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ORIGINAL PAPER

# Hanging Out with the Wrong Crowd? The Role of Unstructured Socializing in Adolescents' Specialization in Delinquency and Substance Use

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## Abstract

**Objectives** Despite abundant attention to offending specialization in criminology, scholars have only recently started to explore opportunity-driven explanations for within-individual patterns of specialization. The current study examines whether unstructured socializing with specific friends can explain within-individual changes in adolescents' degree of specialization in delinquency and substance use.

**Methods** Data were derived from the PROSPER Peers Project, a longitudinal study consisting of five waves of data on 11,183 adolescents (aged 10 to 17). The data include self-reports about engagement in delinquency and substance use, sociometric information, and information on the time respondents reported spending in unstructured socializing with their nominated friends. Hypotheses were tested with negative binomial and binomial logit multilevel models.

**Results** The findings indicate that involvement in unstructured socializing with friends who steal, vandalize, commit violence, use alcohol, use cigarettes, or use drugs enhances adolescents' risks for engagement in those respective behaviors. Such activity affects adolescents' quantitative engagement as well as their level of specialization in these behaviors.

**Conclusions** The study indicates that routine activity—in particular involvement in unstructured socializing—explains within-individual changes in deviance specialization among adolescents. Thus, exposure to opportunities can explain why adolescents specialize in certain types of delinquency and substance use in one time-period, and in other types of behavior in other time-periods. This adds a proximate explanation for this phenomenon to other explanations that focus on local life circumstances and peer group affiliation.

**Keywords** Delinquency versatility · Poly-substance use · Unstructured socializing · Peer influence · Adolescence

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## Introduction

Adolescents in western societies spend a lot of their time talking and 'just hanging out' with friends (Anderson 2013; Larson and Verma 1999; Steketee 2012). This is part of a developmental process toward autonomy and adulthood, which contributes positively to emotional and social functioning (Giordano 2003). Nevertheless, time spent with peers may also, under certain conditions, contribute to risks for engagement in delinquency and substance use (Weerman et al. 2015). The current study addresses the behavior-specific risks of unstructured socializing with certain friends. Unstructured socializing refers to situations in which peers are present, authority figures are absent, and there is a lack of structured activity (Osgood et al. 1996). Involvement in unstructured socializing has often been empirically related to increased risks for delinquency and substance use (e.g., Bernasco et al. 2013; Hoeben and Weerman 2016; Maimon and Browning 2010; Osgood and Anderson 2004). The aim of the current study is to examine whether involvement in unstructured socializing with different peers can explain within-individual patterns of adolescents' *quantitative* involvement in delinquency and substance use as well as the extent to which they *specialize or display versatility* in certain types of delinquency or substance use. The study centers on the following questions: Is there overlap between adolescents' deviance and the type-specific deviance of the friends with whom they spend time unstructured socializing? Can within-individual changes in adolescents' deviance specialization be explained with within-individual changes in time spent unstructured socializing with friends?

In addressing these questions, the study contributes to two lines of research within criminology. First, the study contributes to the literature on deviance specialization (Farrington 1986; Hindelang 1971; Kempf 1987; Klein 1984; Sullivan et al. 2006). Simply put, specialization applies when individuals predominantly engage in one type of delinquency (e.g., vandalism) or substance use (e.g., alcohol use), whereas versatility applies when individuals engage in a variety of types of delinquency or polysubstance use. Previous studies showed that exposure to various life circumstances (e.g., marriage; McGloin et al. 2007) could account for within-individual variation in specialization over time. In the current study, we examine adolescents' routine activities as an additional explanation for within-individual changes in deviance specialization. Routine activities are conceptualized as adolescents' involvement in unstructured socializing with friends.

Second, the study offers a theoretical extension of opportunity theories such as routine activity theory (Cohen and Felson 1979) and the routine activity theory of general deviance (Osgood et al. 1996), to make them applicable for explaining behavior-specific risks. Particularly, adopting insights from behavior setting theory (Barker 1968; Wikström et al. 2012), we elaborate on the role of the social elements in settings of unstructured socializing, namely the present peers. As such, our study builds on the opportunity perspective of peer influence (Haynie and Osgood 2005; Osgood et al. 1996; Warr and Stafford 1991).

The study uses data from the PROSPER Peers project, a longitudinal intervention study among adolescents (aged 10 to 17) in two US states. The data incorporate sociometric information linked with information on how often respondents 'hang out' with their nominated friends. These features enable the measurement of friends' reports about their own characteristics and enable the specification of how much time is spent unstructured socializing with particular friends. The longitudinal design allows for within-individual analysis of behavior patterns while controlling for measured and

unmeasured stable individual characteristics. The study introduces a new method (i.e., multilevel binomial logit modeling) to estimate deviance specialization.

## Within-Individual Variation in Deviance Specialization

Individuals specialize in deviance to the degree they predominantly engage in one type of deviance, whereas they 'display versatility' to the degree they engage in a variety of types of deviance (Farrington 1986; Hindelang 1971; Kempf 1987; Klein 1984). This topic has a long history in research on criminal careers (Blumstein et al. 1986; Piquero et al. 2003) and polysubstance use (Kandel et al. 1978) and is addressed in several influential theoretical traditions (Cloward and Ohlin 1960; Kandel 1975; Moffitt 1993). Recent methodological advancements allow for a more refined investigation of deviance specialization, by using self-reports, longitudinal panel data, and data collected among shorter time spans (McGloin et al. 2007, 2009; Nieuwbeerta et al. 2011; Osgood and Schreck 2007; Sullivan et al. 2006). This fine-grained investigation suggested that offenders specialize in the short term, but display versatility in the long term. Thereby, these studies called attention to the necessity of examining short-term, opportunity-driven, within-individual patterns of specialization.[1]

To date, however, the focus in criminology has been on between-individual patterns of specialization and on socialization or maturation-driven explanations for within-individual patterns of specialization. A *between-individual level perspective* on deviance specialization focuses on how differences between groups of people—characterized by, for example, gender, ethnicity, or parental education—can account for their tendencies to specialize (e.g., Lattimore et al. 1994; Mazerolle et al. 2000; Tumminello et al. 2013). A *socialization or maturation-driven perspective* on specialization emphasizes how differences over the life course—characterized by, for example, changing attitudes or increasing criminal experience and proficiency—can account for within-individual changes in tendencies to specialize (Nieuwbeerta et al. 2011; Thomas 2015). In contrast, an *opportunity-driven perspective* on specialization highlights how differences in exposure to certain circumstances can account for within-individual changes in tendencies to specialize (McGloin et al. 2007). The latter requires an understanding of temporal variations in opportunities and social controls, as well as insight into situational motivations for deviance (Briar and Piliavin 1965; Osgood et al. 1996; Warr 2002). This opportunity-driven perspective has informed some studies into intermittency and within-individual patterns of *quantitative* involvement in offending (Falco Metcalfe and Baker 2014; Falco Metcalfe et al. 2019; Horney et al. 1995; Kazemian and Farrington 2018; Piquero et al. 2002), but few studies have examined opportunity-driven explanations in relation to within-individual patterns of *specialization.*

We know of only three prior studies that examined opportunity-driven explanations for within-individual patterns of specialization. First, McGloin et al. (2007) found in a sample of convicted offenders that short-term changes in marriage, community supervision (probation or parole), and substance use, but not employment, explained short-term within-individual changes in offenders' versatility. Second, McGloin and Piquero (2010) showed

[1] We follow the approach of McGloin et al. (2007) and Sullivan et al. (2006) by studying whether deviant acts committed by one individual in the same time window are of the same type. This interpretation of specialization differs from the one used in older work, which focused on whether chronologically ordered deviant acts would be of the same type (Farrington, 1986, Paternoster et al. 1998). .

with a study of juvenile offenders that variation in co-offender network redundancy (i.e., the extent to which an offender had the same accomplices across multiple co-offending incidents) explained variation in offending specialization. They did not empirically assess within-individual changes in offending specialization over time, but their study is noteworthy because of their theoretical focus on situational predictors of specialization, namely the co-offenders. Third, Thomas (2016) established that changes in self-identified peer status—from identifying as a peer isolate (i.e., not having any close friends) to no longer identifying as a peer isolate and vice versa—explained changes in offending versatility. We do not know of any studies that examined individuals' routine activities in relation to within-individual changes in deviance specialization. This is an important gap in the literature, because routine activities may offer the most proximate explanation for deviant acts (Wikström et al. 2012). In fact, local life circumstances and peer associations have both been theorized to affect deviant behavior by altering individuals' routine activities (Bernburg and Thorlindsson 2001; Horney et al. 1995; McGloin et al. 2007; Warr 1998). In the current study, we use unstructured socializing as an indicator of individual exposure to criminogenic routine activities and situational peer influence. We examine whether changes in individuals' involvement in unstructured socializing can account for within-individual changes in their deviance specialization.

## Unstructured Socializing and Deviance Specialization

Osgood et al. (1996) adapted routine activity theory (Cohen and Felson 1979) and lifestyle theory (Hindelang et al. 1978) to an individual perspective on deviant behavior. They stated that three conditions contribute to the risk of deviance in a certain situation. The *presence of peers* makes deviant acts rewarding because peers can serve as an appreciative audience. The *absence of authority figures* decreases the risk of getting caught. A *lack of structured activity* enables engagement in other (deviant) activities. Further, Osgood et al. (1996) argued that adolescents who spend more time in situations characterized by these conditions—that is, in 'unstructured socializing'—are likely to have higher deviance rates, because most adolescents are open to the idea of deviance (Briar and Piliavin 1965; Matza and Sykes 1961).

Since the publication of Osgood and colleagues' (1996) article, the relationships between unstructured socializing and various forms of deviance have been empirically confirmed. For instance, involvement in unstructured socializing has been associated with violence (Maimon and Browning 2010), property crime (Anderson and Hughes 2009), cigarette use (Greene and Banerjee 2009), alcohol use (Beier 2018), marijuana use (Hawdon 1996), and the use of other illicit drugs (Barnes et al. 2007). This body of literature focused on individuals' quantity of engagement in deviance, and thus on the *general* risk associated with unstructured socializing. To apply the perspective to an examination of within-individual patterns in deviance specialization, we need to know under what circumstances unstructured socializing entails *behavior-specific* risk.

Why would involvement in unstructured socializing relate to different types of deviance across different situations? One could argue that the setting of unstructured socializing is inherently neutral in its' criminogeneity: it can take different shapes and, depending on the exact circumstances, can foster opportunities for various types of delinquency and substance use. Thus, this setting needs further specification to determine how it relates to specific types of deviance. Of the three conditions central in the unstructured socializing

perspective—the absence of authority figures, lack of structured activity, and presence of peers—the latter appears to be the most logical determinant to explain variation in type-specific dimensions of delinquency and substance use. If we consider the characteristics of a behavior setting at the time of a deviant act, the *absence of authority figures* should reduce the risk of detection and punishment regardless of the type of the deviant act: Authority figures are as likely to deter vandalism as they are to deter theft (see Felson 1995, and Hollis-Peel et al. 2011, for a more nuanced discussion of this topic). Similarly, under the assumption that most deviant acts arise spontaneously (Osgood et al. 1996) and take up only a small amount of time, the *lack of a structured activity* allows for opportunities for a wide variety of deviant acts. In contrast, peers are likely to encourage the specific deviant acts that they consider appealing or have already engaged in (McGloin and Nguyen 2012). Thus, peers potentially play an important role in explaining adolescents' behavior-specific involvement in delinquency or substance use (McGloin and Piquero 2010; Thomas 2015, 2016). Therefore, to understand why involvement in unstructured socializing would relate to different types of delinquency and substance use for different adolescents across different time periods, it seems worthwhile to further examine the peers who are present in these settings.

## Unstructured Socializing with Whom? Friends' Delinquency and Substance Use

The unstructured socializing perspective emphasizes the role of *situational* peer influence (Osgood et al. 1996), also known as the 'opportunity perspective' on peer influence (Haynie and Osgood 2005; Megens and Weerman 2012; Ragan 2014; Warr and Stafford 1991). Under the opportunity perspective, peers can affect adolescents' immediate behavior by instigating, reinforcing, or provoking deviant behavior. Instigation takes place when peers bring booze, drugs, or graffiti spray cans; offer others' the use of these goods; take the lead on acts of delinquency or substance use; or otherwise point out opportunities for such behavior (Warr 1996). Generally, individuals are more likely to instigate those types of crime with which they have already experience (McGloin and Nguyen 2012). Thus, in a situation of unstructured socializing, peers may instigate specific actions and thereby create deviance-specific opportunities. Reinforcement applies when peers increase the risk for delinquency or substance by signaling approval for such behavior (Akers 1998; Dishion et al. 1996). It is possible that, because of their own deviance, peers' cognitive frameworks are more tolerant toward behaviors in which they themselves have engaged (Cooper 2007; Festinger 1957). Relatedly, it is possible that deviant peers will more urgently reinforce acts in which they have engaged because others' refusal to engage in those behaviors would be indirect disapproval of the peers' past behavior. Also, if peers have already successfully engaged in the behavior, they may have more faith in a positive outcome (Stafford and Warr 1993). Provocation occurs when peers evoke delinquency or substance use by showing disrespect or by verbally attacking others' status (Anderson 1999; Short and Strodtbeck 1965; Tedeschi and Felson 1994). Provocations can come in the form of an opening remark (i.e., instigation) or in response to others' comments or an initial refusal (i.e., reinforcement). Similar to the processes of instigation and reinforcement, peers may be more likely to provoke behaviors that reflect their own previous actions.

