



Changes in the social networks of prisoners: A comparison of their networks before and after imprisonment



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ABSTRACT

This study examines the social networks of detainees before and after their incarceration. We use unique panel data on 702 detainees and their core discussion networks. Our results show that while the size of the core discussion network remains stable, detainees have replaced more than 60% of their network members after incarceration. By far not all new core network members are truly new: in particular friendship ties have a higher change to deteriorate and be replaced by ties to relatives. We estimate multinomial multilevel models and find, moreover, that changes in the core discussion network are most likely to occur for detainees who have served a longer prison spell, who did not return to the same place of residence, who had fewer strong or family relationships, and who were suspected of involvement in a violent or sexual offense.

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1. Introduction

Understanding how and why networks change is an important goal of social research, the more since the value of social networks for people's wellbeing and goal attainment in various domains of life has been convincingly established. In particular for groups who might depend on their network and on social support, knowledge about network changes can be crucial. We study networks of prisoners before and after detention and aim at answering the following questions: How do networks of prisoners change after detention? Can former detainees (still) rely on support from closer relationships? Furthermore, what kind of theoretical ideas help to understand network changes during this period? Our focus is on the core discussion network, which consists of the network members with whom one usually discusses important personal matters (Burt, 1984). Core discussion networks generally represent the stronger relationships in a social network and are considered the main providers of help and emotional support (McPherson et al., 2006; Mollenhorst et al., 2008). Previous studies have shown that social networks of prisoners do provide help and assistance, e.g. with finding work, a place of living and with financial support

(see Berg and Huebner, 2011; Hairston, 1988; Visser et al., 2004; Visser et al., 2008). It is however not known how the prisoners' networks change in general – as in normal life, ties may be maintained, broken, as well as newly formed. We discuss arguments on the importance of contact opportunities (Feld, 1982), relationship alternatives (Thibaut and Kelley, 1959), as well as investments (Lin, 2001; Flap, 1999) for establishing expectations on relationship change. Furthermore and important for the group under study, stigma and signaling arguments are also of interest (e.g. Goffman, 1963) and we discuss these ideas as potential cost factors for maintaining or starting a relationship. We use data from the 'Prison Project', which is a large-scale and unique panel study on prisoners and their networks in the Netherlands and test our hypotheses with multinomial multilevel regression models.

2. Prisoners' social networks

Obviously, imprisonment can have large and lasting consequences for the social relationships of detainees (Codd, 2008), but research on the changes in prisoners' social networks before and after detention is still limited. There are cross-sectional studies, however, that examined prisoners and their social relationships (e.g. Holt and Miller, 1972; Duwe and Clark, 2013; Western, 2006; Bronson, 2008; Visser and Travis, 2003). These cross-sectional studies can be roughly divided into four groups:

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- (1) An examination of prisoners' contacts with family and friends during incarceration (Holt and Miller, 1972; Brodsky, 1975; Duwe and Clark, 2013; Bales and Mears, 2008; Poehlmann et al., 2010; Mears et al., 2012; Schafer, 1994; Berg and Huebner, 2011; Siennick et al., 2013). Especially the visiting of prisoners has received much interest in the literature (Duwe and Clark, 2013; Bales and Mears, 2008). These studies include descriptions of the obstacles and barriers related to prison visits, such as travel distance and financial costs (Christian, 2005; Holt and Miller, 1972). Moreover, a number of studies have shown that prison visitation is associated with post-prison success and a reduced likelihood of reoffending (Cochran, 2014; Berg and Huebner, 2011; Duwe and Clark, 2013; Holt and Miller, 1972; Hairston, 1988; see also Visser and Travis, 2003).
- (2) Researchers have examined whether prisoners associate with other inmates during imprisonment (e.g. Bronson, 2008; Severance, 2005). These studies reveal that prisoners associate with one another mostly for recreation, emotional support, protection as well as to obtain information and goods (Bronson, 2008; Severance, 2005). Associations between inmates are also examined in relation to pains of imprisonment (Sykes, 1958), levels of stress (Cesaroni and Peterson-Badali, 2010) and violence or victimization (Bottoms, 1999).
- (3) A third topic addressed is the impact of imprisonment on family formation and continuation (e.g. Lopoo and Western, 2005; Western, 2006; Apel et al., 2010). These studies have primarily focused on the relationship with the spouse or romantic partner. Most of these studies show that imprisonment is negatively related to the probability of marriages and cohabitations continuing (Western, 2006; Lopoo and Western, 2005; Huebner, 2005; Western and McLanahan, 2000). Moreover, it has been found that offenders are more likely to divorce after a prison sentence (e.g. Western, 2006; Apel et al., 2010).
- (4) A few existing studies examined changes in contact frequency or relationship quality with family and friends of the detainees. These studies have generally relied on small data sets, using retrospective questions to measure change (Brodsky, 1975; Rocque et al., 2011).

