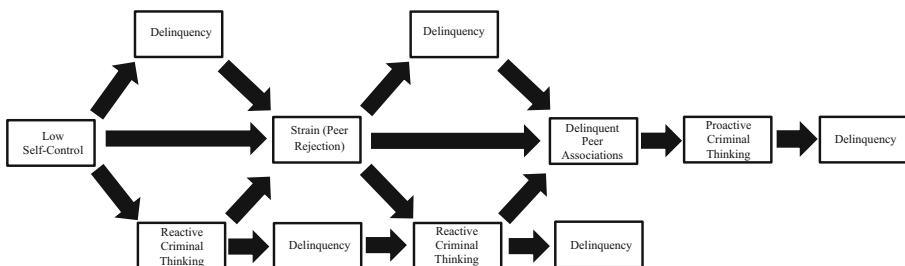

Fig. 1 Control model of criminal lifestyle development

emotional) criminal thinking. Delinquency gives rise to a number of constructs central to the control model of lifestyle development, to include reactive criminal thinking, strain, and delinquent peer associations (peer selection effect). Each of these variables was selected for inclusion in the control model because of their relationship to delinquency and each other. Overlap with the moral model is indicated by the presence of proactive criminal thinking in the latter stages of the model, stemming, in this case, from exposure to delinquent peers (peer influence effect).

Prior research is the foundation upon which the control model of criminal lifestyle development is based. A number of studies have investigated specific pathways in the control model, and several have tested a major model assumption, namely, that low self-control and reactive criminal thinking are not one in the same. Low self-control, as conceptualized by Gottfredson and Hirschi [4], is behavioral in nature and comparable to behavioral impulsivity [15]. Reactive criminal thinking, as conceptualized by Walters [9], is cognitive in nature and comparable to criminal attitudes and beliefs [16]. Ericson and Carriere [2] insinuate that one reason for the surfeit of single-variable theories in criminology is a tendency on the part of some theorists to be overly broad in their theorizing, resulting in what might be called compound constructs containing several related constructs. There is also a tendency on the part of traditional criminological theory to ignore or at least downplay developmental and situational influences on behavior, a trend that has only recently been reversed with the introduction of developmental and life-course theories of crime [17]. One could argue that Gottfredson and Hirschi's [4] conceptualization of low self-control is one example of overly broad theorizing that ignores developmental and situational (with the exception of opportunity) factors. The control model of criminal lifestyle development seeks to reverse this tendency by restricting its definition of self-control and its associated situational and developmental influences to behavioral patterns (i.e., behavioral impulsivity), while conceptualizing the cognitive aspects as an entirely new construct (i.e., reactive criminal thinking).

Lifestyle theory holds that low self-control precedes reactive criminal thinking, and research denotes that while low self-control predicts reactive criminal thinking, reactive criminal thinking does not predict low self-control [10]. Walters [10] also discovered that reactive criminal thinking mediated the relationship between low self-control and delinquency, but low self-control did not mediate the relationship between reactive criminal thinking and delinquency. These results suggest that low self-control is the original problem, with roots in behavioral disinhibition, and that reactive criminal thinking arises from low self-control and delinquency (see also, [18]) and then serves as a mediator of relationships between initial low self-control or behavioral impulsivity and subsequent delinquency and crime. Cognitive variables like reactive criminal thinking often makes excellent mediators of behavior and social conditions [19]. Furthermore, research indicates that reactive criminal thinking is capable of mediating both the peer selection effect (participant delinquency leading to delinquent peers: [20]) and crime continuity (past delinquency leading to future delinquency: [21]). The presence of a reciprocal relationship between delinquency and reactive criminal thinking has received empirical support [21] and is consistent with Thornberry's [6] reciprocity model of delinquency.

The conceptual health and relevance of the control model depend on further theoretical integration and the inclusion of additional evidence-based criminological

constructs. One popular and well-validated criminological theory that may fit nicely into the framework of the control model of criminal lifestyle development is general strain theory. According to the author of general strain theory [22], certain losses, deprivations, and frustrations create strain which, in turn, lead to criminal adaptations as the individual tries to correct the situation, ease the strain, exact revenge, protect positive stimuli, or neutralize negative stimuli. The key, however, is the emotional response. Research indicates that strain creates a number of emotional reactions, only some of which lead to crime. Several studies, in fact, have shown that while anger often leads to criminal offending, other forms of negative affect, such as depression, anxiety, and loneliness, have little to no effect on subsequent offending behavior [23–25]. Although subjective or cognitive appraisals of strain are more reliably associated with specific emotional responses than objective strain [26], there are situations in which strain and its associated emotional concomitants are likely to occur in the presence of low self-control [27]. Peer rejection may be one such situation [28].

Studies show that children with low self-control are more apt to be rejected by their peers than children with high self-control [29–31], that rejected children are more prone to delinquent behavior than non-rejected children [32–35], and that peer rejection may lead to delinquent peer associations [36, 37]. Only two of these studies, however, employed a mediational design. Vitaro et al. [37], for one, determined that peer rejection and peer disruptiveness mediated the early disruptive behavior (low self-control)–violent delinquency relationship but only when peer rejection preceded peer disruptiveness. In a study using the same sample and some of the same variables as the current study 2, Chapple [30] determined that peer rejection and peer delinquency each mediated the low self-control–delinquency relationship. Both mediational analyses were limited by the fact that they evaluated indirect (mediated) effects using either a comparative fit index or normal theory approach. Because the distribution of indirect effects is nearly always non-normal, these methodologies frequently produce misleading results [38]. A better approach would be to evaluate the significance of indirect effects using bias-corrected bootstrapped confidence intervals [39].

Piecing the research on peer rejection, low self-control, and peer deviance into Walters' [9] control model of criminal lifestyle development has given birth to the control model of criminal lifestyle development. As previously noted, about half of the relationships depicted in Fig. 1 have received preliminary support ([10, 20, 21]), whereas the other half, such as those involving the middle portion of the model (from low self-control to strain [peer rejection] to peer delinquency), have yet to be formally evaluated. That was the purpose of the current series of studies. The first study consisted of a cross-lagged analysis of the low self-control–peer rejection relationship previously observed in Chapple's [30] single lag study (low self-control leading to peer rejection). The alternate lag (peer rejection leading to low self-control) was used to test the direction of the relationship between low self-control and peer rejection. A second study was conducted to evaluate the next section of the control model (peer rejection leading to peer delinquency) using a completely different set of measures and participants. In this second study, the cross-lagged relationship between peer rejection and peer delinquency was tested, similar to what had been done previously by Vitaro et al. [37]), in an effort to evaluate the direction of the relationship and assess the indirect pathways (via delinquency and reactive criminal thinking) from peer rejection to peer delinquency. To evaluate the specificity of the mediating effect, a non-anger measure of

negative affect (depression, anxiety, and loneliness) was added to the peer rejection–peer delinquency regression, with the expectation that it would correlate with peer rejection but not with peer delinquency.