In addition to these situational processes through which peers can affect behavior, Warr (2002) proposed three motives for conformity that can explain immediate behavior

transference from one peer to all adolescents in the setting. In their view, adolescents may engage in behaviors that are instigated, reinforced, or provoked by peers (1) out of fear of ridicule, (2) due to status competition, or (3) from a desire to remain loyal to their friends. These motives operate predominantly, though not exclusively, by affecting adolescents' willingness to comply with the behavior of their peers or the behavior suggested by their peers. Thus, in many cases, these motives will promote behavior that is of a similar nature as that of the peer group. Finally, general processes of collective behavior—such as anonymity, diffusion of responsibility, and rowdy behavior—may also explain situational peer influence (McGloin and Rowan 2015; McGloin and Thomas 2016a; Warr 2002). These processes explain why individuals would join in collective behavior and are, therefore, by definition only relevant for explaining situations where there is behavioral overlap between adolescents' deviance and their peers' deviance.

Thus, a closer look at situational processes of peer influence (i.e., instigation, reinforcement, and provocation) and motives to go along with collective behavior (i.e., fear of ridicule, status, loyalty, anonymity, diffusion of responsibility, rowdy behavior) gives reason to believe that the peers with whom adolescents engage in unstructured socializing may affect adolescents' *type-specific* involvement in delinquency or substance use.[2] We can conclude from this that if peer influence is indeed at play in unstructured socializing settings, it should affect not only individuals' frequency of engagement in deviance, but also the types of deviance in which they engage. Thus, potentially, involvement in unstructured socializing with different peers could explain within-individual differences in specialization in delinquency and substance use. At the between-individual level, type-specific peer influence has been empirically confirmed for both delinquency (McGloin and Piquero 2010; Thomas 2015) and substance use (Mathys et al. 2013).

### Friends' Specialization or Versatility

Under the unstructured socializing perspective (Osgood et al. 1996), the motivation for engaging in deviance arises from the situation, for example through its' potential for social rewards when there is an appreciative audience (Briar and Piliavin 1965). Most adolescents, including those who have internalized conventional values, share subterranean values of excitement and approval of recklessness (Matza and Sykes 1961). This implies that unstructured socializing settings entail risk for deviance—and that the present peers can serve as 'appreciative audience'—even if the peers have never engaged in deviance before. We consider this the *general* risk associated with involvement in unstructured socializing. This does not mean the prior experiences of peers are irrelevant. Even though peers might instigate, provoke, or positively reinforce acts of deviance if they have never engaged in it before, the chances of them 'situationally inducing' one specific behavior more than

[2] Aside from fostering opportunities for deviance, involvement in unstructured socializing may also affect deviant behavior through processes of socialization (Hoeben and Weerman 2016). Under this normative perspective, peer influence is also theorized to explain variation in behavior-specificity of individuals' deviance. Transference of norms and values depends on the balance of definitions to which the individual is exposed. An excess of definitions favorable to violence may affect individuals' own tolerance toward violence, but it does not necessarily affect their tolerance toward theft (Akers 1998; Jackson et al. 1986; Sutherland and Cressey 1955; Thomas 2015; Warr 2002).

another will likely increase when they have,.[3] Therefore, the prior experience of peers can provide us with information about the behavior-specific risk of unstructured socializing settings.

The function of our distinction between general and behavior-specific risk is best illustrated by accounting for peers' degree of specialization. Peers who have engaged in all sorts of deviant behavior (i.e., who display versatility) may instigate, provoke, and reinforce all sorts of deviance. In other words, they do not provide type-specific inducements for deviance. This also applies to non-deviant peers: They are as likely—or unlikely—to encourage theft as they are vandalism. Thus, involvement in unstructured socializing with versatile or non-deviant peers should increase adolescents' *general* risk of engaging in deviance, but it is difficult to predict what *behavior-specific* opportunities any given setting would entail. In contrast, peers who have engaged in only one type of deviant behavior (i.e., who are complete specialists) are more likely to instigate, provoke, and reinforce that specific type of behavior rather than other forms of deviance. Thus, in a setting of unstructured socializing with such specialized peers, we can determine behavior-specific risk: The risk of that one type of behavior is heightened relative to the risk of other types of behavior. Therefore, the behavior of the peers in the setting and their degree of specialization give direction to the criminogeneity of unstructured socializing settings. This specification of behavior-specific risk is *complementary* to the general risk in the setting.

In sum, we expect that only the involvement in unstructured socializing with specialized friends will predict increased deviance specialization. Involvement in unstructured socializing with versatile or non-deviant friends is theorized to increase adolescents' general risk for deviance, but to decrease their degree of specialization given the multifaceted nature of the provided opportunities in those settings. This reasoning leads to the following hypotheses:

**Hypothesis 1** Involvement in unstructured socializing with **friends who have specialized** in a specific type of delinquency or substance use will increase adolescents' **risk for engagement** as well as their **degree of specialization** in that type of behavior.

**Hypothesis 2** Involvement in unstructured socializing with **friends who display versatility** in their engagement in delinquency or substance use will increase adolescents' **risk for engagement** in those types of behavior, but will decrease adolescents' **degree of specialization** in those types of behavi*or.*

[3] Under the assumption that their prior experience was a positive one (Stafford and Warr 1993).

[4] These arguments are in line with the unstructured socializing perspective as outlined by Haynie and Osgood (2005). They argue that an interaction between time spent unstructured socializing and having delinquent peers is consistent with the opportunity perspective, although such interaction is not required for explaining how involvement in unstructured socializing would increase risks for delinquency. That is, the general risk of deviance associated with time spent unstructured socializing is not contingent on the behavior of peers, but the deviance of the peers who are present in the setting can still heighten the risk for adolescents' own deviance.

## Previous Studies

Previous studies that examined the unstructured socializing-peer interaction in relation to adolescents' quantitative engagement in deviance did not take into account peers' degrees of specialization or versatility (Gerstner and Oberwittler 2018; Sentse et al. 2010; Svensson and Oberwittler 2010; Wikström et al. 2012). Some of these studies matched the type of behavior of the friends to the type of behavior of the respondent (Agnew 1991; Bernburg and Thorlindsson 2001; Haynie and Osgood 2005; Thorlindsson and Bernburg 2006), but did not account for the level of specialization of the friends or the respondent. Overall, with the exception of Agnew (1991) and Haynie and Osgood (2005), these studies confirmed that the effect of involvement in unstructured socializing on adolescent deviance was amplified when respondents had friends who were delinquent or used substances. The studies that found interactions generally did not take into account the skewed distributions of the dependent variables.

We are not aware of any empirical studies that have examined the association between unstructured socializing and *within-individual* variation in deviance specialization. However, two studies examined the extent to which involvement in unstructured socializing affected *between-individual* variation in deviance specialization. Osgood and Schreck (2007) introduced a new method to assess specialization. To illustrate the application of this method for examining predictors of specialization, they examined the relationship between specialization in violence on the one hand and various variables on the other hand, including involvement in unstructured socializing. They found a positive relationship between unstructured socializing and violence specialization with the Monitoring the Future Data, but did not confirm this relationship with the G.R.E.A.T. Evaluation data. Thomas (2015) examined the role of peers' behavior in explaining between-individual differences in adolescents' specialization in violence, theft, and substance use. To separate normative peer influence from situational peer influence, involvement in unstructured socializing was added as a control variable. Analyses of the Add Health data indicated a negative relationship between unstructured socializing and specialization in theft, but no relationship between unstructured socializing and specialization in violence or substance use. No significant relationships were confirmed with the G.R.E.A.T. Evaluation data. Neither of these studies (Osgood and Schreck 2007; Thomas 2015) examined the behaviors of the friends with whom adolescents were involved in unstructured socializing, which may explain their mixed findings.

## Current Study

The current study investigates whether involvement in unstructured socializing with certain friends can explain within-individual changes in patterns of deviance. We apply a routine activity perspective—in particular the unstructured socializing perspective—since it offers an opportunity-driven explanation for within-individual changes in behavior. We also theorize that specification of the friends with whom adolescents 'hang out' is necessary to determine the behavior-specific risks in settings of unstructured socializing. To our knowledge, the current study is the first study to empirically examine whether involvement in unstructured socializing with different friends is associated with within-individual patterns of specialization in deviant behavior.

## Data and Methods

### Sample

Data for this study were collected in 27 rural public school districts in Iowa and Pennsylvania (USA) as part of the PROSPER Peers project. Students in these districts were predominantly white, English speaking and from rural backgrounds. At least 15% of the families in each district was eligible for free or reduced-cost school lunches. The sample consisted of two entire cohorts of sixth graders (aged 11 to 12); the first cohort completed in-school surveys in the fall of 2002 (N = 6440), and the second cohort in the fall of 2003 (N = 6058). Both cohorts were surveyed again in the spring of the same school year (wave 2) and in the three subsequent springs (waves 3–5). The project allowed new students to enroll at later points in the study and did not follow students who left the school districts. If respondents from the first cohort repeated a grade, they were entered in the second cohort sample beginning that year.

At each wave, respondents were asked to nominate two 'best' friends and five 'close' friends from their own grade. These nominations were later matched to names of other participants based on school rosters. In this computer assisted procedure, two trained coders reviewed computer-suggested matches made based on spelling and phonetics, and searched for matches when the computer algorithms yielded no suggestions. Of all nominated friends, 82.7% were successfully matched to students on the school rosters, 1.9% could not be matched due to multiple plausible matches, 0.5% were inappropriate nominations such as celebrities or self-nominations, and 14.9% appeared to be friends outside of the respondents' grade or school. The respondents nominated on average 4.0 friends. Additional questions were asked to determine the number of friends outside of respondents' school and grade; on average at each wave, respondents had 5.1 friends in other grades and 4.4 friends in other schools.[5]

The current study included respondents with valid information on the study variables for at least two waves, as required for the analytical models. Of the total of 16,284 respondents, 2167 (13.3 percent) were excluded because they participated in only one wave; 1150 (7.1 percent) because they nominated zero friends across all waves; 135 (0.8 percent) because none of their nominated friends could be matched; 82 (0.5 percent) because their matched friends provided insufficient information about the key variables; and 1567 (9.6 percent) because the respondents themselves provided incomplete information on the core variables for all waves. The remaining 11,183 respondents generally had higher grades, were less often eligible for free lunch and were more often engaged in unstructured socializing than the excluded respondents, but the groups did not differ in other aspects.[6]

[5] The answer categories for these questions did not include an option for 'no friends from other grades or other schools'. Therefore, we treated missing values as zero. When missing values are excluded, respondents reported on average 6.1 friends in other grades in school and 5.4 friends from other schools.

[6] Only differences with medium to large effect sizes (> 0.25) are reported here. The other statistically significant differences had very small effect sizes, suggesting that their significance was due to the large sample size.

The final sample is 11,183 respondents contributing 40,023 observations.[7] The sample was roughly evenly split on gender (46% male), predominantly white (81 percent) and from two-parent families (77 percent), and a sizable minority was eligible for free or reduced-cost school lunch (30 percent). For the specialization models, we included only those respondents who reported at least one deviant act.[8] This resulted in analytical samples of 6857 respondents contributing 14,083 observations for the delinquency models and of 5470 respondents contributing 9657 observations for the substance use models. For more information on the sample and data collection, see other publications based on these data (e.g., Ragan 2014; Siennick and Osgood 2012).

## Dependent Variables

For each of the dependent variables, we constructed two measures. The first measure expresses how often respondents reported being involved in specific types of delinquency or substance use (i.e., the quantitative measure), and the second measure expresses the degree to which the respondent specialized in that type of delinquency or substance use relative to the other included types of delinquency and substance use (i.e., the specialization measure). From this point forward, we will refer to these measures as the *quantitative* measures and the *specialization* measures, respectively.

*Quantitative measures:* Delinquency was assessed by asking respondents how often they had been involved in various types of delinquency in the past year. Answer categories ranged from never (0) to five or more times (4). Three type-specific measures were constructed, expressing the sum of the response category values across the items. **Theft** includes stealing something worth less than 25 USD, stealing something worth more than 25 USD, avoiding paying for things such as movies or rides, and taking something from a store without paying (four items). **Vandalism** includes purposely damaging or destroying someone else's property and breaking in, or attempting to break into a building for fun (two items). **Violence** includes beating up someone or physically fighting with someone because they made the respondent angry (one item). Substance use was assessed by asking respondents how often they had used various substances in the past year and in the past month. Four type-specific measures were constructed, expressing the sum of the response category values across the items: Past month **alcohol use** (one item), past month **cigarette use** (one item), past month **marijuana use** (one item), and past year **other drug use** (two items). Other drug use included the use of methamphetamine and the use of inhalants, like glue, paint, or gas. Answer categories for the past month measures ranged from not at all (0) to more than once a week (4). Answer categories for the past year measures ranged from not at all (0) to more than twelve times (4). All quantitative measures for delinquency and substance use were highly skewed and treated as counts with negative binomial distributions.

*Specialization measures* We measure specialization as the proportion of the different behaviors reported by a respondent that fall into the category of interest. For descriptive results and computing explanatory variables, our measure is the number of reported

[7] We tried to retain as many respondents in the analyses as possible. This means we included individuals who had sufficient information for inclusion in some, but not all of the models. Any discrepancies between the maximum number of respondents and observations reported here and the number of respondents and observations in the final models (as reported in the tables) are due to this inclusion strategy.