To our knowledge the only studies using longitudinal data are studies that used data from the Returning Home Project (see LaVigne et al., 2005; Naser and LaVigne, 2006). The Returning Home Project is a large-scale panel study that contains data on inmates of the cities of Baltimore, Chicago, Cleveland and Houston. Inmates were interviewed just before they were released from prison as well as two months and six months after their release. They were asked whether they agreed or disagreed with eleven statements about family relationship quality (see Visser et al., 2004). Studies based on these data showed no changes in family relationship quality and support in the period from before to after imprisonment; however, these data provide no information about actual network members and cannot show whether changes at relationship level have been going on.

In sum, the few studies that examined the social relationships of detainees did not inquire into prisoners' relationship stability, dissolution, and formation in the period from before to after their incarceration. The present study aims to fill this gap and addresses the following research questions:

- (1) How do social networks of prisoners after release differ from their social networks prior to imprisonment?
- (2) To what extent are a) characteristics of the prisoner and b) characteristics of the network members associated with relationship stability, dissolution and formation?

3. Research on network changes

Networks change constantly, due to changes in social settings, life events as well as due to general developments in society. In the past decade, several studies have investigated these changes. A well-known study for network changes due to general changes in society has been carried out by McPherson et al. (2006), which showed considerable decline in the size of the core discussion networks of a group of Americans over a 20 year period, i.e. between 1984 and 2004. Findings are however very much depending on interviewer effects and the position of the network module in the questionnaire (see Paik and Sanchagrin, 2013). Another study on changes in the core discussion network has been carried out by Mollenhorst et al. (2014) in the Netherlands. They examined changes in the core discussion networks and showed that the number of core discussion partners has remained stable for most individuals over a 7 year period (at 2.4 network members on average). Despite the stability in network size, some large changes were observed in the social composition of the core discussion network. During these seven years, 70% of the network members disappeared from the core discussion network and were replaced by new core discussion network members (Mollenhorst et al., 2014).¹ They also showed that the changes were largely due to changes in meeting opportunities.

A large strand of literature inquires into changes in social networks after important life events. Wrzus et al. (2013) reviewed 277 studies that had been carried out in the past to examine social network changes during the life course and the effects of life events on social networks. They revealed that life events could lead to a reduced network size, but after some time the network 'recovers'.

Although these studies have led to important insights about network changes among the general population and about network changes after important life events, we do not know how the networks of prisoners change. Moreover, to date, there has not been any research examining changes in the social networks of prisoners at the relationship level.

4. Why do networks change?

We base our hypotheses on three well-established general conditions that account for network changes: meeting opportunities (Feld, 1982), relationship alternatives (Thibaut and Kelley, 1959) and investment considerations (Lin, 2001; Flap, 1999).