Study 1

Hypothesis

The hypothesis for study 1 held that a cross-lagged analysis would reveal that while low self-control would predict peer rejection, peer rejection would not predict low self-control.

Method

Participants All 411 boys from the Cambridge Study in Delinquent Development [40] served as participants in this first study. Most of these boys were born in 1953 and came from intact working class homes in South London. Sampling consisted of a census of 8–9-year-old boys from seven primary schools located within a mile of the research office. Data were collected in interviews conducted with the boys, their parents, their teachers, and their peers. Official arrest/conviction records were also reviewed. The majority of boys in this study were white in appearance and of British origin (87 %). The remaining 13 % of participants were either Afro-Caribbean or of other European (German, Irish, Swedish, Australian, French, Spanish, or Portuguese) descent.

Measures The two independent/dependent variables utilized in this study were cross-lagged over a 2-year period between the ages of 8–9 and 10–11 years. Low self-control was based on an evaluation of the child's behavior by his teacher who was asked to respond to the following three dichotomous questions (yes = 2, no = 1): (1) Does he lack concentration or is he restless in a way that seriously hinders his learning? (2) Does he have difficulties (dull, timid, dirty, untidy, attention seeking, mischievous, sexual, aggressive, troublemaker) with other children in his class? (3) Is he difficult to discipline? Responses to these three items were summed to produce a score that could range from 3 to 6. The items displayed good internal consistency at both age 8–9 (mean inter-item $r = 0.26$) and age 10–11 (mean inter-item $r = 0.35$).

The other independent/dependent variable in this cross-lagged analysis was peer rejection. Peer rejection was measured using a sociometric evaluation of a participant's popularity as rated by his peers. The sociometric ratings were organized into four levels, and ratings were assigned so that higher scores reflected lower levels of rated popularity: 1 = popular, 2 = average-popular, 3 = average-unpopular, and 4 = unpopular. Lower levels of popularity were assumed to reflect greater peer rejection.

Five control variables with potential relevance to low self-control and/or peer rejection were included in the analysis: age, race/ethnicity, family income, parental rules, and number of friends. Age was divided into four groups: 1 = 123 to 130 months of age, 2 = 131 to 137 months of age, 3 = 138 to 141 months of age, and 4 = 142 to 158 months of age. Race/ethnicity was coded as 1 (British) or 2 (non-British). Family income was assessed as comfortable (1), adequate (2), or inadequate (3). Parental rules were classified as average (1) or slack/rigid (2) and number of friends were assessed as

many (1), an average number (2), or few to none (3). Each control variable was collected when the child was 8 to 9 years of age, with the first four being rated by a professional interviewer and the number of friends being a self-report from the child.

Procedure The design for this study involved crossing teacher-assessed low self-control and peer-assessed popularity (peer rejection) at 8–9 years of age with peer rejection and low self-control at 10–11 years of age. The two evaluations were accordingly separated by 2 years. Measures taken when the child was 8–9 years of age were identified by a 1 (i.e., low self-control-1, peer rejection-1), whereas measures taken when the child was 10–11 years of age were identified by a 2 (i.e., low self-control-2, peer rejection-2). Controlling for age, race, income, parental rules, and number of friends, a cross-lagged regression was calculated using the structured equation modeling program, *MPlus 5.2* [41].

Missing Data Nearly three quarters of the sample had complete data on all nine variables ($n = 304$, 74.0 %). Of the remaining participants, 58 (14.1 %) had missing data on one variable, 36 (8.8 %) had missing data on two variables, and 13 (3.1 %) had missing data on three to five variables. Missing data were handled with full information maximum likelihood (FIML). FIML works by estimating model parameters and standard errors for the entire sample from known relationships between non-missing data. Studies show that the estimates produced with FIML are significantly less biased than those generated by more traditional procedures like simple imputation and listwise deletion [42, 43].

Results

Means, standard deviations, and correlations for the nine variables included in study 1 can be found in Table 1. Multicollinearity was not a problem in this study as evidenced by the results of a collinearity diagnostic analysis (tolerance = 0.892–0.987; variance inflation factor [VIF] = 1.013–1.121). Consistent with predictions, low self-control-1 leading to peer rejection-2 path was significant, whereas the peer rejection 1 leading to low self-control-2 path was non-significant in both the Bonferroni-corrected zero-order correlational (see Table 1) and structured equation modeling (see Table 2 and Fig. 2) analyses. The Raghunathan et al. [44] test for comparing dependent but non-overlapping correlations revealed a significance difference between the two zero-order correlations, $Z = 2.03$, $p < 0.05$.

Discussion

The current results are consistent with the hypothesis that low self-control precedes peer rejection, providing preliminary support for the low self-control/general strain theory portion of the model presented in Fig. 1. In a cross-lagged analysis of the proposed low self-control–peer rejection relationship, low self-control predicted peer rejection but peer rejection did not predict low self-control. Unfortunately, because sociometric peer data were unavailable after age 10/11, a comprehensive measure of delinquency was unavailable at age 12/13, and no proxy measures of reactive criminal thinking were available for the Cambridge study, it was not possible to investigate the

Table 1 Demographic characteristics and correlations for the nine variables in study 1

Variable	n	M	SD	Range	2	3	4	5	6	7	8	9
1. Age	411	2.46	1.10	1–4	0.04	0.06	0.02	−0.00	−0.04	0.06	−0.03	0.04
2. Race	411	1.13	0.34	1–2		0.06	0.14	0.08	0.04	−0.08	0.06	0.06
3. Family income	411	1.92	0.72	1–3			0.27*	0.06	0.16	0.14	0.14	0.16
4. Parental rules	375	1.37	0.48	1–2				0.12	0.15	0.15	0.10	0.18*
5. Number of friends	390	1.67	0.68	1–3					0.07	−0.01	0.04	0.13
6. Low self-control-1	402	3.57	0.80	3–6						0.33*	0.22*	0.28*
7. Low self-control-2	388	3.71	0.93	3–6							0.16	0.24*
8. Peer rejection-1	385	2.55	1.08	1–4								0.38*
9. Peer rejection-2	353	2.46	1.09	1–4								

Variable variables included in study 1, *n* number of participants with non-missing data, *M* mean, *SD* standard deviation, *Range* range of scores in the current sample, *Age* chronological age (1 = 123–130 months, 2 = 131–137 months, 3 = 138–141 months, 4 = 142–158 months), *Race 1* white/British, *Race 2* non-white/non-British, *Family income 1* comfortable, *Family income 2* adequate, *Family income 3* inadequate, *Parental rule 1* average, *Parental rule 2* slack or rigid, *Number of friends 1* many, *Number of friends 2* average number, *Number of friends 3* few or none, *Low self-control-1* low self-control at age 8/9, *Low self-control-2* low self-control at age 10/11, *Peer rejection-1* peer rejection at age 8/9, *Peer rejection-2* peer rejection at age 10/11

*$p < 0.0014$ (Bonferroni-corrected alpha level; 0.05/36 correlations)

indirect (mediated) effects proposed by the control model of criminal lifestyle development. In addition, self-control was assessed with just three items, a low score on a sociometric measure of popularity does not necessarily mean the child felt rejected, and popularity is not a particularly strong operationalization of Agnew's [45] strain construct. A second study was consequently conducted on the next leg of the model (general strain leading to delinquent peer associations) using a different sample of children, a behavioral measure of rejection, and three waves of data, which permitted calculation of indirect effects.