[8] In supplementary analyses, we also ran the models for only those respondents who reported at least two deviant acts (findings available from the first author).

behaviors (i.e., items with non-zero responses) within one type of delinquency or substance use (e.g., theft) as a proportion of the total number of reported behaviors across all types of delinquency or substance use (e.g., theft/(theft + vandalism + violence)).[9] When modeling specialization as an outcome, we treat this proportion as a latent variable by applying a binomial logit model that takes as input the numerator and denominator as two separate numbers, rather than the proportion as a single number. The proportions vary from 0 to 1, where 1 reflects complete specialization in that type of delinquency or substance use, 0 reflects no specialization in that type of delinquency or substance use, and scores between 0 and 1 reflect versatility. Higher scores are indicative of a higher degree of specialization. Note that the measures indicate relative specialization; they express the extent to which a respondent in a certain time period is specialized in one type of deviance as opposed to the other included types of deviance. This means that an individual with score 0 on the violence specialization measure might display complete specialization in, for example, theft. Measures were constructed separately for delinquency and substance use, which means that, for example, specialization in alcohol use is not dependent on respondents' engagement in vandalism. In contrast to the quantitative measures, the specialization measures were only constructed for the waves in which respondents reported at least one type of delinquency or at least one type of substance use.[10]

## Independent Variables

**Involvement in unstructured socializing** was measured by asking the respondent for each nominated friend, "How often do you spend time just hanging out with this person outside of school (without adults around)?" The answer categories were never (0); once or twice a month (1); once a week (2); a few times a week (3); and almost every day (4). These responses were summed across respondents' friends and divided by the square root of the number of those friends (range 1 to 7), following the approach taken by Haynie and Osgood (2005).[11]

The unique structure of the data allowed us to specify with which of his or her friends a given respondent spent time unstructured socializing, and how that related to his or her involvement in delinquency and substance use. Furthermore, because the friends were also enrolled in the study, they answered the same deviance questions as the respondents

[9] For example, if an individual would report 2 types of theft, 1 type of vandalism, and no types of violence, their total number of reported behavior types is 3. This person would have a score of 0.67 on the theft specialization measure (2/3), a score of 0.33 on the vandalism specialization measure (1/3), and a score of 0 on the violence specialization measure (0/3).

[10] The specialization measures differ from the Diversity Index that has been previously applied in individual-level research on offender versatility (e.g., Mazerolle et al. 2000; McGloin et al. 2007; Piquero et al. 1999; Sullivan et al. 2006) in two main respects. First, higher scores indicate specialization rather than versatility. Second, separate measures are constructed for each type of deviance, whereas the Diversity Index was developed to express versatility in one measure. The measures are similar to the Offense Specialization Coefficient employed by DeLisi et al. (2011), except that it was calculated for behavior categories (e.g., theft, vandalism) rather than individual items.

[11] Two other possible approaches are to simply take the sum without correcting for the number of friends (the summative measure), or to divide the sum by the number of friends (the average measure). All models were replicated with average measures instead of the square root measures (findings available from the first author). The findings were fairly similar across measurement strategies, but the models using the square root measure fitted the data better than the models using the average measure. See "Appendix A" in the online supplementary material for a more detailed discussion of the different measures.

(described above). This made it possible to obtain information about those friends' behaviors based on *responses of those friends*, rather than relying on respondents' reports about their friends. Such sociometric measures are argued to be more accurate measures of friends' behavior and to provide a more conservative measure for capturing peer influence compared to the alternative perceptual measures (Haynie 2002; McGloin and Thomas 2016b; Young et al. 2014).

We constructed several measures that combined characteristics of respondents' friends with the respondents' reports about time spent in unstructured socializing with those friends. These measures were constructed with information about the two *best friends* and the five *close friends* nominated by the respondent (the "send" network). We constructed measures that expressed: (1) Involvement in unstructured socializing with friends who engaged in specific types of delinquency (i.e., theft, vandalism, and violence) and substance use (i.e., alcohol, cigarettes, marijuana, and other drugs). The descriptive statistics in Table 3 indicate that, on average per respondent, 21.8% of the nominated friends reported theft in the past year, 17.0% reported vandalism, 22.8% reported violence, 21.4% reported using alcohol, 9.5% reported using cigarettes, 5.0% reported using marijuana, and 5.0% reported using other drugs. (2) Involvement in unstructured socializing with friends who *did not engage* in those specific types of delinquency and substance use; (3) Involvement in unstructured socializing with friends who were complete specialists in those specific types of delinquency and substance use (i.e., friends who *only* engaged in those types of delinquency and substance use, and not in other types). These friends scored 1 on the proportion score that was described previously in the section on specialization measures. Throughout this paper, we will refer to these friends as 'specialized friends'. The descriptive statistics in Table 3 indicate that, on average per respondent, 7.5% of the nominated friends were complete specialists in theft, 3.2% of the friends specialized in vandalism, 9.3% specialized in violence, 12.5% specialized in alcohol use, 2.1% specialized in cigarette use, 0.3% specialized in marijuana use, and 1.6% specialized in other drug use. (4) Involvement in unstructured socializing with friends who displayed versatility, that is who engaged in the specified type of delinquency or substance use plus at least one other type of delinquency or substance use. These friends had scores between 0 and 1 on the proportion score that was described previously in the section on specialization measures. Finally, we also constructed a measure to express respondents' overall involvement in unstructured socializing, without any specification of the friends with whom it was undertaken. For all unstructured socializing measures with specified friend characteristics, the denominator was the square root of the number of friends with that characteristic (not the square root of the total number of friends). If respondents had no friends with a certain characteristic, they received a score of zero for the corresponding unstructured socializing measure.

The constructed measures offer an efficient way of differentiating the effects of time spent unstructured socializing with different kinds of friends. This approach is only possible because the data capture the amount of time spent unstructured socializing with specific friends. To our knowledge, there is no straightforward way to accomplish this differentiation with traditional interaction terms. If we created traditional interaction terms, we would have to add seven to each model at both the within-individual level and the between-individual level (one interaction term for each potential nominated friend).

## Controls

To isolate the situational effects of spending time unstructured socializing with certain friends from the prior socialization effects of simply having deviant friends, we controlled for the **proportion of reciprocal friends who were deviant.**[12] The type of deviance captured in this control variable matched the type of the dependent variable in each model. Reciprocity of a nomination—whether the nominated friend also nominated the respondent—is one measure of friendship quality. Adolescents may be more likely to adapt their behavior to that of their very close friends (Megens and Weerman 2010; Urberg et al. 2003).

Additional variables were included to control for **gender** (1 = male), **ethnicity** (1 = white), whether the respondent was eligible for **free or reduced price school lunch** (1 = yes) and whether the respondent lived with **two parents**, including stepparents (1 = yes). **Grades** represented respondents' general grades, varying from mostly D's (1) to mostly A's (5). **Parental knowledge** was the mean of two items on perceived parental knowledge about respondents' whereabouts and who they are with, rated on a scale of never (1) to always (5). **Risk-seeking** was the mean of three items on respondents' tendency to, for example, "do what feels good, regardless of the consequences," rated on a scale from never (1) to always (5). **Number of friends** was a count of the number of the respondents' friends who were matched to the school roster. A set of dummy variables for **wave** was included to control for age-related change in the outcomes. Finally, the models with the specialization measures as dependent variables included controls for respondents' overall **involvement** in delinquency and substance use (i.e., the number of reported behaviors) to address the general tendency of measures of specialization to be entangled with overall levels of deviance (Osgood and Schreck 2007).

## Analytical Strategy

To examine within-individual patterns in deviance and involvement in unstructured socializing, we apply an analytical strategy that isolates within-individual changes over time while controlling for measured time-varying individual characteristics, as well as for measured and unmeasured time-stable individual characteristics. Our focal coefficients essentially compare adolescents to themselves under different conditions, thus eliminating the influence of all time-stable, between-individual potential sources of spuriousness. This offers a more stringent test of our hypotheses. Two-level random intercept models (time within individual) were estimated in Stata. Following the hybrid approach suggested by Allison (2009), the models include two versions of each independent variable: One expresses the person-mean across all waves, and the other expresses the wave-specific deviation from that person-mean. The person-mean version acts as a control variable, leaving the coefficient for the time-varying version to be determined only by within-individual change. Note that our within-individual estimates are limited to respondents with relevant

[12] We also constructed several alternative measures including the proportion of best and stable friends who were deviant; the proportion of deviant friends who reciprocated the friendship nomination or were best or stable friends; and the proportion of all nominated friends who were deviant as well as best, stable, or reciprocal friends. Bivariate correlations indicated that of all examined measures, the control variable we used in the main analyses was the strongest predictor of each dependent variable, and thus offered the most conservative control.

data on two or more occasions, thus, whose responses vary across at least two waves. Tables 4, 5, 6, and 7 specify the number of cases that contributed to the model estimation.

To account for the non-normal distributions of the dependent variables, the models with the quantitative outcomes were estimated as negative binomial models (xtnbreg and menbreg in stata) and the models with the specialization outcomes were estimated as generalized linear models with binomial response and link logit (meglm in stata). We will elaborate on the binomial logit models, since they have not been applied previously for the examination of deviance specialization.

For the basic model without specification for the type of friends, our level 1 regression equation is:

$$\log\left(\frac{\pi_{ti}}{1-\pi_{ti}}\right) = \beta_{0i} + \beta_{1i}\left(\text{Unstr.Soc.}_{ti} - P\text{Munstr.soc.}_{i}\right) + \cdots + e_{ti} \tag{1}$$

with $Y_{ti} \sim B\left(n_{ti}, \pi_{ti}\right)$

The level 2 regression equations are:

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{PMunstr.soc}_{i}) + \cdots + u_{0i} \tag{2}$$

$$\beta_{ni} = \gamma_{ni} \tag{3}$$

The results of binomial logit regression are logistic coefficients with the same interpretation as ordinary logistic regression, and for dichotomous data the models are equivalent. However, where the outcome in logistic regression is a single 'yes/no', the outcome in binomial logit regression refers to 'how many yeses' out of 'how many trials'. In Eq. (1) above, the level 1 outcome represents the log odds (thus probability) that each of the deviant acts individual $i$ reports at time $t$ will fall under the specific behavior category being analyzed. The observed outcome, $Y_{ti}$, is the number of the acts that fall in this category, which is modeled as a binomial distribution determined by $n_{ti}$, the total number of different behaviors across all categories that individual $i$ reported at time $t$ and the modeled probability, $\pi_{ti}$. The model was informed by the work of Osgood and Schreck (2007), who pointed out that the precision of specialization measures is inherently dependent on the total number of reported offenses by an individual. The binomial treatment of the outcome serves a function comparable to their item level model. To accomplish this, the model takes into account the numerator (number of reported behaviors within one category; the number of positive events) as well as the denominator (number of reported behaviors across all categories; the number of trials). Like the item response theory model of Osgood and Schreck (2007), the binomial model treats the logit of the proportion of deviant behaviors as a latent dependent variable (Osgood and Rowe 1994) and implicitly weights the observed proportion by the number of reported deviant behaviors.

The level 1 outcome depends on the constant term $\beta_{0i}$, which varies randomly across individuals and represents individual differences in their tendency to report specific deviant behavior types relative to other behavior types (i.e., specialization). The level 1 regression also includes predictor variables (e.g., involvement in unstructured socializing) and control variables (i.e., grades, parental knowledge, number of friends, risk-seeking, overall deviance) that vary over time within individuals. The level 1 predictors express the wave specific deviation from the person-mean (PM). The corresponding coefficients (e.g., $\beta_{1i}$) represent the effect of changes in, for example, time spent in unstructured socializing with

friends on changes in specialization, as compared to individuals' *usual activity patterns*. Thus, they express whether increased involvement in unstructured socializing in one time period, as compared to in other time periods *for the same individual,* leads to an increased tendency *of that individual* to specialize in that time period as compared to in other time periods.

The level 2 equations express that individuals' tendencies to report a deviant behavior from a specific category relative to other categories ($\beta_{0i}$) depend on the base rate of that behavior ($\gamma_{00}$, the grand mean). Common behaviors, which are typically less serious, will have higher values than behaviors that are reported less often by the sample. Further, individuals' tendencies to specialize ($\beta_{0i}$) depend on their average (person-mean) scores on the predictors (e.g., time spend in unstructured socializing on average across all waves), and a vector of level-2 covariates (i.e., gender, ethnicity, free lunch, two parent family, as well as person means of grades, parental knowledge, number of friends, risk-seeking, and overall deviance). Thus, the coefficients for the level 2 predictors (e.g., $\gamma_{01}$) represent how *differences between individuals* in, for example, time spent in unstructured socializing with friends, relate to *differences between individuals* in their probability to report a specific behavior type relative to other types.

We do not expect multicollinearity to bias the models. The average VIF's for the main models varied between 1.14 and 1.23 and the highest VIF was 1.71. For the supplemental models, average VIF's varied between 1.13 and 1.33 and the highest VIF was 2.18.

To address our research questions, we took the following steps. First, we examined the prevalence and temporal variability of specialization and versatility in the sample, to gain perspective on the extent of specialization and potential for within-individual versus between-individuals explanations in our data. Second, we examined whether the respondents spent more time in unstructured socializing with certain friends, to gain insight into potential tendencies of adolescents to hang out with their at-risk friends or specialized friends. Third, we examined the baseline relationship between deviant behavior and involvement in unstructured socializing, without specifying the type of friends. In doing so, we examined whether unspecified settings of unstructured socializing are indeed behaviorally neutral in their criminogeneity. Fourth, we examined whether the unstructured socializing-deviance relationship can be specified by accounting for the type of friends with whom adolescents engage in unstructured socializing. Specifically, we distinguish between unstructured socializing with specialized friends (i.e., friends who are solely engaged in one type of deviance) and unstructured socializing with versatile friends (i.e., friends who engage in at least two types of deviance). We present two models for each type of deviant behavior: one for the quantitative dependent variable and one for the specialization dependent variable. For all models, we discuss three aspects of our findings: (1) We discuss whether increased involvement in unstructured socializing with *specialized* friends increases respondents' quantity of involvement and degree of specialization in *similar* behavior, which would be in line with Hypothesis 1. (2) We discuss whether increased involvement in unstructured socializing with *specialized* friends increases respondents' quantity of involvement and degree of specialization in *non-similar* behavior, which would provide reason to reject Hypothesis 1. (3) We discuss whether increased involvement in unstructured socializing with *versatile* friends increases respondents' quantity of involvement and decreases respondents' degree of specialization in similar behavior. This pattern would be in line with Hypothesis 2.