Meeting opportunities. Contact opportunities are crucial for the formation as well as for the continuation of relationships (see among others, Blau, 1977; Feld, 1982; McPherson and Smith-Lovin, 1987; Fischer, 1982; Mollenhorst et al., 2008, Conti and Doreian, 2010). According to Feld (1982), people come into contact with one another through the social settings in which they participate. Social settings refer to places, such as the neighborhood, the family, the workplace or public places. If individuals move out of a social setting (e.g. move out of the neighborhood) they have to put more effort in maintaining their social relationships. Consequently, moving out of a social setting increases the likelihood that relationships deteriorate, since opportunities to meet each other become scarce (cf Mollenhorst et al., 2014). On the other hand, if individuals enter a new social setting, it provides an opportunity to meet new people (Feld and Carter, 1998). Based on this idea, we expect that changes in the social networks of prisoners depend on prison sentence length:

¹ Although Mollenhorst et al. (2014) examined people's personal relationships in terms of core discussion relationships and relationships with practical helpers, a turnover rate of about 70% was also found for the core discussion network alone.

The longer one's prison sentence,

(H1a) the less likely maintenance of pre-existing social relationships, and

(H1b) the more likely the formation of new social relationships in prison.

Imprisonment also has consequences for prisoners' contact opportunities *after* their release from prison. Criminological studies have shown that imprisonment challenges prisoners' employment, housing, and marital opportunities (see Fagan and Freeman, 1999; Huebner, 2005; Roman and Travis, 2006). Prisoners who cannot return to their former neighborhood or workplace will be less likely to come into regular contact with their pre-existing social relationships and therefore will have a higher probability of losing them. At the same time, released detainees who cannot return to the same social settings come into contact with other people at their new place of residence or new workplace. This may result in the formation of new relationships. Based on the idea of meeting opportunities, we expect:

Prisoners who cannot return to their initial social settings (work, neighborhood, family) are

(H1c) less likely to maintain their social relationships outside prison, and

(H1d) more likely to form new social relationships in prison.

Relationship alternatives. A second condition that is important for relationship formation and maintenance relates to the idea of relationship alternatives (Thibaut and Kelley, 1959). It is argued that if one has only few network members or has only unsatisfying relationships of a bad quality, one is more likely to form new social relationships (Volker et al., 2007). In line with this idea, we expect that the probability to form new relationships with other inmates increases if one has fewer relationship alternatives outside prison. Likewise, if detainees spend more time with other inmates, it becomes more likely that they also discuss important personal matters with them and that these other inmates constitute alternatives for the network outside prison. Therefore, we hypothesize:

(H2a) The smaller prisoners' core network before incarceration, the more they engage in new social relationships with other inmates, and

(H2b) the more they are involved in activities with other inmates, the less maintenance of the social relationships outside prison.

Investment considerations. A third condition that affects the formation and maintenance of social relationships is the investment undertaken in the past or expected in the future. Individuals are thought to invest in relationships with others if these social relationships give or are expected to give access to valuable resources (Lin, 2001; Flap, 1999). Besides looking at the expected future benefits, individuals are also assumed to consider the costs in their decision to maintain or form social relationships. Hence, an increase in the amount of time and energy needed to maintain a social relationship will cause deterioration. A prison sentence can increase the costs of maintaining a social relationship, for example through material circumstances like increased travel distance (see the previously mentioned studies by Christian, 2005; Lanier, 1993) or restricted visiting hours. Costs of maintaining a relationship may also increase because of stigmatization processes and social signaling (Goffman, 1963; Gottfredson and Hirschi, 1990). The likelihood of prisoners being stigmatized can be expected to depend on the type of crime they have committed. Especially prisoners who have been involved in a violent or sexual offense are at high risk for being negatively stereotyped. A prisoner's involvement

in a violent or sexual crime may act as a signal for family and friends that they are at risk of becoming a victim of physical or sexual violence themselves (see also Apel et al., 2010; Van Schellen, 2012). Moreover, family and friends may break off contact with an (ex-) prisoner because they worry about their own reputation when being seen in the company of a violent or sexual offender (Pryor et al., 2012). Also, potential new network members may refrain from contact for the same reasons. The hypotheses that follow are:

(H3a) Detainees who are incarcerated farther away from their homes are less likely to maintain their social relationships, and

(H3b) Detainees suspected of having committed a violent or sexual offence are less likely to maintain their social relationships as well as to form new ones.