Study 2

Hypotheses

Three hypotheses were tested in this second study:

1. Peer rejection would predict delinquent peer associations but not vice versa when controlling for the mediating effects of delinquency and reactive criminal thinking.
2. The direct and indirect (via delinquency and reactive criminal thinking) effects of peer rejection on delinquent peer associations should be significant.
3. Introduction of a non-anger negative affect (depression, anxiety, loneliness) mediator into the mediation analysis should not alter the significant direct and indirect (via delinquency and reactive criminal thinking) effects of peer rejection on delinquency and should not achieve significance itself (despite a significant *a* path between peer rejection and non-anger negative affect).

Table 2 Results of a cross-lagged regression of low self-control and peer rejection: study 1

Predictor	b (95 % CI)	β	t	p
Peer rejection-1 (outcome measure)				
Age	−0.035 (−0.132, 0.062)	−0.035	−0.70	.482
Race	0.141 (−0.181, 0.462)	0.044	0.86	.392
Family income	0.180 (0.025, 0.334)	0.120	2.28	.022
Parental rules	0.097 (−0.151, 0.345)	0.043	0.76	.446
Number of friends	0.030 (−0.135, 0.195)	0.019	0.36	.719
Low self-control-1 (outcome measure)				
Age	−0.035 (−0.105, 0.034)	−0.049	−0.99	.320
Race	0.037 (−0.193, 0.266)	0.015	0.31	.755
Family income	0.138 (0.027, 0.248)	0.125	2.45	.014
Parental rules	0.189 (0.015, 0.363)	0.114	2.13	.033
Number of friends	0.057 (−0.059, 0.174)	0.048	0.96	.336
Peer rejection-2 (outcome measure)				
Age	0.045 (−0.049, 0.138)	0.045	0.93	.350
Race	0.012 (−0.290, 0.314)	0.004	0.08	.939
Family income	0.111 (−0.034, 0.257)	0.074	1.50	.134
Parental rules	0.215 (−0.019, 0.450)	0.095	1.80	.064
Number of friends	0.147 (−0.009, 0.303)	0.091	1.85	.064
Low self-control-1	0.245 (0.113, 0.378)	0.180	3.64	<.001
Peer rejection-1	0.320 (0.224, 0.416)	0.317	6.51	<.001
Low self-control-2 (outcome measure)				
Age	0.060 (−0.018, 0.138)	0.071	1.51	.132
Race	−0.320 (−0.577, −0.062)	−0.116	−2.44	.015
Family income	0.078 (−0.046, 0.202)	0.060	1.23	.220
Parental rules	0.221 (0.024, 0.417)	0.114	2.20	.028
Number of friends	−0.058 (−0.192, 0.076)	−0.042	−0.85	.398
Peer rejection-1	0.076 (−0.007, 0.160)	0.088	1.79	.074
Low self-control-1	0.350 (0.236, 0.464)	0.299	6.03	<.001
Peer reject-1 with LSC-1	0.165 (0.081, 0.250)	0.198	3.84	<.001
Peer reject-2 with LSC-2	0.092 (0.03, 0.181)	0.111	2.04	.042

$N = 411$

Peer rejection-1 (outcome measure) regression equation with peer rejection at age 8/9 as the predicted variable, *Low self-control-1 (outcome measure)* regression equation with low self-control at age 8/9 as the predicted variable, *Peer rejection-2 (outcome measure)* regression equation with peer rejection at age 10/11 as the predicted variable, *Low self-control-2 (outcome measure)* regression equation with low self-control at age 10/11 as the predicted variable, *Age* chronological age (1 = 123–130 months, 2 = 131–137 months, 3 = 138–141 months, 4 = 142–158 months), *Race 1* white/British, *Race 2* non-white/non-British, *Family income 1* comfortable, *Family income 2* adequate, *Family income 3* inadequate, *Parental rules 1* average, *Parental rules 2* slack or rigid, *Number of friends 1* many, *Number of friends 2* average number, *Number of friends 3* few or none, *LSC-1* low self-control at age 8/9, *LSC-2* low self-control at age 10/11, *Peer rejection-1* peer rejection at age 8/9, *Peer rejection-2* peer rejection at age 10/11, *Peer reject-1 with LSC-1* correlation between peer rejection at age 8/9 and low self-control at age 8/9, *Peer reject-2 with LSC-2* correlation between peer rejection at age 10/11 and low self-control at age 10/11, *b (95 % CI)* unstandardized coefficient and the lower and upper limits of the 95 % confidence interval for the unstandardized coefficient (in parentheses), *β* standardized coefficient, *t* asymptotic *t* test, *p* significance level of the asymptotic *t* test

Age 8-9 Years   **Age 10-11 Years**
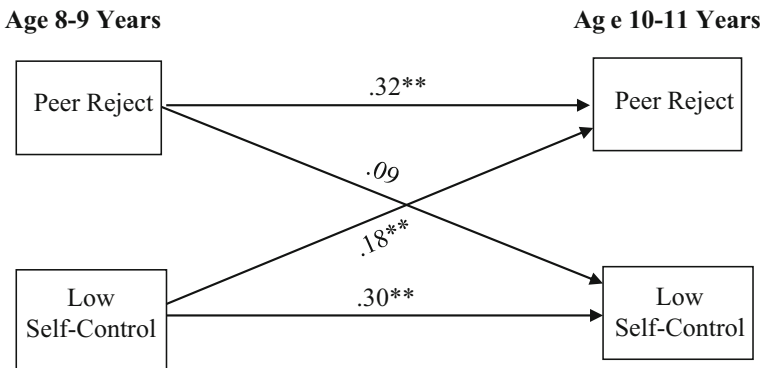

Fig. 2 Cross-lagged analysis of low self-control and peer rejection in study 1. *Note.* Standardized beta coefficients are reported; control variables are not shown. *$p < 0.05$, **$p < 0.001$

Method

Participants Data for this second study came from the National Longitudinal Survey of Youth-Child Data (NLSY-C: [46]), a convenience sample of boys and girls born to mothers from the 1979 National Longitudinal Survey of Youth (NLSY-79). Interviews for the NLSY-C were conducted biennially between 1986 and 2012, although several of the instruments used in the current study were first administered in 1992 and several others were not administered past age 14. Three consecutive waves of data, with 2 years between each wave, were collected starting as early as age 4 and ending as late as age 14. Of the 11,512 members of the NLSY-C sample, about 40 % ($N = 4534$) had complete data on at least 5 of the 10 variables used in this study. These cases were included in a preliminary analysis designed to evaluate moderation effects for age, race (white, non-white), and sex.