## Findings

### Specialization and Versatility in Delinquency and Substance Use

Descriptive statistics, presented in Tables 1 and 2, show that the respondents display versatility as well as specialization across the waves. The descriptive statistics in Table 2 show

**Table 1** Descriptive statistics for dependent variables and controls ($N_{max}$ = 40,023 person-observations)

| | *N* | Mean | *SD* | Min | Max | Alpha | *ICC* |
|---|---|---|---|---|---|---|---|
| *Delinquency* | | | | | | | |
| Theft (quantitative) | 39,553 | 0.733 | 2.098 | 0.000 | 16.000 | 0.823 | 0.369 |
| Theft (specialization) | 14,239 | 0.407 | 0.395 | 0.000 | 1.000 | – | 0.382 |
| Vandalism (quantitative) | 39,737 | 0.324 | 0.979 | 0.000 | 8.000 | 0.627 | 0.354 |
| Vandalism (specialization) | 14,392 | 0.213 | 0.305 | 0.000 | 1.000 | – | 0.252 |
| Violence (quantitative) | 39,831 | 0.401 | 0.903 | 0.000 | 4.000 | – | 0.420 |
| Violence (specialization) | 14,388 | 0.366 | 0.404 | 0.000 | 1.000 | – | 0.398 |
| *Substance use* | | | | | | | |
| Alcohol use (quantitative) | 39,889 | 0.327 | 0.748 | 0.000 | 4.000 | – | 0.264 |
| Alcohol use (specialization) | 9890 | 0.607 | 0.404 | 0.000 | 1.000 | – | 0.412 |
| Cigarette use (quantitative) | 39,906 | 0.205 | 0.757 | 0.000 | 4.000 | – | 0.342 |
| Cigarette use (specialization) | 9950 | 0.188 | 0.303 | 0.000 | 1.000 | – | 0.371 |
| Marijuana use (quantitative) | 39,847 | 0.091 | 0.489 | 0.000 | 4.000 | – | 0.216 |
| Marijuana use (specialization) | 9908 | 0.068 | 0.169 | 0.000 | 1.000 | – | 0.210 |
| Drug use (quantitative) | 39,781 | 0.086 | 0.505 | 0.000 | 8.000 | 0.467 | 0.232 |
| Drug use (specialization) | 9851 | 0.113 | 0.268 | 0.000 | 1.000 | – | 0.345 |
| Proportion of reciprocal friends who: | | | | | | | |
| Steal | 34,638 | 0.208 | 0.320 | 0.000 | 1.000 | – | 0.205 |
| Vandalize | 34,688 | 0.157 | 0.286 | 0.000 | 1.000 | – | 0.191 |
| Conduct violence | 34,699 | 0.212 | 0.326 | 0.000 | 1.000 | – | 0.265 |
| Use alcohol | 34,706 | 0.204 | 0.320 | 0.000 | 1.000 | – | 0.141 |
| Use cigarettes | 34,713 | 0.086 | 0.229 | 0.000 | 1.000 | – | 0.221 |
| Use marijuana | 34,707 | 0.042 | 0.162 | 0.000 | 1.000 | – | 0.159 |
| Use drugs | 34,685 | 0.046 | 0.161 | 0.000 | 1.000 | – | 0.141 |
| Gender (male = 1) | 40,018 | 0.450 | | 0.000 | 1.000 | – | – |
| Ethnicity (white = 1) | 40,020 | 0.831 | | 0.000 | 1.000 | – | – |
| Age in years | 38,815 | 13.46 | 1.316 | 10.000 | 17.000 | – | – |
| Free lunch (free lunch = 1) | 39,094 | 0.270 | | 0.000 | 1.000 | – | 0.653 |
| Grades | 38,865 | 4.110 | 0.878 | 1.000 | 5.000 | – | 0.631 |
| Two parent family (two parents = 1) | 39,605 | 0.790 | | 0.000 | 1.000 | – | 0.731 |
| Parental knowledge | 39,532 | 4.535 | 0.726 | 1.000 | 5.000 | 0.844 | 0.421 |
| Number of nominated friends | 40,023 | 4.870 | 1.879 | 1.000 | 7.000 | – | 0.345 |
| Risk seeking | 39,111 | 2.115 | 0.984 | 1.000 | 5.000 | 0.753 | 0.404 |

The *ICC*s were calculated in Stata as suggested by Hilbe (2011) and Hosmer and Lemeshow (2000). The *ICC*s express the percentage of the total variance that is at the individual level (versus the wave or person-observation level). For example, the *ICC* for theft (quantitative) expresses that approximately 36.9% of the variance in delinquency is explained by differences between adolescents. The other 63.1% is explained by differences within adolescents over time

**Table 2** Distributions of the specialization measures

| Variable | Range | % Theft ($N$=14,239) | % Vandalism ($N$=14,392) | % Violence ($N$=14,388) | % Alcohol ($N$=9890) | % Cigarettes ($N$=9950) | % Marijuana ($N$=9908) | % Drugs ($N$=9851) |
|---|---|---|---|---|---|---|---|---|
| Time periods | 0.00 | 42.4 | 57.1 | 40.7 | 20.5 | 65.6 | 83.1 | 81.4 |
| | 0.01–0.10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.11–0.20 | 0.0 | 4.7 | 9.9 | 1.0 | 1.0 | 1.0 | 0.0 |
| | 0.21–0.30 | 1.1 | 7.2 | 5.3 | 2.7 | 2.6 | 2.7 | 2.5 |
| | 0.31–0.40 | 5.5 | 9.6 | 7.3 | 9.4 | 9.0 | 7.3 | 4.3 |
| | 0.41–0.50 | 13.7 | 11.6 | 11.4 | 19.0 | 13.7 | 4.9 | 5.3 |
| | 0.51–0.60 | 5.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.61–0.70 | 6.9 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| | 0.71–0.80 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.81–0.90 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.91–1.00 | 20.7 | 8.4 | 25.3 | 47.5 | 8.1 | 1.1 | 6.4 |
| | | % Theft ($N$=6906) | % Vandalism ($N$=6912) | % Violence ($N$=6911) | % Alcohol ($N$=5511) | % Cigarettes ($N$=5510) | % Marijuana ($N$=5512) | % Drugs ($N$=5510) |
| Individuals[a] | 0.00 | 31.7 | 44.8 | 30.7 | 12.8 | 58.3 | 76.1 | 76.1 |
| | 0.01–0.10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.11–0.20 | 0.0 | 8.3 | 21.2 | 2.1 | 2.1 | 2.1 | 0.0 |
| | 0.21–0.30 | 1.6 | 13.4 | 8.2 | 6.1 | 5.9 | 6.0 | 5.6 |
| | 0.31–0.40 | 7.9 | 14.3 | 9.7 | 13.8 | 13.0 | 10.2 | 7.2 |
| | 0.41–0.50 | 17.3 | 12.0 | 11.9 | 22.5 | 15.7 | 4.9 | 6.6 |
| | 0.51–0.60 | 12.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.61–0.70 | 9.1 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| | 0.71—0.80 | 4.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.81–0.90 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.91–1.00 | 15.3 | 5.4 | 18.3 | 42.8 | 5.1 | 0.7 | 4.3 |

[a]These numbers express the degree of specialization across all five waves. The numbers indicate that, for example, 15.3% of the respondents reported almost solely theft and no other types of delinquency in all included waves

**Table 3** Descriptive statistics for independent variables ($N_{max}$ = 40,023 person-observations)

| | *N* | % of friends[a] | Mean | *SD* | Min | Max | Wilcoxon signed rank test[b] | *ICC* |
|---|---|---|---|---|---|---|---|---|
| Unstructured socializing (unspecified) | 39,632 | | 3.335 | 2.419 | 0.000 | 10.580 | | 0.328 |
| Unstructured socializing with friends who: | | | | | | | | |
| Steal | 39,519 | 21.837 | 1.372 | 1.807 | 0.000 | 9.800 | | 0.231 |
| Do not steal | 39,519 | 78.163 | 3.333 | 2.455 | 0.000 | 10.580 | − 120.807** | 0.318 |
| Vandalize | 39,519 | 17.046 | 1.126 | 1.680 | 0.000 | 9.800 | | 0.211 |
| Do not vandalize | 39,519 | 82.954 | 3.472 | 2.485 | 0.000 | 10.580 | − 135.684** | 0.329 |
| Conduct violence | 39,521 | 22.780 | 1.415 | 1.860 | 0.000 | 10.580 | | 0.273 |
| Do not conduct violence | 39,521 | 77.220 | 3.323 | 2.436 | 0.000 | 10.580 | − 118.653** | 0.337 |
| Use alcohol | 39,519 | 21.427 | 1.352 | 1.839 | 0.000 | 10.580 | | 0.198 |
| Do not use alcohol | 39,519 | 78.573 | 3.339 | 2.478 | 0.000 | 10.580 | − 118.889** | 0.290 |
| Use cigarettes | 39,518 | 9.504 | 0.635 | 1.378 | 0.000 | 9.800 | | 0.204 |
| Do not use cigarettes | 39,518 | 90.496 | 3.664 | 2.568 | 0.000 | 10.580 | − 149.963** | 0.339 |
| Use marijuana | 39,518 | 5.017 | 0.346 | 1.032 | 0.000 | 8.500 | | 0.144 |
| Do not use marijuana | 39,518 | 94.983 | 3.783 | 2.586 | 0.000 | 10.580 | − 158.734** | 0.348 |
| Use drugs | 39,519 | 5.031 | 0.387 | 1.051 | 0.000 | 8.000 | | 0.131 |
| Do not use drugs | 39,519 | 94.969 | 3.790 | 2.559 | 0.000 | 10.580 | − 160.859** | 0.357 |
| Unstructured socializing with friends who: | | | | | | | | |
| Specialize in theft | 39,517 | 7.474 | 0.554 | 1.207 | 0.000 | 8.000 | | 0.087 |
| Are versatile (theft +≥ 1 type) | 39,517 | 14.302 | 0.959 | 1.586 | 0.000 | 8.940 | − 41.132** | 0.217 |
| Specialize in vandalism | 39,517 | 3.212 | 0.257 | 0.854 | 0.000 | 6.930 | | 0.056 |
| Are versatile (vandalism +≥1 type) | 39,517 | 13.763 | 0.926 | 1.557 | 0.000 | 8.940 | − 71.343** | 0.204 |
| Specialize in violence | 39,517 | 9.334 | 0.666 | 1.346 | 0.000 | 8.940 | | 0.133 |
| Are versatile (violence +≥1 type) | 39,517 | 13.283 | 0.898 | 1.546 | 0.000 | 8.940 | − 23.651** | 0.226 |
| Specialize in alcohol use | 39,518 | 12.533 | 0.893 | 1.524 | 0.000 | 8.940 | | 0.134 |
| Are versatile (alcohol +≥ 1 type) | 39,518 | 8.844 | 0.611 | 1.330 | 0.000 | 8.940 | − 29.701** | 0.177 |
| Specialize in cigarette use | 39,518 | 2.141 | 0.165 | 0.709 | 0.000 | 6.930 | | 0.090 |

**Table 3** (continued)

| | *N* | % of friends[a] | Mean | *SD* | Min | Max | Wilcoxon signed rank test[b] | *ICC* |
|---|---|---|---|---|---|---|---|---|
| Are versatile (cigarettes +≥ 1 type) | 39,518 | 7.335 | 0.503 | 1.230 | 0.000 | 8.160 | −47.819** | 0.173 |
| Specialize in marijuana use | 39,518 | 0.302 | 0.024 | 0.266 | 0.000 | 5.660 | | 0.046 |
| Are versatile (marijuana +≥ 1 type) | 39,518 | 4.678 | 0.322 | 0.994 | 0.000 | 8.000 | −55.106** | 0.140 |
| Specialize in drug use | 39,518 | 1.602 | 0.127 | 0.616 | 0.000 | 6.930 | | 0.055 |
| Are versatile (drugs +≥ 1 type) | 39,518 | 3.418 | 0.269 | 0.884 | 0.000 | 8.000 | −25.770** | 0.114 |

The *ICC*s are calculated in Stata as suggested by Hilbe (2011) and Hosmer and Lemeshow (2000). The *ICC*s express the percentage of the total variance that is at the individual level (versus the wave or person-observation level)

[a]Percentage of nominated friends characterized by this feature

[b]The Wilcoxon-signed rank tests each compare two means: unstructured socializing with delinquent friends, using friends, and specialized friends on the one hand compared to unstructured socializing with non-delinquent friends, non-using friends, and versatile friends on the other hand

**Table 4** Delinquency regressed on overall unstructured socializing (Quantitative: $N_{max}$ = 11,183 persons, 40,023 observations; Specialization: $N_{max}$ = 6857 persons, 14,083 observations)

| | Theft | | | | Vandalism | | | | Violence | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | |
| | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Unstructured socializing | 0.018* | 0.008 | 0.005 | 0.008 | 0.015+ | 0.009 | −0.003 | 0.008 | 0.002 | 0.007 | −0.005 | 0.008 |
| Prop. of reciprocal dq. friends[a] | 0.300** | 0.041 | 0.136** | 0.039 | 0.187** | 0.049 | 0.088* | 0.041 | 0.154** | 0.039 | 0.079+ | 0.041 |
| Overall delinquency | | | 0.232** | 0.010 | | | 0.022* | 0.009 | | | −0.359** | 0.011 |
| Intercept | 1.531** | 0.193 | −0.935** | 0.147 | 2.074** | 0.215 | −1.493** | 0.143 | 2.150** | 0.188 | 0.078 | 0.147 |
| *N* persons WP | 3522 | | 3021 | | 2798 | | 2683 | | 3505 | | 2997 | |
| *N* observations WP | 11,899 | | 9436 | | 9463 | | 8620 | | 11,570 | | 9297 | |
| *N* persons BP | 11,125 | | 6241 | | 11,136 | | 6245 | | 11,152 | | 6245 | |
| *N* observations BP | 31,832 | | 11,092 | | 31,979 | | 11,109 | | 32,053 | | 11,112 | |
| Log (pseudo) likelihood | −25,706.78 | | −9949.38 | | −16,784.97 | | −8095.46 | | −21,039.60 | | −8531.51 | |
| *AIC* | 51,459.56 | | 19,946.75 | | 33,615.95 | | 16,236.92 | | 42,125.20 | | 17,109.02 | |
| *BIC* | 51,652.03 | | 20,122.29 | | 33,808.52 | | 16,405.17 | | 42,317.83 | | 17,277.29 | |