The idea of investing in social relationships while talking into account expected future benefits has also implications for the value of investments being made in the past: past investments in a relationship enhances relational stability and quality (Axelrod, 1984). In particular, relations to family and partner are relationships in which in the past many investments have been undertaken. Therefore, we expect in addition that

(H3c) Detainees who have more family relationships and have relationships of a better quality before their incarceration are more likely to maintain their social relationships.

Finally, we expect that the formation and maintenance of social relationships also depend on the willingness of prisoners to turn away from their criminal ways after their release. This idea draws upon the assumption of social capital theory that individuals invest in social relationships, which give access to useful resources. Inmates who intend to refrain from criminal behavior will benefit more from having non-criminal social resources, while inmates who intend to continue their involvement in crime will benefit more from having criminal resources. Criminal relationships in particular are useful for detainees with criminal motivations, because these relationships can provide useful information and skills. Accordingly, we hypothesize:

Prisoners who are motivated to commit crimes in the future are

(H3d) more likely to maintain their criminal relationships, and are

(H3e) more likely to form new criminal relationships.

Table 1 summarizes our hypotheses and the arguments on which they rely.

5. Data and methods

5.1. Prison project

To test our hypotheses, we use data from the Prison Project, a longitudinal and nationwide study on the effects of imprisonment in the Netherlands. In this project, a representative sample of 1909 prisoners has been interviewed at the beginning of their imprisonment, as well as 6 months after their release from prison. The sample consists of male prisoners aged 18–65, born in the Netherlands, and not suffering from psychological problems that prevented understanding of study demands². All entered one

² Prisoners with psychological problems were not structurally excluded from the study. In essence every male, adult prisoner who was born in the Netherlands and who entered one of the remand center between October 2010 and April 2011 was approached. However, in some cases a staff member of the prison told us that a person was not approachable because of his mental health problems. In such cases, the mental health problems prevented that the person could understand what the intention of study was and what participation in the study meant.

Table 1
Overview of hypotheses.

Argument	Hypothesis
Meeting opportunities	1a <i>The longer one's prison sentence,</i> - the less likely maintenance of pre-existing social relationships, and
	1b - the more likely the formation of new social relationships in prison.
	1c <i>Prisoners who cannot return to their initial social settings (work, neighborhood, family) are</i> - less likely to maintain their social relationships outside prison, and
	1d - more likely to form new social relationships inside prison.
Relational alternatives	2a <i>The smaller prisoners' core network before incarceration</i> - the more they engage in new social relationships with other inmates, and
	2b - the more they are involved in activities with other inmates, the less maintenance of the social relationships outside prison
Investment considerations	3a <i>Detainees who are incarcerated farther away from their homes are</i> - less likely to maintain their social relationships, and
	3b <i>Detainees suspected of having committed a violent or sexual offense</i> - are less likely to maintain their social relationships as well as to form new ones
	3c <i>Detainees who have more family relationships and have relationships of a better quality before their incarceration</i> - are more likely to maintain their social relationships.
	3d <i>Prisoners who are motivated to commit crimes in the future are</i> - more likely to maintain their criminal relationships, and
	3e - more likely to form new criminal relationships.

of the Dutch remand centers between October 2010 and April 2011 and were on remand for about three weeks when they were interviewed for the first time. Participation was voluntary, and all participants signed an informed consent declaration. For this study, we rely on a sample consisting of 702 ex-prisoners who participated both in the first interview in prison (T1; held about three weeks after arrival in custody) and in the interview that was conducted six months after release (up until June 2012; in short T2).