A review of the interaction terms in a preliminary analysis of the 10 study variables revealed that age moderated the peer rejection–delinquent peer and delinquency–delinquent peer relationships. The results indicated that the younger age groups (4 to 8 at wave 1 and 8 to 12 at wave 3) may have been too young to demonstrate some of the behaviors and relationships proposed in this study. Conversely, there were no significant moderator effects for either race or sex. Accordingly, the sample was restricted to those children who were 9 or 10 years of age at wave 1 and 13 or 14 years of age at wave 3. Over 80 % of the eligible children from the NLSY-C were either 9 or 10 years of age at wave 1 and were included in the present study ($N = 3817$). There were roughly equal numbers of boys ($n = 1901$, 49.8 %) and girls ($n = 1916$, 50.2 %) in the sample, and the ethnic distribution was 51.9 % white, 27.8 % black, and 20.3 % Hispanic.

Measures The independent variable for the current study was a three-item indicator of peer rejection measured at wave 1. Peer rejection was also measured at wave 3 for the cross-lagged analyses using these same three variables. Three items from the Behavior Problems Index (BPI: [47]), a behavioral rating scale completed by the child's mother, were used to create the peer rejection scale: (1) "feels/complains no one loves him/her," (2) "has trouble getting along with other children," and (3) "is not liked by other

children." Each item was rated on a three-point scale (3 = *often true*, 2 = *sometimes true*, 1 = *not true*). Scores on the peer rejection scale ranged from 3 to 9, and the scale displayed good internal consistency at waves 1 (mean inter-item $r=0.32$) and 3 (mean inter-item $r=0.35$).

The dependent variable for this study was a single item from the BPI assessed at wave 3 which served as a proxy for delinquent peer associations. Delinquent peer associations were also measured at wave 1 for the cross-lagged analysis using this same item. The item, "hangs around with kids who get into trouble," was rated by the child's mother using a three-point scale (3 = *often true*, 2 = *sometimes true*, 1 = *not true*). This item, which can range in score from 1 to 3, was used previously by Chapple [30] to assess delinquent peer associations.

There were three-mediator variables included in study 2, all obtained through self-report during the wave 2 interview: delinquency, reactive criminal thinking, and depression. Delinquency was measured with self-reported involvement in five delinquent acts rated on a four-point scale (0 = *never*, 1 = *once*, 2 = *twice*, 3 = *more than twice*). Children were asked: (1) How often in the last year did you hurt someone bad enough that they needed a doctor? (2) How often in the last year did you take something from a store without paying for it? (3) How often in the last year did you damage school property on purpose? (4) How often in the last year did you get drunk? (5) How often in the last year did you skip school without permission? Scores on the delinquency measure ranged from 0 to 15.

The Reactive Criminal Thinking (RCT) scale consisted of six items from the NLSY-C *Child Self-Administered Supplement*. The child rated each statement on a four-point Likert-type scale (4 = *strongly agree*, 3 = *agree*, 2 = *disagree*, 1 = *strongly disagree*). Each statement, along with the reactive criminal thinking style it is believed to represent, reads as follows: (1) I often get into a jam because I do things without thinking (cutoff); (2) I think that planning takes the fun out of things (discontinuity); (3) I have to use a lot of self-control to keep out of trouble (cutoff); (4) I enjoy taking risks (cognitive indolence); (5) I enjoy new and exciting experiences, even if they are a little frightening or unusual (cognitive indolence); (6) Life with no danger in it would be too dull for me (cognitive indolence). This scale's internal consistency was found to be adequate (mean inter-item $r=0.25$).

In an earlier study, Walters and Yurvati [48] determined that the six items used in the current study as proxies for reactive criminal thinking correlated moderately well ($r=0.43$, $p<0.001$) with the reactive criminal thinking score from the Psychological Inventory of Criminal Thinking Styles (PICTS: [49]) in a separate sample of participants. Although none of the six items on the RCT scale used in the current study directly referenced crime, it should be noted that reactive criminal thinking is a measure of criminal thought process (*how* an offender thinks) rather than of criminal thought content (*what* an offender thinks). As such, direct reference to crime is unnecessary as long as the item embodies the specific criminal thought process purportedly being assessed by the item. In fact, Walters et al. [50] found that PICTS items making no reference to crime loaded just as well onto a latent reactive criminal thinking factor as PICTS items directly referencing crime.

The depression or non-anger negative affect scale consisted of six items from the NLSY-C *Child Self-Administered Supplement* that had been grouped together in the NLSY-C as a broad measure of child depression and anxiety. In completing this

measure, the child was asked to rate how often he or she experienced six different emotional symptoms associated with depression (feel sad/blue, feel nervous/tense/on edge, feel happy [reverse coded], feel bored, feel lonely, and feel tired/worn out) on a three-point scale (3 = *often*, 2 = *sometimes*, 1 = *hardly ever*). Combining the ratings yielded a depression index with a total score that ranged from 6 to 18. The internal consistency of this scale was modest but acceptable for a broadband indicator of negative affect (mean inter-item $r = 0.19$).

Control variables for this study included age, race (white = 1, non-white = 2), sex (male = 1, female = 2), and wave 1 peer delinquency. Cole and Maxwell [51] contend that precursor measures of the mediator and dependent variables should be included in a longitudinal path analysis to rule out the possibility that pre-existing differences on these measures account for the results of a mediation analysis. This was possible for the dependent variable (peer delinquency) but presented a problem for the three-mediator variables (delinquency, RCT, and depression). Due to the restricted time frame in which the *Child Self-Administered Supplement* was administered, data were missing for slightly more than 75 % of the wave 1 measures of delinquency, RCT, and depression. As such, analyses using the mediator precursors were treated as ancillary and reported in a footnote.