Results are from random intercept panel models (negative binomial for the quantitative models and binomial logit for the specialization models); only results at the within-individual level are shown. The within-individual level included controls for grades, parental knowledge, risk seeking, number of nominated friends, and dummy variables for waves 1, 2, 3, 4. Coefficients for the control variables and between-individual level findings are available in the supplementary online material ("Appendix B")

*N* WP refers to the number of persons and observations that were included for the estimation of within-individual level coefficients (i.e., individuals with usable data on two or more waves). *N* BP refers to the total number of persons and observations included in the model

**$p < 0.01$ *$p < 0.05$ +$p < 0.10$

[a]Type of friends' behavior is matched to the dependent variable (i.e., theft, vandalism, or violence)

**Table 5** Substance use regressed on overall unstructured socializing (Quantitative: $N_{max}$ = 11,183 persons, 40,023 observations; Specialization: $N_{max}$ = 5470 persons, 9657 observations)

| | Alcohol use | | | | Cigarette use | | | | Marijuana use | | | | Drug use | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | |
| | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Unstructured socializing | 0.032** | 0.007 | 0.012 | 0.010 | 0.027* | 0.012 | 0.002 | 0.012 | 0.020 | 0.020 | −0.008 | 0.017 | 0.020 | 0.017 | −0.017 | 0.018 |
| Prop. of reciprocal using friends[a] | 0.415** | 0.041 | −0.021 | 0.049 | 0.893** | 0.070 | 0.496** | 0.065 | 0.947** | 0.131 | 0.411** | 0.107 | 0.577** | 0.141 | 0.263* | 0.131 |
| Overall use | | | −0.748** | 0.022 | | | 0.161** | 0.024 | | | 0.655** | 0.031 | | | 0.463** | 0.032 |
| Intercept | 3.145** | 0.224 | 0.802** | 0.178 | 3.368** | 0.304 | −0.661** | 0.208 | 1.988** | 0.418 | −2.825** | 0.278 | 1.012* | 0.395 | −4.430** | 0.327 |
| *N* persons WP | 3714 | | 2479 | | 1647 | | 1677 | | 932 | | 1267 | | 959 | | 1257 | |
| *N* observations WP | 12,932 | | 6522 | | 5500 | | 4662 | | 3153 | | 3654 | | 3305 | | 3636 | |
| *N* persons BP | 11,161 | | 4871 | | 11,161 | | 4873 | | 11,161 | | 4874 | | 11,160 | | 4872 | |
| *N* observations BP | 32,067 | | 7759 | | 32,084 | | 7760 | | 32,051 | | 7756 | | 31,994 | | 7752 | |
| Log (pseudo) likelihood | −18,978.82 | | −4879.36 | | −10,733.98 | | −4098.25 | | −5751.84 | | −2281.86 | | −6412.27 | | −3193.59 | |
| *AIC* | 38,003.63 | | 9804.73 | | 21,513.97 | | 8242.50 | | 11,549.67 | | 4609.72 | | 12,870.54 | | 6435.18 | |
| *BIC* | 38,196.27 | | 9964.73 | | 21,706.62 | | 8402.51 | | 11,742.30 | | 4769.72 | | 13,063.13 | | 6602.11 | |

Results are from random intercept panel models (negative binomial for the quantitative models and binomial logit for the specialization models); only results at the within-individual level are shown. The within-individual level included controls for grades, parental knowledge, risk seeking, number of nominated friends, and dummy variables for waves 1, 2, 3, 4. Coefficients for the control variables and between-individual level findings are available in the supplementary online material ("Appendix B")

*N* WP refers to the number of persons and observations that were included for the estimation of within-individual level coefficients (i.e., individuals with usable data on two or more waves). *N* BP refers to the total number of persons and observations included in the model

$^{**}p < 0.01$ $^{*}p < 0.05$ $+p < 0.10$

[a] Type of friends' behavior is matched to the dependent variable (i.e., alcohol, cigarette, marijuana, or drug use)

**Table 6** Delinquency regressed on unstructured socializing with friends who are specialized in certain types of delinquency (Quantitative: $N_{max}$ = 11,183 persons, 40,023 observations; Specialization: $N_{max}$ = 6857 persons, 14,083 observations)

| | Theft | | | | Vandalism | | | | Violence | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | |
| | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Unstructured socializing with specialized friends: | | | | | | | | | | | | |
| Specialized in theft | 0.066** | 0.010 | 0.042** | 0.010 | 0.015 | 0.013 | −0.027* | 0.011 | 0.009 | 0.011 | −0.025* | 0.011 |
| Specialized in vandalism | −0.009 | 0.015 | −0.016 | 0.014 | 0.030+ | 0.015 | 0.037** | 0.014 | −0.004 | 0.015 | −0.014 | 0.015 |
| Specialized in violence | 0.009 | 0.010 | 0.000 | 0.010 | 0.013 | 0.012 | −0.016 | 0.010 | 0.025** | 0.009 | 0.016+ | 0.009 |
| Unstructured socializing with versatile friends: | | | | | | | | | | | | |
| Theft +≥ 1 type | 0.048** | 0.009 | 0.013 | 0.008 | – | – | – | – | – | – | – | – |
| Vandalism +≥ 1 type | – | – | – | – | 0.067** | 0.010 | 0.022* | 0.009 | – | – | – | – |
| Violence +≥ 1 type | – | – | – | – | – | – | – | – | 0.037** | 0.008 | 0.003 | 0.008 |
| Overall delinquency | – | – | 0.232** | 0.010 | – | – | 0.024** | 0.009 | – | – | −0.360** | 0.011 |
| Prop. of reciprocal dq. friends[a] | 0.201** | 0.043 | −0.009 | 0.041 | 0.138** | 0.049 | −0.020 | 0.043 | 0.073+ | 0.040 | −0.027 | 0.042 |
| Intercept | 1.270** | 0.196 | −0.901** | 0.151 | 1.832** | 0.221 | −1.348** | 0.147 | 1.906** | 0.190 | 0.218 | 0.151 |
| *N* persons WP | 3494 | | 3036 | | 2771 | | 2702 | | 3474 | | 3011 | |
| *N* observations WP | 11,788 | | 9454 | | 9342 | | 8651 | | 11,423 | | 9318 | |
| *N* persons BP | 11,092 | | 6205 | | 11,098 | | 6205 | | 11,111 | | 6205 | |
| *N* observations BP | 31,657 | | 11,004 | | 31,755 | | 11,004 | | 31,819 | | 11,004 | |
| Log (pseudo) likelihood | −25,438.91 | | −9858.85 | | −16,528.69 | | −7986.16 | | −20,768.99 | | −8425.60 | |
| *AIC* | 50,935.83 | | 19,777.69 | | 33,115.38 | | 16,030.31 | | 41,595.98 | | 16,909.20 | |
| *BIC* | 51,178.34 | | 19,996.87 | | 33,357.99 | | 16,242.19 | | 41,838.64 | | 17,121.08 | |

Results are from random intercept panel models (negative binomial for the quantitative models and binomial logit for the specialization models); only results at the within-individual level are shown. The within-individual level included controls for grades, parental knowledge, risk seeking, number of nominated friends, and dummy variables for waves 1, 2, 3, 4. Coefficients for the control variables and between-individual level findings are available in the supplementary online material ("Appendix B")

*N* WP refers to the number of persons and observations that were included for the estimation of within-individual level coefficients (i.e., individuals with usable data on two or more waves). *N* BP refers to the total number of persons and observations included in the model

**$p < 0.01$ *$p < 0.05$ +$p < 0.10$

[a]Type of friends' behavior is matched to the dependent variable (for the models in this table: delinquency)

**Table 7** Substance use regressed on unstructured socializing with friends who are specialized in certain types of substance use (Quantitative: $N_{max}$ = 11,183 persons, 40,023 observations; Specialization: $N_{max}$ = 5470 persons, 9657 observations)

| | Alcohol use | | | | Cigarette use | | | | Marijuana use | | | | Drug use | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | |
| | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Unstructured socializing with specialized friends: | | | | | | | | | | | | | | | | |
| Spec. in alc. | 0.085** | 0.009 | 0.048** | 0.010 | 0.023 | 0.018 | −0.013 | 0.013 | −0.003 | 0.026 | −0.041* | 0.019 | 0.005 | 0.025 | −0.039+ | 0.020 |
| Spec. in cig. | 0.035* | 0.018 | −0.051** | 0.018 | 0.177** | 0.029 | 0.095** | 0.020 | 0.038 | 0.043 | −0.040 | 0.028 | 0.072 | 0.045 | −0.018 | 0.030 |
| Spec. in mar. | −0.007 | 0.041 | 0.003 | 0.041 | 0.002 | 0.078 | −0.024 | 0.047 | 0.093 | 0.093 | 0.078 | 0.080 | 0.108 | 0.115 | −0.139+ | 0.083 |
| Spec. in drug | −0.008 | 0.023 | −0.060* | 0.029 | −0.005 | 0.043 | 0.000 | 0.033 | −0.150* | 0.072 | −0.166** | 0.052 | 0.173** | 0.051 | 0.168** | 0.043 |
| Unstructured socializing with versatile friends: | | | | | | | | | | | | | | | | |
| Alc. +≥1 type | 0.091** | 0.010 | −0.022* | 0.011 | – | – | – | – | – | – | – | – | – | – | – | – |
| Cig. +≥1 type | – | – | – | – | 0.210** | 0.019 | 0.074** | 0.013 | – | – | – | – | – | – | – | – |
| Mar. +≥1 type | – | – | – | – | – | – | – | – | 0.208** | 0.031 | 0.097** | 0.021 | – | – | – | – |
| Drug. +≥1 type | – | – | – | – | – | – | – | – | – | – | – | – | 0.084* | 0.037 | 0.001 | 0.025 |
| Overall use | – | – | −0.726** | 0.022 | – | – | 0.150** | 0.024 | – | – | 0.650** | 0.032 | – | – | 0.459** | 0.033 |
| Prop. of reciprocal using friends[a] | 0.253** | 0.051 | −0.163** | 0.053 | 0.468** | 0.092 | 0.098 | 0.065 | 0.795** | 0.126 | 0.200* | 0.095 | 0.317* | 0.134 | −0.191* | 0.093 |
| Intercept | 0.321* | 0.137 | 0.939** | 0.179 | 2.571** | 0.251 | −0.462* | 0.209 | 1.184** | 0.342 | −2.859** | 0.277 | −1.011** | 0.332 | −4.160** | 0.331 |
| *N* persons WP | 3704 | | 2472 | | 1639 | | 1681 | | 929 | | 1273 | | 957 | | 1262 | |
| *N* observations WP | 12,884 | | 6516 | | 5473 | | 4677 | | 3135 | | 3667 | | 3292 | | 3649 | |

**Table 7** (continued)

| | Alcohol use | | | | Cigarette use | | | | Marijuana use | | | | Drug use | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | | Quantitative | | Specialization | |
| | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| *N* persons BP | 11,150 | | 4865 | | 11,150 | | 4865 | | 11,151 | | 4865 | | 11,150 | | 4865 | |
| *N* observations BP | 31,964 | | 7732 | | 31,977 | | 7732 | | 31,948 | | 7732 | | 31,913 | | 7732 | |
| Log (pseudo) likelihood | − 19,323.10 | | − 4819.09 | | − 11,107.14 | | − 4053.13 | | − 5850.25 | | − 2251.88 | | − 6697.19 | | − 3166.41 | |
| *AIC* | 38,706.20 | | 9700.18 | | 22,274.28 | | 8168.27 | | 11,760.49 | | 4565.76 | | 13,454.38 | | 6396.81 | |
| *BIC* | 38,957.38 | | 9915.72 | | 22,525.46 | | 8383.81 | | 12,011.65 | | 4781.30 | | 13,705.50 | | 6619.31 | |

Results are from random intercept panel models (negative binomial for the quantitative models and binomial logit for the specialization models); only results at the within-individual level are shown. The within-individual level included controls for grades, parental knowledge, risk seeking, number of nominated friends, and dummy variables for waves 1, 2, 3, 4. Coefficients for the control variables and between-individual level findings are available in the supplementary online material ("Appendix B")

*N* WP refers to the number of persons and observations that were included for the estimation of within-individual level coefficients (i.e., individuals with usable data on two or more waves). *N* BP refers to the total number of persons and observations included in the model

$^{**}p < 0.01$ $^{*}p < 0.05$ $+p < 0.10$

[a] Type of friends' behavior is matched to the dependent variable (for the models in this table: substance use)

that of all respondents who reported at least one type of delinquency across all five waves, 15.3% are completely specialized in theft throughout the waves, 5.4% are completely specialized in vandalism, and 18.3% are completely specialized in violence. This was 42.8%, 5.1%, 0.7%, and 4.3% for, respectively, alcohol use, cigarette use, marijuana use, and use of other illicit drugs. Looking at the descriptive statistics for the time periods, or separate waves, the percentages of specialization are slightly higher across all types of deviance. Thus, in line with previous research (Sullivan et al. 2006), we find that respondents show more specialization when the time period is of shorter duration.