Tracing and contacting the ex-prisoners was very difficult. In an attempt to limit sample attrition, several measures were undertaken such as asking for detailed contact information, using official records of probation services and municipalities, contacting their lawyers, using social media and making house visits. Of the 1909 subjects who participated in the first interview, 1423 respondents were eligible for participation at T2³. Of these, 43 respondents did not give permission to be approached for follow-up interviews. Of the remaining 1380 respondents, 76% was successfully contacted and 51% participated in the post-prison interview. This resulted in a final sample of 702 ex-prisoners⁴.

5.2. Network delineation and dependent variables

We measured the social network with the name generator/interpreter method (McCallister and Fischer, 1978). Name generator questions identify the names, nicknames or initials of prisoners' network members. Interpreter questions provide information on characteristics of the network members (e.g. age, gender and criminal involvement) and on characteristics of the relationships with these network members (e.g. contact frequency and duration of the relationship). Prisoner's core discussion networks were identified with the question: "With whom did you discuss important personal matters in the six months prior to your arrest/the past six months?" (Volker and Flap, 2002; Burt, 1984). At T1, respondents were asked about their core discussion

³ Not all participants were eligible for participation in T2, because some of them were still imprisoned while others had not yet been released for six months. Participants and non-participants differed amongst others with respect to previous convictions (eight vs ten), prior prison spells (three vs five), and type of offense. Participants were slightly more often suspected of involvement in violent offenses (46% vs 42%) and less often suspected of property offenses (32% vs 39%).

⁴ Note that this study uses data on sample members who could be interviewed six months after release up until June 2012.

network members in the six months prior to arrest. At T2, six months after release, respondents were asked about their core discussion network members in the past six months. At each point of measurement, inmates were invited to mention five network members with whom they discussed important personal matters.

Having collected information on the core discussion network members of the respondents, we asked additional questions at T2 in order to determine the *stability and decay of existing social relationships* and the *formation of new relationships*. After answering the question about the core discussion network, respondents were presented with a list of names of the persons they had mentioned as core discussion network members prior to imprisonment. We asked respondents the following questions: "Could you tell us whether the persons presented on this list are the same as those just mentioned? Who are the same persons?" If network members were not mentioned anymore, we asked for every person whether the respondent was still in touch with him/her (1 = still in touch; 2 = no longer a contact). We used these two questions to group the core discussion network members into five categories: (1) 'stable', referring to network members who were mentioned as core discussion partners both prior to imprisonment and after release; (2) 'dissolved – still in touch', referring to network members who were no longer mentioned as core discussion partners but were still in touch with the respondent after release; (3) 'dissolved – no contact', referring to network members who were no longer mentioned as core discussion partners and were not in touch anymore with the respondent after release; (4) 'dissolved – no information', referring to network members who were no longer mentioned as core discussion partners and for whom information about levels of contact after release was missing, and (5) 'new', referring to network members who were mentioned as core discussion partners after release but had not been mentioned prior to imprisonment.

5.3. Independent variables

The independent variables in this study refer to characteristics of the prisoners and characteristics of the network members. Information about characteristics of the prisoners is based on two sources: officially registered data and face-to-face interviews. Information about the network members was obtained with the interpreter questions asked during the interviews.

Characteristics of the prisoner. First, we assessed *sentence length* by using data from the Judicial Institutions Department of the

Netherlands (OBJD). Sentence length reflects the actual number of days that respondents spent in prison between the first day of remand and the date of release from confinement.