Procedure The current study used a three-wave longitudinal design with no overlap between waves. It therefore qualifies as prospective in nature. Data were analyzed in a four-regression path analysis computed with *MPlus* 5.2. Because the dependent variable (wave 3 peer delinquency) was categorical, the path analysis was performed with a robust weighted least squares (WLSMV) estimator. Bias-corrected bootstrapped 95 % confidence intervals ($b = 5000$) were used to evaluate the significance of mediating effects (significance indicated by a confidence interval that did not include zero) based on research showing that this procedure is superior to the standard z test procedure in modeling the non-normality of indirect effects [39, 52, 53]. Kenny's [54] "failsafe ef" procedure—calculated as $(r_{my.x}) \times (sd_{m.x}) \times (sd_{y.x})/(sd_m) \times (sd_y)$—was used to test the sensitivity of significant mediated relationships to the obfuscating effects of unobserved covariate confounders.

The wave 2 delinquency and wave 2 RCT variables were the mediators of interest in this study and formed the target pathways. The wave 2 depression variable served as a contrast mediator in the sense that it was expected to correlate with wave 1 peer rejection (*a* path of the comparison pathway) but not with wave 3 delinquent peers (*b* path of the comparison pathway). In the cross-lagged analysis, peer rejection and peer delinquency were crossed at waves 1 and 3 with mediation by delinquency and reactive criminal thinking at wave 2. In the two-mediator analysis, wave 1 peer rejection served as the independent variable, wave 3 peer delinquency served as the dependent variable, and wave 2 delinquency and wave 2 RCT served as mediator variables. In the three-mediator analysis, wave 1 peer rejection served as the independent variable, wave 3 peer delinquency served as the dependent variable, and wave 2 delinquency, wave 2 RCT, and wave 2 depression served as mediator variables.

Missing Data Complete data on all 10 variables included in this study were available for 1941 participants (50.9 % of the total sample). Another 1343 (35.2 %) participants

were missing data on one variable, 202 (5.3 %) participants were missing data on two variables, and 331 participants (8.7 %) were missing data on three or four variables. Wave 3 peer rejection was the variable with the most missing data (26.4 %), followed by wave 2 depression (20.3 %), wave 2 delinquency (10.3 %), wave 3 delinquent peers (8.7 %), wave 2 RCT (4.6 %), wave 1 delinquent peers (1.1 %), and wave 1 peer rejection (0.9 %). There were no missing data for age, race, or sex. As in study 1, missing data were handled with FIML.

Results

Descriptive statistics for the 10 variables included in the current study (two independent variables, two target mediator variables, one comparison mediator variable, two dependent variables, and three control variables) are listed in Table 3. As the results from this table indicate, nearly two thirds of the zero-order correlations were significant despite severe restrictions in the range of the age variable and the use of a Bonferroni-corrected alpha level. Collinearity diagnostics failed to show evidence of multicollinearity between the eight predictor variables (tolerance = 0.884–0.990; VIF = 1.010–1.131).

Cross-lagged analysis was used to assess the direction of the peer rejection–peer delinquency relationship. Comparing the two direct effects made it possible to test the direction of the relationship accounting for age, race, sex, and the two intervening variables (delinquency and reactive criminal thinking at wave 2). This way, the direct effect of peer rejection on peer delinquency and of peer delinquency on peer rejection could be evaluated independent of the mechanism represented by the indirect effects [39]. Whereas the direct path of the target sequence (wave 1 peer rejection leading to wave 3 peer delinquency) achieved significance (estimate = 0.156, 95 % BCBCI = 0.117–0.199), the direct path of the alternate sequence (wave 1 peer delinquency leading to wave 3 peer rejection) did not (estimate = 0.152, 95 % BCBCI = −0.100 to 0.403). Converting the four cross-lagged variables to a common scale (z scores) permitted use of Preacher and Hayes' [55] contrast test to evaluate the difference between the two direct effects, the results of which indicated that the target sequence was significantly stronger than the alternate sequence (estimate = 0.066, 95 % BCBCI = 0.003–0.127).

The results for the two-mediator path analysis of the peer rejection–peer delinquency relationship (without the cross-lags) can be found in Tables 4 and 5. These findings indicate that both wave 2 delinquency and wave 2 RCT successfully mediated the peer rejection–peer delinquency relationship (see Fig. 3). Sensitivity testing revealed that an unobserved covariate confounder would need to correlate at least 0.14 with both the mediator and outcome (controlling for the mediator and independent variable) to completely eliminate the indirect effect of wave 2 delinquency on the peer rejection–peer delinquency relationship and that an unobserved covariate confounder would need to correlate 0.08 with both the mediator and outcome (controlling for the mediator and independent variable) to totally eliminate the indirect effect of wave 2 RCT on the peer rejection–peer delinquency relationship. An ancillary analysis controlling for pre-existing levels of delinquency and

Table 3 Demographic Characteristics and Correlations for the 10 Variables in study 2

Variable	n	M	SD	Range	2	3	4	5	6	7	8	9	10
1. Age	3817	9.53	0.50	9–10	−0.01	0.01	−0.02	−0.04	0.04	0.05	−0.01	−0.01	0.01
2. Race	3817	1.48	0.50	1–2		0.00	0.05	0.07*	0.12*	−0.03	0.06*	0.07*	0.07*
3. Sex	3817	1.50	0.50	1–2			−0.04	−0.17*	−0.14*	−0.12*	−0.00	−0.00	−0.05
4. Peer rejection-1	3783	3.70	1.02	3–9				0.28*	0.09*	0.08*	0.15*	0.44*	0.20*
5. Peer delinquency-1	3774	1.13	0.36	1–3					0.11*	0.08*	0.08*	0.19*	0.28*
6. Delinquency-2	3424	0.71	1.65	0–15						0.21*	0.18*	0.12*	0.16*
7. RCT-2	3642	14.60	3.40	6–24							0.21*	0.04	0.09*
8. Depression-2	3042	10.36	2.22	6–18								0.15*	0.09*
9. Peer rejection-3	2808	3.60	1.00	3–9									0.36*
10. Peer delinquency-3	3485	1.21	0.46	1–3									

Variable variables in the two- and three-mediator models, *n* number of participants with non-missing data, *M* mean, *SD* standard deviation, *Range* range of scores in the current sample, *Age* chronological age in years, *Race 1* (white), *Race 2* non-white, *Sex 1* (male), *Sex 2* (female), *Peer rejection-1* maternal rating of difficult and rejecting peer relationships at wave 1, *Peer delinquency-1* peer delinquent associations at wave 1, *Delinquency-2* self-reported involvement in delinquency during wave 2, *RCT-2* reactive criminal thinking score at wave 2, *Depression-2* self-reported depression at wave 2, *Peer rejection-3* maternal rating of difficult and rejecting peer relationships at wave 3, *Peer delinquency-3* peer delinquent associations at wave 3

$*p < 0.0011$ (Bonferroni-corrected alpha level, 0.05/45 correlations)

reactive criminal thinking (wave 1 delinquency and wave 1 RCT) achieved similar results.[1]

A comparison pathway (wave 1 peer rejection leading to wave 2 depression 2 leading to wave 3 peer delinquency) with a non-anger negative affect mediator (wave 2 depression) was added to the path analysis to create a three-mediator model. The results of this analysis revealed that the comparison pathway failed to achieve significance but that the indirect effects of wave 2 delinquency and wave 2 RCT on the peer rejection–peer delinquency relationship remained significant even with introduction of a non-anger negative affect mediator (see Table 6). As predicted, the *a* path from peer rejection to depression was significant, the *b* path from depression to peer delinquency was not significant (see non-bolded coefficients in Fig. 3), and the overall indirect effect was non-significant. What this means is that peer rejection generates high levels of negative affect in the form of anxiety, depression, and loneliness but that these emotions do not necessarily lead to delinquent peer associations.