The intra-class correlations presented in Table 1 indicate that the variation in respondents' degrees of specialization is better explained by variation within individuals than by variation between individuals. In other words, specialization varies more over time than that it varies among individuals. For example, the intra-class correlation for theft indicates that only 38% of the variance in specialization in theft is from variation between individuals. The other 62% is from variation over time within the individual. These findings provide a strong indication of temporal variation in deviance specialization, confirming findings from previous work (McGloin et al. 2007; Nieuwbeerta et al. 2011; Sullivan et al. 2006).

### Who are the Friends they Hang Out with?

On average, the respondents engage in unstructured socializing almost every week. The descriptive statistics in Table 3 indicate that respondents generally spend more time in unstructured socializing with their non-delinquent friends than with their delinquent friends; more time in unstructured socializing with their non-substance using friends than with their substance using friends; and more time in unstructured socializing with their versatile friends than with their specialized friends. Alcohol use is the exception to this pattern: Respondents spend more time in unstructured socializing with friends who are specialized in alcohol use than with friends who use alcohol alongside other substances. All differences were significant as confirmed with Wilcoxon signed rank tests. The findings of these tests are provided in Table 3. Note that the characteristics of the friends with whom respondents most often engage in unstructured socializing are similar to the characteristics of the nominated friends overall (column '% of friends' in Table 3). These descriptive statistics confirm findings from previous research (Siennick and Osgood 2012) that adolescents spend the most time unstructured socializing with friends who are available, rather than with their at-risk friends.

### Unstructured Socializing, Delinquency, and Substance Use

Tables 4 and 5 present the general relationship between involvement in unstructured socializing and the outcome measures (i.e., delinquency and substance use), without specification of the friends with whom the respondents are involved in unstructured socializing. The tables present two models for each behavioral outcome: one with the quantitative measure as the dependent variable and one with the specialization measure as the dependent variable. First, we will examine the models with the *quantitative measures* as dependent variables (i.e., how often the respondent engages in the behavior). Consistent with previous work (e.g., Osgood et al. 1996), the findings confirm that involvement in unstructured socializing is positively related to most types of deviance. Note that the within-individual level findings, presented in Tables 4 and 5, represent changes in time spent unstructured socializing and changes in the outcome measures, as compared to individuals' *usual activity patterns*.

Thus, these findings describe increases or decreases in delinquency and substance use for those years in which individuals reported spending more time in unstructured socializing as compared to previous and later years *for that same individual*. The findings indicate that individuals who engage in one more unit of unstructured socializing as compared to their usual activity patterns have a 1.8% higher risk of committing theft ($b = 0.018$, $p < 0.05$, $IRR = 1.018$), a 1.5% higher risk of committing vandalism ($b = 0.015$, $p < 0.10$, $IRR = 1.015$), a 3.3% higher risk of using alcohol ($b = 0.032$, $p < 0.01$, $IRR = 1.033$), and a 2.7% higher risk of using cigarettes ($b = 0.027$, $p < 0.05$, $IRR = 1.027$).[13] No associations are seen between unstructured socializing and violence, marijuana use, or drug use. Also, no evidence is found for relationships between unstructured socializing and the *specialization measures* (i.e., to what extent the respondent specializes in this type of behavior versus engaging in other types). This is in line with our expectations: We theorized that specification of the friends with whom adolescents spend time in unstructured socializing is necessary to explain individuals' degree of specialization, since the unstructured socializing setting itself fosters opportunities for various types of behavior. We address the role of these peers in the next section.

### Unstructured Socializing with Specialized or Versatile Friends

Tables 6 and 7 show how the unstructured socializing-deviance relationship varies depending on the friends with whom respondents spend time unstructured socializing. Specifically, we distinguish between unstructured socializing with completely specialized friends (i.e., friends who are solely engaged in one type of deviance) and unstructured socializing with versatile friends (i.e., friends who engage in at least two types of deviance). Again, we present two models for each behavioral outcome: one for the quantitative dependent variable and one for the specialization dependent variable. Please note that the specialization models for different behaviors are not independent from each other. Specialization in theft, for example, can only be interpreted as 'specialization in theft relative to specialization in violence or vandalism'.

*Unstructured socializing with specialized friends and similar behavior.* First, does unstructured socializing with *specialized* friends increases adolescents' risk for engaging in *similar* deviant behavior? Yes; this is the case for all investigated types of deviance except marijuana use. Thus, in this respect, our findings are largely in line with Hypothesis 1. With regard to the *quantity* of respondents' involvement in deviance, the findings indicate that, compared to respondents' usual activity pattern, a one unit increase in unstructured socializing with friends who are completely specialized in one type of deviance, is related to, respectively, increases in that type of deviance of 6.8% in theft ($b = 0.066$, $p < 0.01$, $IRR = 1.068$), 3.0% in vandalism ($b = 0.030$, $p < 0.10$, $IRR = 1.030$), 2.5% in violence ($b = 0.025$, $p < 0.01$, $IRR = 1.025$), 8.9% in alcohol use ($b = 0.085$, $p < 0.01$, $IRR = 1.089$), 19.4% in cigarette use ($b = 0.177$, $p < 0.01$, $IRR = 1.194$), and 18.9% in use of other drugs ($b = 0.173$, $p < 0.01$, $IRR = 1.189$). We did not confirm the expected relationship between unstructured socializing and marijuana use. With regard to respondents' *degree of specialization* in specific types of deviance, the findings indicate that a one unit increase in

[13] Coefficients were interpreted as log linear and express the change in the log count of the outcome associated with every one-unit increase in the independent variable. The incidence rate ratio (*IRR*) expresses the multiplicative change in the outcome measure with every one-unit increase in the predictor.

unstructured socializing with specialized friends increases respondents' degree of specialization in that time period by 4.3% in theft ($b=0.042$, $p<0.01$, $OR=1.043$), 3.8% in vandalism ($b=0.037$, $p<0.01$, $OR=1.038$), 1.7% in violence ($b=0.016$, $p<0.10$, $OR=1.017$), 4.9% in alcohol use ($b=0.048$, $p<0.01$, $OR=1.049$), 10.0% in cigarette use ($b=0.095$, $p<0.01$, $OR=1.100$), and 18.3% in use of other drugs ($b=0.168$, $p<0.01$, $OR=1.183$).[14] The association with specialization in marijuana use was not confirmed.

*Unstructured socializing with specialized friends and non-similar behavior.* Second, does unstructured socializing with *specialized* friends increase adolescents' risk for engagement in *non-similar* deviant behaviors? Note that, if involvement in unstructured socializing offers type-specific opportunities for deviance depending on the peers who are present, we would expect that spending time unstructured socializing with friends who completely specialized in one type of deviance would predominantly increase adolescents' engagement in that type of deviance, more so than their engagement in other types of deviance. In this respect, the findings are in line with Hypothesis 1 for most types of deviance except for alcohol use. With regard to the *quantity* of respondents' involvement in deviance, the findings from Tables 6 and 7 indicate that unstructured socializing with friends specialized in behaviors other than the outcome variable does not affect respondents' involvement in that type of delinquency or substance use. This pattern is consistent for all investigated types of delinquency and for most types of substance use, with the exception of alcohol use: Spending time unstructured socializing with friends specialized in cigarette use can increase respondents' quantity of alcohol use ($b=0.035$, $p<0.05$). With regard to respondents' *degree of specialization*, the findings are in line with our expectations: Involvement in unstructured socializing with specialized friends does not increase, or even reduces, respondents' specialization in non-similar types of deviance. This was confirmed for all types of delinquency and substance use.

*Unstructured socializing with versatile friends and similar behavior.* Third, does unstructured socializing with *versatile* friends affect adolescents' risk for engagement in deviant behaviors? Note that friends were considered to be 'versatile' if they engaged in a specific type of deviance (i.e., the same type as the behavioral outcome for the respondent) as well as in at least one other type of deviance. In line with Hypothesis 2, we find that involvement in unstructured socializing with versatile friends increases respondents' *quantity of engagement* in overlapping behaviors. The findings indicate that a one unit increase in unstructured socializing with versatile friends increases respondents' engagement in deviance in that time period by 4.9% for theft ($b=0.048$, $p<0.01$, $IRR=1.049$), 6.9% for vandalism ($b=0.067$, $p<0.01$, $IRR=1.069$), 3.7% for violence ($b=0.037$, $p<0.01$, $IRR=1.037$), 9.5% for alcohol use ($b=0.091$, $p<0.01$, $IRR=1.095$), 23.3% for cigarette use ($b=0.210$, $p<0.01$, $IRR=1.233$), 23.1% for marijuana use ($b=0.208$, $p<0.01$, $IRR=1.231$), and 8.7% in use of other drugs ($b=0.084$, $p<0.05$, $IRR=1.087$). However, in contrast to the Hypothesis 2 prediction that time spent unstructured socializing with versatile friends would *decrease* adolescents' degree of specialization, we find that involvement in unstructured socializing with versatile friends is either unrelated to or positively associated with respondents' degree of specialization in all investigated types of deviance, except for alcohol use. Specifically, we find that spending time unstructured socializing with versatile friends is unrelated to the degree of specialization in theft, violence, and other drug

[14] Coefficients express the expected change in the log odds of the outcome with every one-unit increase in the independent variable. The odds ratio (OR) expresses the multiplicative change in the odds of the outcome measure with every one-unit increase in the predictor.

use. It is positively related to the degree of specialization in vandalism ($b = 0.022$, $p < 0.05$, $OR = 1.022$), cigarette use ($b = 0.074$, $p < 0.01$, $OR = 1.077$), and marijuana use ($b = 0.097$, $p < 0.01$, $OR = 1.102$). In line with our expectations, we find a negative association for alcohol use, indicating that a one-unit increase in time spent unstructured socializing with versatile friends *decreases* respondents' degree of specialization in alcohol use by 2.2% ($b = -0.022$, $p < 0.05$, OR = 0.978).

In summary, in line with Hypothesis 1, our findings indicate that involvement in unstructured socializing with friends who are completely specialized in theft, vandalism, violence, alcohol use, cigarette use, and illicit drug use, but not marijuana use, increases the likelihood that adolescents will engage in those behaviors themselves. Moreover, we find that involvement in unstructured socializing with friends who engage in these behaviors affects respondents' degree of specialization in the respective behaviors, even after controlling for respondents' overall engagement in deviance and their friends' overall engagement in deviance. This was established by examining within-individual changes in respondents' involvement in unstructured socializing and deviant behavior, essentially comparing individuals to themselves under different circumstances. In other words, the findings indicate that within-individual changes in involvement in unstructured socializing with different friends can explain at least part of the within-individual variation in adolescents' degree of specialization in delinquency and substance use. The findings also speak to the behavior-specificity of the relationship between unstructured socializing and adolescents' engagement in delinquency and substance use. In contrast with Hypothesis 1, we find a crossover effect for time spent with friends who specialize in cigarette use, which increases adolescents' risk for using alcohol. We also find, in contrast to Hypothesis 2, that time spent unstructured socializing with versatile friends can increase adolescents' degree of specialization in vandalism, cigarette use, and marijuana use.

## Supplemental Analyses

The main analyses, presented above, focused on within-individual differences and thus on temporal variation in respondents' involvement in unstructured socializing and deviance. All associations were also estimated at the between-individual level; the findings are provided in the online supplementary materials ("Appendix B"). The within-individual level findings were confirmed at the between-individual level, where the effects were stronger. The between-individual level findings indicate that an individual who spends more time in unstructured socializing with certain friends *compared to another individual* has increased risks of engaging in the same types of deviance as those friends.

The main analyses only regard time spent unstructured socializing with specialized friends versus with versatile friends. We also estimated models to compare the effects of spending time unstructured socializing with deviant friends versus with non-deviant friends. The findings are available from the first author. They confirm that unstructured socializing with friends who engage in all investigated types of deviance is associated with increased risks of adolescents engaging in similar behaviors. Involvement in unstructured socializing with non-deviant friends is unrelated or negatively related to adolescents' quantitative involvement in deviance and to their degree of specialization.

The main analyses with the specialization measures as dependent variables included respondents who reported at least one act of delinquency or substance use. Additional analyses were conducted that included only those respondents who reported at least two deviant acts, which is an analytical sample of 5074 individuals and 9342 time periods for the

delinquency models and of 3880 individuals and 6221 time periods for the substance use models. The results of these analyses, available from the first author, confirm all conclusions, except for violence. Under this specification, involvement in unstructured socializing with friends specialized in violence is not associated with respondents' degree of specialization in violence.

The main analyses include different samples for the quantitative and specialization models, since the quantitative models include all respondents and the specialization models only those respondents who reported at least one act of deviance. Additional analyses were conducted for the quantitative models that included the same subsamples as were used for the specialization models. The results of these analyses, available from the first author, confirm all conclusions with one exception. Under this specification, involvement in unstructured socializing with friends who specialized in vandalism was not associated with respondents' involvement in vandalism.

The main analyses also used a measure of unstructured socializing that was constructed by dividing by the square root of the number of friends (the square root measure). Additional analyses were conducted with an alternative measure constructed by simply dividing by the number of friends (the average measure). "Appendix A" in the online supplementary material elaborates on the difference between these measures. The results of these analyses, available from the first author, led to nearly identical conclusions. One difference was in the crossover effect of time spent unstructured socializing with friends specialized in cigarette use on non-similar behavior. In the main analyses, we found that hanging out with friends specialized in cigarette use increased respondents' risk for quantity of alcohol use. In the supplemental analyses, we found that hanging out with friends specialized in cigarette use increased respondents' risk for quantity of other illicit drug use, but not their risk for quantity of alcohol use.

## Discussion and Conclusion

Adolescents differ in the extent to which they specialize or display versatility in their engagement in delinquency and substance use (Moss et al. 2014; Osgood and Schreck 2007). Such patterns of specialization not only vary between individuals, but also have been shown to vary across the life course (Nieuwbeerta et al. 2011) and across shorter time periods (McGloin et al. 2007; Sullivan et al. 2006). To date, research on deviance specialization has predominantly examined explanations that focus on stable individual characteristics and explanations that focus on processes of socialization and maturation. In contrast, studies on the role of social controls, local life circumstances, or other opportunity-driven explanations for temporal patterns of specialization are still scarce (but see McGloin et al. 2007).

The current study contributes to existing work by theoretically extending the routine activity theory for general deviance to determine behavior-specific opportunities, and by empirically testing whether this explanation can account for within-individual changes in deviance specialization. The study also introduces a new method (i.e., multilevel binomial logit modeling) to scrutinize predictors of temporal patterns in deviance specialization. It is the first study to examine whether involvement in unstructured socializing explains within-individual patterns of specialization, and the first study to explore the role of friends'

versatility in the unstructured socializing-deviance relationship. We draw two main conclusions from our study.

First, the study confirms observations from previous work (McGloin et al. 2007; Sullivan et al. 2006) that individuals' degree of deviance specialization varies over time, even in early adolescence. In line with various other general (not at-risk) samples of adolescents (Brooks-Russell et al. 2015; Moss et al. 2014; Osgood and Schreck 2007; Thomas 2015), the respondents from the PROSPER Peers Project showed substantial versatility in their use of substances and engagement in delinquency. Nevertheless, 5.4 to 18.3% of the delinquent individuals displayed complete specialization in one type of delinquency (i.e., theft, vandalism, or violence) and 0.7 to 42.8% of the substance using individuals displayed complete specialization in one type of substance use (i.e., alcohol, cigarettes, marijuana, other illicit drugs). Also, we found that patterns of specialization in deviance varied across the five waves of data collection.

Second, the study shows that involvement in unstructured socializing with certain friends explains at least part of these within-individual patterns in deviance. The findings indicate that the friends with whom adolescents hang out can help explain why involvement in unstructured socializing would lead to different behavioral outcomes across different time-periods. This adds a proximate explanation for within-individual differences in deviance specialization to other explanations focusing on variation in life circumstances (e.g., McGloin et al. 2007, see also Horney et al. 1995) and peer group affiliation (McGloin and Piquero 2010; Thomas 2016). Findings of the current study also indicated that differences *between* individuals in type-specific deviance are at least partially explained by differences in their involvement in unstructured socializing with friends. Thus, for example, person A is at higher risk of engaging in violence due to his or her involvement in unstructured socializing with violent friends, whereas person B is at higher risk of engaging in vandalism due to his or her involvement in unstructured socializing with vandalizing friends. These between-individual findings confirm those from McGloin and Piquero (2010), Thomas (2015), and Osgood and Schreck (2007).

The findings of the current study point to the relevance of opportunity theories (Cohen and Felson 1979; Osgood et al. 1996) and the opportunity perspective on peer influence (Haynie and Osgood 2005; Osgood et al. 1996; Warr and Stafford 1991) for explaining within-individual variation in deviance specialization. Opportunity theories such as the routine activity theory (Cohen and Felson 1979) and the routine activity theory of general deviance (Osgood et al. 1996) aim to explain general risk for deviance. The current study is an attempt to theoretically extend these theories and make them applicable for explaining behavior-specific risk. Adopting insights from behavior setting theory (Barker 1968; Wikström et al. 2012), we specified the setting of unstructured socializing based on its social elements: the present peers. We have argued that in unstructured socializing settings, the present peers are more likely to instigate, provoke, and positively reinforce types of behavior that they have engaged in themselves. Our findings are in line with this idea. Future studies should explore whether other characteristics of the unstructured socializing setting can add to this explanation, such as the location where it takes place (Bernasco et al. 2013; Hoeben and Weerman 2014; Miller 2013; Weerman et al. 2015). Involvement in unstructured socializing in a mall may provide more opportunities for theft, whereas unstructured socializing in a park may induce vandalism, and unstructured socializing in nightlife locations may induce alcohol use and violence. Also, the duration of involvement in unstructured socializing may be of importance (Meldrum and Leimberg 2018). Delinquent acts require brief periods of involvement in unstructured socializing (e.g., Buckle and Farrington 1984), whereas substance use may only occur when adolescents have the

prospect of several hours of idle time for the effects to wear off before they can return to their parents. Addressing these issues will bring us closer to a definition of criminogenic behavior settings (Barker 1968; Weerman et al. 2018b; Wikström et al. 2012).

Research on offending specialization is dominated by studies among serious, often adult, offenders. Naturally, the prevalence and frequency of offending will be different among general (not at-risk) populations of adolescents and, therefore, patterns of specialization and versatility will also be different (Monahan and Piquero 2009). These differences are reflected in the inclusion criteria and operationalization of 'specialization' in studies among at-risk samples versus general adolescent samples. Specifically, in studies of at-risk populations, it is common to include only respondents who committed two or more acts (Mazerolle et al. 2000; McGloin et al. 2007; Piquero et al. 1999), whereas studies among general adolescent samples also included respondents who committed one act (Deane et al. 2005; Osgood and Schreck 2007; Thomas 2015). Since adolescent populations are preeminently suitable for examining dimensions of criminal careers (Kreager et al. 2016; Moffitt 1993), it might be worthwhile to revisit the concept of 'specialization' and reach agreement on a form in which it can be applied for infrequent offenders.

We assessed specialization in specific categories of substance use, whereas previous work has examined substance use as one category of delinquency alongside property crime and violence (e.g., Thomas 2015). We did this for two reasons. First, the unstructured socializing perspective traditionally has a strong focus on explaining different types of substance use, starting with Osgood et al. (1996), who examined the role of unstructured socializing in predicting heavy alcohol use, marijuana use, and other drug use alongside criminal behavior and dangerous driving. Therefore, it made sense conceptually to examine specialization in substance use as well as delinquency. Second, polysubstance use among adolescents is a widespread phenomenon (Conway et al. 2013; Martin et al. 1996; Moss et al. 2014), but few studies have tried to explain within-individual changes in it (but see Egginton et al. 2002). Our application of opportunity theory provides an explanation for why adolescents would use substances within one category in one time-period, and use substances from another category in the next. In addition, the gateway hypothesis views the use of socially accepted substances, such as alcohol and tobacco, as a stepping stone to the use of illicit drugs (Choi et al. 2018; Kandel 1975; Kandel et al. 1978; Vanyukov et al. 2012). Although this theory was not developed to explain short-term within-individual changes in polysubstance use, our findings suggest one possible mechanism by which it might.

## Limitations

The longitudinal nature of the PROSPER study and the sociometric features linked with respondents' reports about unstructured socializing with each nominated friend make the data exceptionally well-suited for studying the relationship between unstructured socializing with different friends and within-individual patterns of adolescent deviance. Nevertheless, the data have some limitations that will be addressed in this section.

The main limitation was the year-to-year data collection structure. Given this structure, our shortest time spans are still considerably broader than the month-to-month time span applied in previous work on within-individual patterns in deviance specialization (McGloin et al. 2007; Sullivan et al. 2006). Since involvement in unstructured socializing may also affect deviant behavior through normative socialization by peers (Hoeben and Weerman 2016) and the time spans of 1 year may be large enough to establish socialization, it is

possible that our findings do not solely reflect situational peer influence. Further, the time spans may have masked part of the short-term variation in specialization due to aggregation effects. We expect that the relationships between involvement in unstructured socializing with friends and adolescents' deviance specialization will be stronger in data that capture shorter time spans, such as the biweekly data used in Weerman et al. (2018a).

A second limitation was the absence of information about conditions under which deviant acts occurred. Therefore, it was unknown whether the reported deviant acts occurred in situations of unstructured socializing, whether they were undertaken together with the friends with whom the respondents spent time unstructured socializing (i.e., co-offending, see Grund and Morselli 2017; McGloin and Piquero 2010), and whether they occurred consecutively or simultaneously (i.e., co-morbidity). Our findings therefore only concern the risk for adolescents' involvement in delinquency and substance use that is associated with the time they spend unstructured socializing with certain friends. This is insufficient to fully shed light on some of our findings, for example, our finding that involvement in unstructured socializing with friends specialized in cigarette use was positively related to respondents' alcohol use, or the finding that time spend unstructured socializing with versatile friends increases adolescents' specialization in vandalism, cigarette use, and marijuana use. These findings might be explained by simultaneous or consecutive use of different substances, or by the use of these substances in similar settings (Egginton et al. 2002). Importantly, these unexpected findings illustrate the relevance of distinguishing between quantitative and qualitative aspects of deviant behavior: Simultaneous or consecutive use of substances can explain increases in the quantity of use, but would increase versatility rather than specialization (Osgood et al. 1988). Replication is warranted with situational data, for example with data derived from space-time budgets (Hoeben et al. 2014; Wikström et al. 2012), or with data obtained in an experimental set-up (Gallupe et al. 2016; Paternoster et al. 2013).

A third limitation was that the data only captured information about unstructured socializing with 'best' or 'close' friends, not with distant friends or acquaintances. Respondents' involvement in unstructured socializing may therefore be underestimated. This is particularly problematic if delinquent and substance using adolescents, compared to non-delinquent or non-substance using adolescents, spend more time in unstructured socializing with peers who are not friends, or if unstructured socializing with distant friends is more strongly related to delinquency or substance use than unstructured socializing with close friends. Future research has to determine whether that is the case. Relatedly, we know little of the group structures or other peers that were present in situations of unstructured socializing. Respondents may hang out with just the one friend the question refers to. If they do not, we do not know who else is present in that situation. It would be interesting to study the group size (McGloin and Rowan 2015; McGloin and Thomas 2016a) and group composition with respect to, for example, age differences within the group (Reiss and Farrington 1991; Van Mastrigt and Farrington 2011; Warr 1996), gender composition (Lam et al. 2014), and the nature of the friendships within the group.

## Concluding Remarks

Despite the abundant attention to delinquency specialization in criminology (Blumstein et al. 1986; Piquero, et al. 2003), scholars have only recently started to explore within-individual patterns of specialization (McGloin et al. 2007; Sullivan et al. 2006). The current study adds to this literature by showing that involvement in unstructured socializing with different friends explains within-individual patterns in specialization in delinquency and

substance use. Thereby, the study calls for further attention to the role of opportunities for understanding deviance specialization.

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## References

Agnew R (1991) The interactive effects of peer variables on delinquency. Criminology 29:47–72
Akers RL (1998) Social learning and social structure: a general theory of crime and deviance. Northeastern University Press, Boston
Allison PD (2009) Fixed effects regression models. Sage Publications, Los Angeles
Anderson E (1999) Code of the street: decency, violence, and the moral life of the Inner City. Norton, New York
Anderson AL (2013) Adolescent time use, companionship, and the relationship with development. In: Gibson CL, Krohn MD (eds) Handbook of life-course criminology: emerging trends and directions for future research. Springer, New York, pp 111–127
Anderson AL, Hughes LA (2009) Exposure to situations conducive to delinquent behavior: the effects of time use, income, and transportation. J Res Crime Delinq 46:5–34
Barker RG (1968) Ecological psychology: concepts and methods for studying the environment of human behavior. Stanford University Press, Stanford
Barnes GM, Hoffman JH, Welte JW, Farrell MP, Dintcheff BA (2007) Adolescents' time use: effects on substance use, delinquency, and sexual activity. J Youth Adolesc 36:697–710
Beier H (2018) Situational peer effects on adolescents' alcohol consumption: the moderating role of supervision, activity structure, and personal moral rules. Deviant Behav 39:363–379
Bernasco W, Ruiter S, Bruinsma GJN, Pauwels LJR, Weerman FM (2013) Situational causes of offending: a fixed-effects analysis of space-time budget data. Criminology 51:895–926
Bernburg JG, Thorlindsson T (2001) Routine activities: a closer look at the role of opportunity in deviant behavior. Justice Q 18:543–567
Blumstein A, Cohen J, Roth JA, Visher C (1986) Criminal careers and "career criminals", vol 1. National Academy Press, Washington DC
Briar S, Piliavin I (1965) Delinquency, situational inducements, and commitment to conformity. Soc Probl 13:35–45
Brooks-Russell A, Conway KP, Liu D, Xie Y, Vullo GC, Li K, Iannotti RJ, Compton W, Simons-Morton B (2015) Dynamic patterns of adolescent substance use: results from a nationally representative sample of high school students. J Stud Alcohol Drugs 76:962–970
Buckle A, Farrington DP (1984) An observational study of shoplifting. Br J Criminol 24:63–73
Choi HJ, Lu Y, Schulte M, Temple JR (2018) Adolescent substance use: latent class and transition analysis. Addict Behav 77:160–165
Cloward R, Ohlin L (1960) Delinquency and opportunity: a theory of delinquent gangs. Free Press, New York
Cohen LE, Felson M (1979) Social change and crime rate trends: a routine activity approach. Am Sociol Rev 44:588–608
Conway KP, Vullo GC, Nichter B, Wang J, Compton WM, Iannotti RJ, Simons-Morton B (2013) Prevalence and patterns of polysubstance use in a nationally representative sample of 10th graders in the United States. J Adolesc Health 52:716–723
Cooper JM (2007) Cognitive dissonance: fifty years of a classic theory. Sage, Los Angeles
Deane G, Armstrong DP, Felson RB (2005) an examination of offense specialization using marginal logit models. Criminology 43:955–988