Discussion

The results of this second study provide preliminary support for the strain–delinquent peer association portion of the control model of criminal lifestyle development depicted in Fig. 1. This section of the control model—which had not been formally tested prior to the current investigation—was assessed against three hypotheses, all of which received support in this study: (1) the directional effect appeared to go from peer rejection (strain) to peer delinquency rather than from peer delinquency to peer rejection; (2) delinquency and reactive criminal thinking mediated the peer rejection–peer delinquency relationship; and (3) including non-anger negative affect (depression, anxiety, and loneliness) as a mediator in a three-mediator model did not alter the significant direct and indirect effects observed in the two-mediator model. This indicates that strain, as measured in the current study by peer rejection, exerts both a direct and indirect effect on delinquent peer associations although the mechanism of effect is something other than depression, anxiety, or loneliness. Other features of negative affect (anger and hostility within the context of reactive criminal thinking) and delinquent behavior (in the formation of a peer selection effect) along with variables not yet identified appear to be what links peer rejection to delinquent peer associations.

One could argue that the simple mediation effects of delinquency and particularly reactive criminal thinking on the peer rejection–peer delinquency relationship were small and therefore unimportant. There are several factors that should be considered,

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[1] In an attempt to control for pre-existing differences in delinquency and reactive criminal thinking, precursor measures for the mediators (wave 1 delinquency and wave 1 RCT) were added to the two-mediator model. The WLSMV analysis would not run, however, due to the fact that the weight matrix portion of the categorical wave 3 peer delinquency variable was non-invertible, probably because one or more categories had too few observations. Treating wave 3 peer delinquency as a continuous variable, handling missing data (78 % for each precursor) with FIML and running an ML analysis nevertheless produced results consistent with a significant indirect effect for both delinquency (estimate = 0.003, 95 % BCBCI = 0.001–0.006) and reactive criminal thinking (estimate = 0.001, 95 % BCBCI = 0.000*–0.003: *dividing the independent variable by 10 revealed that this lower limit was > 0.000). In these analyses, the standardized coefficients for the *a* and *b* paths of the delinquency indirect effect were 0.07 ($p < 0.001$) and 0.10 ($p < 0.001$), respectively, and the standardized coefficients for the *a* and *b* paths of the reactive criminal thinking indirect effect were 0.07 ($p < .001$) and 0.04 ($p < .05$), respectively.

Table 4 Results of a mediation path analysis of peer rejection as a predictor of peer delinquency: two-mediator model from study 2

Predictor	b (95 % CI)	β	t	p
Peer rejection-1 (outcome measure)				
Age	−0.018 (−0.082, 0.043)	−0.009	−0.58	.559
Race	0.060 (0.000, 0.125)	0.031	1.89	.058
Sex	0.019 (−0.043, 0.081)	0.010	0.61	.544
Delinquency-2 (outcome measure)				
Peer rejection-1	0.112 (0.055, 0.180)	0.067	3.50	<.001
Age	0.176 (0.068, 0.279)	0.054	3.25	.001
Race	0.351 (0.242, 0.458)	0.107	6.32	<.001
Sex	−0.409 (−0.523, −0.298)	−0.125	−7.22	<.001
RCT-2 (outcome measure)				
Peer rejection-1	0.202 (0.084, 0.328)	0.058	3.26	.001
Age	0.376 (0.156, 0.601)	0.055	3.30	<.001
Race	−0.269 (−0.495, −0.046)	−0.040	−2.36	.018
Sex	−0.731 (−0.953, −0.502)	0.108	−6.36	<.001
Peer delinquency-3 (outcome measure)				
Delinquency-2	0.070 (0.042, 0.097)	0.109	5.09	<.001
RCT-2	0.019 (0.003, 0.034)	0.062	2.44	.015
Peer rejection-1	0.148 (0.102, 0.191)	0.138	6.53	<.001
Peer delinquency-1	0.833 (0.718, 0.947)	0.286	14.03	<.001
Age	0.048 (−0.047, 0.146)	0.023	0.98	.329
Race	0.129 (0.026, 0.223)	0.061	2.62	.009
Sex	0.031 (−0.069, 0.130)	0.015	0.62	.534
Delinquency-2 with RCT-2	1.036 (0.842, 1.239)	0.192	10.24	<.001

$N = 3774$ (43 cases with missing data on x-variables were not included in the analysis)

Peer rejection-1 (outcome measure) regression equation with peer rejection at wave 1 as the predicted variable, *Delinquency-2 (outcome measure)* regression equation with own delinquency at wave 2 as the predicted variable, *RCT-2 (outcome measure)* regression equation with reactive criminal thinking at wave 2 as the predicted variable, *Peer delinquency-3 (outcome measure)* regression equation with peer delinquent associations at wave 3 as the predicted variable, *Age* chronological age in years, *Race* 1 (white), *Race 2* (non-white), *Sex 1* (male), *Sex 2* (female), *Peer rejection-1* peer rejection at wave 1, *Delinquency-2* own delinquency at wave 2, *RCT-2* reactive criminal thinking at wave 2, *Peer delinquency-1* peer delinquent associations at wave 1, *Delinquency-2 with RCT-2* correlation between peer delinquency and reactive criminal thinking at wave 2, *b (95 % CI)* unstandardized coefficient and the lower and upper limits of the 95 % confidence interval for the unstandardized coefficient (in parentheses), *β* standardized coefficient, *t* asymptotic *t* test, *p* significance level of the asymptotic *t* test

however, in evaluating the merits of this argument. First, single indirect effects are nearly always small [38]. Notions of full and partial mediation have been replaced by the realization that nearly all mediation is partial and that single variables, at least in social science research, normally account for only a small portion of the total effect [39, 56]. Second, there was a 2-year gap between assessments in this study. There is a great deal that can happen in the course of a 2-year period to conceal and complicate variable relationships, particularly when working with children and early adolescents where

Table 5 Total, direct, and indirect effects for pathways running from peer rejection to peer delinquency: two mediators from study 2