DeLisi M, Beaver KM, Wright KA, Wright JP, Vaughn MG, Trulson CR (2011) Criminal specialization revisited: a simultaneous quantile regression approach. Am J Crim Justice 36:73–92
Dishion TJ, Spracklen KM, Andrews DW, Patterson GR (1996) Deviancy training in male adolescent friendships. Behav Ther 27:373–390
Egginton R, Williams L, Parker H (2002) Going out drinking: the centrality of heavy alcohol use in English adolescents' leisure time and poly-substance-taking repertoires. J Subst Use 7:125–135
Falco Metcalfe C, Baker T (2014) The drift from convention to crime: exploring the relationship between co-offending and intermittency. Crim Justice Behav 41:75–90
Falco Metcalfe C, Baker T, Brady CM (2019) Exploring the relationship between lasting, quality social bonds and intermittency in offending. Am J Crim Justice 44:892–912
Farrington DP (1986) Age and crime. In: Tonry M, Morris N (eds) Crime and justice: a review of research, vol 7. University of Chicago Press, Chicago, pp 189–250
Felson M (1995) Those who discourage crime. In: Eck JE, Weisburd DL (eds) Crime and place: crime prevention studies. Criminal Justice Press, Monsey
Festinger L (1957) A theory of cognitive dissonance. Stanford University Press, Stanford
Gallupe O, Nguyen H, Bouchard M, Schulenberg JL, Chenier A, Cook KD (2016) An experimental test of deviant modeling. J Res Crime Delinq 53:482–505
Gerstner D, Oberwittler D (2018) Who's hanging out and what's happening? A look at the interplay between unstructured socializing, crime propensity, and delinquent peers using social network data. Eur J Criminol 15:111–129
Giordano PC (2003) Relationships in adolescence. Ann Rev Sociol 29:257–281
Greene K, Banerjee SC (2009) Examining unsupervised time with peers and the role of association with delinquent peers on adolescent smoking. Nicotine Tob Res 11:371–380
Grund T, Morselli C (2017) Overlapping crime: stability and specialization of co-offending relationships. Soc Netw 51:14–22
Hawdon JE (1996) Deviant lifestyles: the social control of daily routines. Youth Soc 28:162–188
Haynie DL (2002) Friendship networks and delinquency: the relative nature of peer delinquency. J Quant Criminol 18:99–134
Haynie DL, Osgood DW (2005) Reconsidering peers and delinquency: how do peers matter? Soc Forces 84:1109–1130
Hilbe JM (2011) Negative binomial regression, 2nd edn. Cambridge University Press, Cambridge
Hindelang MJ (1971) Age, sex, and the versatility of delinquent involvements. Soc Probl 18:522–535
Hindelang MJ, Gottfredson MR, Garofalo J (1978) Victims of personal crime: an empirical foundation for a theory of personal victimization. Ballinger Publisher and Co, Cambridge
Hoeben EM, Weerman FM (2014) Situational conditions and adolescent offending: does the impact of unstructured socializing depend on its location? Eur J Criminol 11:481–499
Hoeben EM, Weerman FM (2016) Why is involvement in unstructured socializing related to adolescent delinquency? Criminology 54:242–281
Hoeben EM, Bernasco W, Weerman FM, Pauwels LJR, Van Halem S (2014) The space-time budget method in criminological research. Crime Sci 3:1–15
Hollis-Peel ME, Reynald DM, Van Bavel M, Elffers H, Welsh BC (2011) Guardianship for crime prevention: a critical review of the literature. Crime Law Soc Change 56:53–70
Horney J, Osgood DW, Haen Marshall I (1995) Criminal careers in the short-term: intra-individual variability in crime and its relation to local life circumstances. Am Sociol Rev 60:655–673
Hosmer DW, Lemeshow S (2000) Applied logistic regression, 2nd edn. Wiley, New York
Jackson EF, Tittle CR, Burke MJ (1986) Offense-specific models of the differential association process. Soc Probl 33:335–356
Kandel DB (1975) Stages in adolescent involvement in drug use. Science 190:912–914
Kandel DB, Kessler RC, Margulies RZ (1978) Antecedents of adolescent initiation into stages of drug use: a developmental analysis. J Youth Adolesc 7:13–40
Kazemian L, Farrington DP (2018) Advancing knowledge about residual criminal careers: a follow-up to age 56 from the Cambridge study in delinquent development. J Crim Justice 57:1–10
Kempf KL (1987) Specialization and the criminal career. Criminology 25:399–420
Klein MW (1984) Offense specialisation and versatility among juveniles. Br J Criminol 24:185–194
Kreager DA, Ragan D, Nguyen H, Staff J (2016) When onset meets desistance: cognitive transformation and adolescent delinquency experimentation. J Dev Life Course Criminol 2:135–161
Lam CB, McHale SM, Crouter AC (2014) Time with peers from middle childhood to late adolescence: developmental course and adjustment correlates. Child Dev 85:1677–1693
Larson RW, Verma S (1999) How children and adolescents spend time across the world: work, play, and developmental opportunities. Psychol Bull 125:701–736

Lattimore PK, Visher CA, Linster RL (1994) Specialization in juvenile careers: markov results for a California cohort. J Quant Criminol 10:291–316
Maimon D, Browning CR (2010) Unstructured socializing, collective efficacy, and violent behavior among urban youth. Criminology 48:443–474
Martin CS, Kaczynski NA, Maisto SA, Tarter RE (1996) Polydrug use in adolescent drinkers with and without DSM-IV alcohol abuse and dependence. Alcohol Clin Exp Res 20:1099–1108
Mathys C, Burk WJ, Cillessen AHN (2013) Popularity as a moderator of peer selection and socialization of adolescent alcohol, marijuana, and tobacco use. J Res Adolesc 23:513–523
Matza D, Sykes GM (1961) Juvenile delinquency and subterranean values. Am Sociol Rev 26:712–719
Mazerolle P, Brame R, Paternoster R, Piquero A, Dean C (2000) Onset age, persistance, and offending versatility: comparisons across gender. Criminology 38:1143–1172
McGloin JM, Nguyen H (2012) It was my idea: considering the instigation of co-offending. Criminology 50:463–494
McGloin JM, Piquero A (2010) On the relationship between co-offending network redundancy and offending versatility. J Res Crime Delinq 47:63–90
McGloin JM, Rowan ZR (2015) A threshhold model of collective crime. Criminology 53:484–512
McGloin JM, Thomas KJ (2016a) Incentives for collective deviance: group size and changes in perceived risk, cost, and reward. Criminology 54:459–486
McGloin JM, Thomas KJ (2016b) Considering the elements that inform perceived peer deviance. J Res Crime Delinq 53:597–627
McGloin JM, Sullivan CJ, Piquero AR, Pratt TC (2007) Local life circumstances and offensing specialization/versatility: comparing opportunity and propensity models. J Res Crime Delinq 44:321–346
McGloin JM, Sullivan CJ, Piquero AR (2009) Aggregating to versatility? Transitions among offender types in the short term. Br J Criminol 49:243–264
Megens KCIM, Weerman FM (2010) Attitudes, delinquency and peers: the role of social norms in attitude-behaviour inconsistency. Eur J Criminol 7:299–316
Megens KCIM, Weerman FM (2012) The social transmission of delinquency: effects of peer attitudes and behavior revisited. J Res Crime Delinq 49:420–443
Meldrum RC, Leimberg A (2018) Unstructured socializing with peers and risk of substance use: where does the risk begin? J Drug Issues 48:452–471
Miller J (2013) Individual offending, routine activities, and activity settings: revisiting the routine activity theory of general deviance. J Res Crime Delinq 50:390–416
Moffitt T (1993) Adolescent-limited and life-course persistant antisocial behavior: a developmental taxonomy. Psychol Rev 100:674–701
Monahan K, Piquero AR (2009) Investigating the longitudinal relation between offending frequency and offending variety. Crim Justice Behav 36:653–673
Moss HB, Chen CM, Yi H-Y (2014) Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample. Drug Alcohol Depend 136:51–62
Nieuwbeerta P, Blokland AAJ, Piquero AR, Sweeten G (2011) A life-course analysis of offense specialization across age: introducing a new method for studying individual specialization over the life course. Crime Delinq 57:3–28
Osgood DW, Anderson AL (2004) Unstructured socializing and rates of delinquency. Criminology 42:519–549
Osgood DW, Rowe DC (1994) Bridging criminal careers, theory, and policy through latent variable models of individual offending. Criminology 32:517–554
Osgood DW, Schreck CJ (2007) A new method for studying the extent, stability, and predictors of individual specialization in violence. Criminology 45:273–312
Osgood DW, Johnston LD, O'Malley PM, Bachman JG (1988) The generality of deviance in late adolescence and early adulthood. Am Sociol Rev 53:81–93
Osgood DW, Wilson JK, O'Malley PM, Bachman JG, Johnston LD (1996) Routine activities and individual deviant behavior. Am Sociol Rev 61:635–655
Paternoster R, Brame R, Piquero A, Mazerolle P, Dean CW (1998) The forward specialization coefficient: distributional properties and subgroup differences. J Quant Criminol 14:133–154
Paternoster R, McGloin JM, Nguyen H, Thomas KJ (2013) The causal impact of exposure to deviant peers: an experimental investigation. J Res Crime Delinq 50:476–503
Piquero AR, Paternoster R, Mazerolle P, Brame R, Dean CW (1999) Onset age and offense specialization. J Res Crime Delinq 36:275–299
Piquero AR, Brame R, Mazerolle P, Haapanen R (2002) Crime in emerging adulthood. Criminology 40:137–169

Piquero AR, Farrington DP, Blumstein A (2003) The criminal career paradigm. In: Tonry M (ed) Crime and justice: a review of research, vol 30. University of Chicago Press, Chicago, pp 359–506
Ragan DT (2014) Revisiting 'what they think': adolescent drinking and the importance of peer beliefs. Criminology 52:488–513
Reiss AJ Jr, Farrington DP (1991) Advancing knowledge about co-offending: results from a prospective longitudinal survey of london males. J Crim Law Criminol 82:360–395
Sentse M, Dijkstra JK, Lindenberg S, Ormel J, Veenstra R (2010) The delicate balance between parental protection, unsupervised wandering, and adolescents autonomy and its relation with antisocial behavior: the trails study. Int J Behav Dev 34:159–167
Short JF Jr, Strodtbeck FL (1965) Group process and gang delinquency. The University of Chicago Press, Chicago
Siennick SE, Osgood DW (2012) Hanging out with which friends? Friendship-level predictors of unstructured and unsupervised socializing in adolescence. J Res Adolesc 22:646–661
Stafford M, Warr M (1993) A reconceptualization of general and specific deterrence. J Res Crime Delinq 30:123–135
Steketee M (2012) The lifestyles of youth and their peers. In: Junger-Tas J, Haen Marshall I, Enzmann D, Killias M, Steketee M, Gruszczynska B (eds) The many faces of youth crime: Contrasting theoretical perspectives on juvenile delinquency across countries and cultures. Springer, New York, pp 237–255
Sullivan CJ, McGloin JM, Pratt TC, Piquero AR (2006) Rethinking the 'norm' of offender generality: investigating specialization in the short-term. Criminology 44:199–233
Sutherland EH, Cressey DR (1955) Principles of criminology, 5th edn. Lippincott, Philadelphia
Svensson R, Oberwittler D (2010) It's not the time they spend, it's what they do: the interaction between delinquent friends and unstructured routine activity on delinquency. J Crim Justice 38:1006–1014
Tedeschi JT, Felson RB (1994) Violence aggression and coercive actions. American Psychological Association, Washington
Thomas KJ (2015) Delinquent peer influence on offending versatility: can peers promote specialized delinquency? Criminology 53:280–308
Thomas KJ (2016) On the relationship between peer isolation and offending specialization: the role of peers in promoting versatile offending. Crime Delinq 62:26–53
Thorlindsson T, Bernburg JG (2006) Peer groups and substance use: examining the direct and interactive effect of leisure activity. Adolescence 41:321–339
Tumminello M, Edling C, Liljeros F, Mantegna RN, Sarnecki J (2013) The phenomenology of specialization of criminal suspects. PLoS ONE 8:1–8
Urberg KA, Luo Q, Pilgrim C, Degirmencioglu SM (2003) A two-stage model of peer influence in adolescent substance use: individual and relationship-specific differences in susceptibility to influence. Addict Behav 28:1243–1256
Van Mastrigt SB, Farrington DP (2011) Prevalence and characteristics of co-offending recruiters. Justice Q 28:325–359
Vanyukov MM, Tarter RE, Kirillova GP, Kirisci L, Reynolds MD, Kreek MJ, Conway KP, Maher BS, Iacono WG, Bierut L, Neale MC, Clark DB, Ridenour TA (2012) Common liability to addiction and 'gateway hypothesis': theoretical, empirical, and evolutionary perspective. Drug Alcohol Depend 123:S3–S17
Warr M (1996) Organization and instigation in delinquent groups. Criminology 34:11–37
Warr M (1998) Life transitions and desistance from crime. Criminology 36:183–216
Warr M (2002) Companions in crime: the social aspects of criminal conduct. Cambridge University Press, Cambridge
Warr M, Stafford M (1991) The influence of delinquent peers: what they think or what they do? Criminology 29:851–866
Weerman FM, Bernasco W, Bruinsma GJN, Pauwels LJR (2015) When is spending time with peers related to delinquency? The importance of where, what and with whom. Crime Delinq 61:1386–1413
Weerman FM, Wilcox P, Sullivan CJ (2018a) The short-term dynamics of peers and delinquent behavior: an analysis of bi-weekly changes within a high school student network. J Quant Criminol 34:431–463
Weerman FM, Hoeben EM, Bernasco W, Pauwels LJR, Bruinsma GJN (2018b) Studying situational effects of setting characteristics: research examples from the study of peers, activities, and neighborhoods. In: Bruinsma GJN, Johnson S (eds) The Oxford handbook of environmental criminology. Oxford University Press, Oxford, pp 600–628

Wikström P-OH, Oberwittler D, Treiber K, Hardie B (2012) Breaking rules: the social and situational dynamics of young people's urban crime. Oxford University Press, Oxford

Young JTN, Rebellon CJ, Barnes JC, Weerman FM (2014) Unpacking the black box of peer similarity in deviance: understanding the mechanisms linking personal behavior, peer behavior and perceptions. Criminology 52:60–86



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