Pathways	BCBCI		
	Estimate	Lower	Upper
Total effect	0.160	0.115	0.203
Direct effect	0.148	0.102	0.191
Total indirect effect	0.012	0.006	0.019
Specific indirect effects			
Peer rejection → delinquency → peer delinquency	0.008	0.004	0.014
Peer rejection → RCT → peer delinquency	0.004	0.001	0.009

$N = 3774$ (43 cases with missing data on x-variables were not included in the analysis)

Peer rejection peer rejection at wave 1, *Delinquency* self-reported delinquency at wave 2, *Peer delinquency* peer delinquent associations at wave 3, *RCT* reactive criminal thinking at wave 2, *BCBCI* bias-corrected bootstrapped 95 % confidence interval ($b = 5000$), *Estimate* unstandardized point estimate, *Lower* lower boundary of the 95 % confidence interval, *Upper* upper boundary of the 95 % confidence interval

change is the norm. Third, the current study involved correlating variables from different domains given that the independent and dependent variables were based on maternal ratings of child behavior and the mediators were based on child self-report. Correlations across domains are nearly always smaller than correlations within a domain [57], so it is somewhat misleading to compare the current study to the bulk of criminological research where correlations come from a single domain (normally self-report).
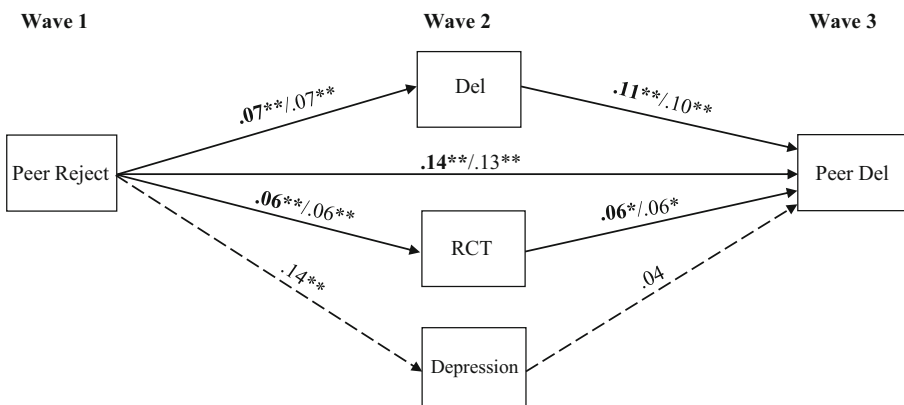

Fig. 3 Path analysis of the mediating effects of wave 2 delinquency, reactive criminal thinking, and depression on the wave 1 peer rejection–wave 3 peer delinquency relationship for the two-mediator (*bolded coefficients in front of slash*) and three-mediator (*non-bolded coefficients*) models in study 2. *Note.* Standardized beta coefficients are reported; *solid lines* = pathways for the two- and three-mediator models; *dashed lines* = pathways for the third mediator (depression) of the three-mediator model; *Peer Reject* = peer rejection at wave 1; *Del* = own delinquency at wave 2; *RCT* = reactive criminal thinking at wave 2; *Depression* = depression at wave 2; *Peer Del* = peer delinquent associations at wave 3; control variables are not shown. *$p < 0.05$, **$p < 0.001$

Table 6 Total, direct, and indirect effects for pathways running from peer rejection to peer delinquency: three mediators from study 2

Pathways	BCBCI		
	Estimate	Lower	Upper
Total effect	0.160	0.115	0.203
Direct effect	0.144	0.097	0.187
Total indirect effect	0.016	0.007	0.027
Specific indirect effects			
Peer rejection → delinquency → peer delinquency	0.008	0.003	0.014
Peer rejection → RCT → peer delinquency	0.003	0.001	0.009
Peer rejection → depression → peer delinquency	0.005	−0.002	0.014

$N = 3774$ (43 cases with missing data on x-variables were not included in the analysis)

Peer rejection peer rejection at wave 1, *Delinquency* self-reported delinquency at wave 2, *Peer delinquency* peer delinquent associations at wave 3, *RCT* reactive criminal thinking at wave 2, *Depression* depression at wave 2, *BCBCI* bias-corrected bootstrapped 95 % confidence interval ($b = 5000$), *Estimate* unstandardized point estimate, *Lower* lower boundary of the 95 % confidence interval, *Upper* upper boundary of the 95 % confidence interval

General Discussion

Results from the two studies reported in this paper offer preliminary support for several pathways in the control model of criminal lifestyle development. Several earlier studies provisionally confirmed pathways in the front end, back end, and bottom portions of the model but the middle portion had yet to be tested. As a means of review, prior research on the front end of the model indicated that low self-control predicts reactive criminal thinking which, in turn, predicts delinquency [10]. Regarding the back end of the model, there are now two studies [20, 58] showing that the peer influence effect (delinquent peer associations leading to participant delinquency) is mediated by proactive criminal thinking. With respect to the lower portion of the model, there is now preliminary evidence supporting the psychological inertia theorem (delinquency leading to reactive criminal thinking leading to delinquency [21]) and the peer selection effect (participant delinquency leading to reactive criminal thinking leading to delinquent peer associations [20]). The current study corroborates most of the remaining pathways by documenting preliminary causal pathways from low self-control to peer rejection (study 1) and from peer rejection to delinquent peer associations, both directly and via delinquency and reactive criminal thinking (study 2).

A theoretical implication of the current results is that conceptual integration is possible despite skepticism by those who believe competition between theories is the best way to promote science (e.g., [59]). Four different theoretical traditions (low self-control, general strain, differential association, and criminal thinking), each with its own unique assumptions and methodologies, are represented in the control model of criminal lifestyle development (see Fig. 1) and each received preliminary support in the current series of studies. The concerns of Wheeldon et al. [7] about integrating models with different underlying assumptions (e.g., free will versus determinism) and

methodologies (e.g., quantitative versus qualitative) notwithstanding, this initial attempt at theoretical integration achieved some degree of success. This may be because no assumptions need to be made about whether low self-control is innate or learned, agentic, or determined, or whether crime should be studied quantitatively or qualitatively, in order for the pathways to do their job. By extending the model backwards, however, we enter a realm where assumptions are vital. Is low self-control a function of biological factors like temperament [10, 60] or environmental factors like parental support and control [4] are questions rich in assumptions. These are also questions that are best answered empirically with qualitative and quantitative research. What the current results suggest is that one way of achieving integration is by creating links between constructs using the methodologies of moderation and mediation, and while moderation is not currently represented in Fig. 1, it could be added as research in this area progresses.

A practical implication of the current results is that they point to avenues by which delinquency and crime might be prevented. Trentacosta and Shaw [61] determined that adaptive emotional self-regulation strategies like active distraction in childhood reduced antisocial behavior in early adolescence by lessening peer rejection in late childhood. Parenting training has also been found to be effective in reducing conduct disorder and delinquency in children and early adolescents with low self-control who may be at risk for peer rejection [62, 63]. In a review of the prevention literature on aggression, van Lier et al. [64] surmised that aggression and violent behavior were best prevented by developing programs that target peer relationships. One of the more promising approaches they came across was one in which aggressive and delinquent children were integrated into groups of conventional peers. This, of course, will be most effective during the early stages of delinquency. Targeting low self-control, peer rejection, and such mediators as early delinquency and reactive criminal thinking should therefore be more effective than trying to discourage delinquent peer associations after they have already formed. Gottfredson and Hirschi [4] maintain that while absolute self-control improves with age, relative self-control does not change after age 8 or 9. Research, however, indicates that both absolute and relative self-control change moderately after middle childhood and that intervention and prevention programs can be of assistance in facilitating the development of self-control [65, 66].

Before discussing the limitations of the research presented in this paper, I would like to discuss several of the strengths. First, the variables in both studies were measured across domains rather than within a single domain. The exclusive use of self-report in measuring the variables in a study is a fairly common practice in criminology, but it is a practice that leads to mono-operational bias and artificially inflated correlations via shared method variance [67]. In study 1, peer rejection was measured with peer ratings from a sociometric survey and low self-control was assessed with teacher reports; in study 2, the independent (peer rejection) and dependent (peer delinquency) variables were based on maternal ratings and the mediator variables were based on self-report. A second strength of both studies is that they controlled for continuity in the cross-lagged variables by including the precursor to the predicted variable in both cross-lagged regressions while controlling for prior levels of the dependent variable in the two- and three-mediator analyses for study 2. A further strength of study 2 is that it incorporated a control mediator into the three-mediator analysis designed to test the specificity of the general strain effect. Prior research has shown that anger is significantly more likely to lead to a criminal adaptation than non-anger negative affect [23–25]. When a non-anger

negative affect measure of depression was added to the three-mediator model, it correlated with peer rejection but not with peer delinquency, it did not alter the significance of the two target mediators (delinquency and reactive criminal thinking), and it failed to achieve a significant indirect effect.

Turning our attention to limitations we can see that external validity was weak in both studies. The sample for study 1 was a census of boys from seven schools located within a mile of the Cambridge study's field research office. The sample for the second study was comprised of boys and girls born to women from the nationally representative NLSY-79 sample but was nothing more than a non-probability convenience sample. Additional research is consequently required to test the generalizability of the results from both studies. A second limitation of both studies is the 2-year gap between each of the evaluation periods (waves) in studies 1 and 2. A great deal can transpire in 2 years, particularly in samples of children and early adolescents where change can be both rapid and abrupt. Such a relatively long period of time between assessments could provide opportunities for non-study variables to infiltrate the design and influence the results in unanticipated ways. A third limitation is the absence of mediators in study 1 and the large amount of missing data (>75 %) for the two-mediator precursors in study 2. Without precursor variables, it is impossible to rule out the alternate hypothesis that pre-existing differences in delinquency or reactive criminal thinking were the cause rather than the effect of peer rejection. Treating the three-level dependent variable as a continuous measure and using FIML to compensate for the large amount of missing data in the mediator precursor variables did not appreciably alter the results from those obtained in analyses conducted without mediator precursors (see footnote 1), although this may have been too much to ask even from FIML. A fourth limitation is that peer delinquency in study 2 was measured with a one-item maternal rating. Even though this item was used previously by Chapple [30] to assess peer delinquency, a single item is subject to misinterpretation and idiosyncratic responding. Research is also required to determine whether these results replicate when peer delinquency is measured with peer network nominations [68] rather than maternal ratings.

On the subject of limitations, one could take issue with the construct validity of the self-report items used to assess reactive criminal thinking in study 2 given that these same items were used by Turner and Piquero [69] to measure low self-control. I would like to explain, however, why I believe these items do a better job of assessing reactive criminal thinking than they do of assessing low self-control. First, Gottfredson and Hirschi [4] clearly state that low self-control should be assessed behaviorally, with a measure like the BPI. Second, cognitive and perceptual factors like impression management and self-serving bias are more likely to influence responding on a self-report inventory than they are to shape responses to a behavioral rating scale [70, 71]. Cognitive influence is present even when constructing a self-report measure of specific behaviors (e.g., number of offenses committed in the past year), although the influence is much stronger when an individual is asked to make subjective judgments about his or her experiences, opinions, and priorities. Self-serving bias and impression management are actually part of the process of reactive criminal thinking. The fact that the six reactive criminal thinking items used in study 2 correlated 0.43 with an established measure of reactive criminal thinking in a different sample of participants [48] lends further credence to the construct validity of the RCT scale. Moreover, considering that

these items correlated only modestly with concurrent total BPI scores used in the Turner and Piquero [69] study ($r = 0.00–0.22$, $M = .15$) and were three times less stable than the BPI externalizing score in the Walters [10] investigation denotes that they are measuring something other than Gottfredson and Hirschi's [4] behavioral self-control concept. Finally, results from a recent meta-analysis showed that self-report and behavioral indicators of "low self-control" are measuring different constructs [72], perhaps because behavioral indicators are measuring low self-control and self-report indicators are measuring reactive criminal thinking.

Results from studies conducted on peer rejection in both the Cambridge Study in Delinquent Development and NLSY-C indicate that constructs from general strain theory may play a role in the control model of criminal lifestyle development. Future research could extend this model by replacing peer rejection with other putative causes of strain, such as parental conflict, school failure, and loss of freedom through incarceration. The notion that only certain emotional concomitants of strain, anger in particular, lead to criminal outcomes may well be another piece to the crime puzzle. In the current study, the direct effect of peer rejection on delinquent peer associations was still strong after accounting for the indirect effects of delinquency and reactive criminal thinking. This suggests that additional variables, like anger and hostile attribution biases, may be involved in mediating the relationship between peer rejection and peer delinquency, although a direct effect, or even a shared method variance effect [67], for that matter, between peer rejection and delinquent peer associations cannot be ruled out. All of these possibilities are fertile soil for future research. In creating a path for future research on the control model, one could argue that instead of evaluating the model in piecemeal fashion, as was done in the current study, all of the pathways should be studied simultaneously. Although well-intended, this advice is impractical given the relatively low precision of current key measures and the even lower power of current statistical methods to test more than three or four pathways at a time (keeping in mind that overall model fit is not a legitimate means of evaluating indirect effects). There are 15 paths and 7 sequences currently represented in the control model. Before we can instantaneously put all of the pieces of this puzzle together, the precision of our measures and the power of our methodologies would need to be significantly enhanced.

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