Moreover, we constructed three variables to assess whether inmates returned to the same social settings after release. At T1, we asked respondents about their housing situation, job situation and marital status prior to imprisonment. At T2, we asked respondents whether they had returned to the same place of residence, the same employer and the same romantic partner. The variable *returned to the same place of residence* consists of three categories: 1 = yes; 2 = no; and 3 = had no permanent place of residence prior to incarceration. Respondents who returned to the same place of residence are those who indicated at T2 that they lived in the same municipality as they lived in prior to incarceration. The variable *returned to the same employer* consists of the categories: 1 = yes; 2 = no; and 3 = was no employee prior to incarceration. The variable *returned to the same romantic partner* consists of the categories: 1 = yes; 2 = no; and 3 = had no romantic partner prior to incarceration.

The *number of core discussion partners prior to prison* is the sum of all network members with whom the respondent discussed important personal matters prior to imprisonment. Because respondents were allowed to mention five network members, this variable ranges from 0 to 5.

We used six items to measure *socialization with other inmates*. These items were adapted from the Dutch Inmate Survey (Mol and Henneken-Hordijk, 2008) and from the Measurement of Quality of Prison Life (Liebling and Arnold, 2004). Examples of items used are: “I get on well with most of the detainees” and “There are fellow detainees who listen to me when I have problems”⁵. Response categories ranged from 1 (‘Strongly disagree’) to 5 (‘Strongly agree’). We calculated an average score to measure socialization with other inmates (a higher score means that prisoners were more likely to socialize with other inmates). The scale has an internal consistency of .80.

The *distance between prison and place of residence* concerns the least number of kilometers that needed to be traveled by car to reach the location of the allocated prison from the city center of the respondent’s place of residence prior to imprisonment. If prisoners had no place of residence prior to imprisonment, we set the number of kilometers at ‘0’ and included the variable ‘returned to the same place of residence’ in our analysis.

Information about the type of crime detainees were suspected of was obtained from the registration system of the Dutch Prison Service. We were in particular interested in involvement in a *violent or sexual crime* because these types of crime are stigmatized most. We coded involvement in such offenses as ‘1’, and ‘0’ for non-involvement.

We controlled for whether or not a respondent was *criminally motivated*, because we assumed that this would influence network changes. For that matter, we asked respondents how likely it was that they would commit offenses after their release.

5.4. Characteristics of network members

We inquired into role relationship, contact frequency as well as duration of the relationship between the respondent and his core network members. The *role* of the network member was assessed by asking respondents how they were related to their network members. Network members were grouped into six categories: (1) romantic partner, (2) parent, (3) brother/sister, (4) other family member, (5) friend and (6) other.

To measure whether the network member was *criminal* or not, we combined the answers to two questions. First, we asked respondents whether or not the network member had been involved in criminal activities during the past year (1 = yes; 0 = no). Second, we asked a name generator question to identify the network members with whom respondents discussed criminal activities and exchanged criminal knowledge and skills (1 = yes; 0 = no). We defined network members as criminal when they were identified as such with at least one of the two questions. We used two variables to measure relationship quality. *Contact frequency* was assessed by asking respondents how often they usually had contact with their network members. Response categories ranged from 1 (‘Less than once a year’) to 6 (‘Daily’). Because most respondents indicated that they had daily, weekly or monthly contact with their core discussion network members, we grouped network members into those with whom the respondent had: 1 = ‘Less than weekly’, 2 = ‘Weekly’ or 3 = ‘Daily’ contact. *Relationship duration* was assessed by asking respondents about the number of years they had known their network members.

5.5. Control variables

We controlled for five characteristics of the respondent. *Age* of the respondent was measured in years. *Non-native Dutch* indicates whether both parents of the respondent were born in the Netherlands (=0) or at least one of them was born somewhere else (=1). Although the second measurement took place after six months of release, some respondents were interviewed again in prison because of a reconviction (22%, see Table 1). Therefore, we also took into account whether the *prisoner had returned to prison at T2* (1 = yes; 0 = no). Moreover, some prisoners were released before their trial took place. In order to control for this, we included the variable *pretrial release* (1 = yes; 0 = no).

We also controlled for extraversion because it is found that extravert people are more likely to establish new social relationships than introvert people (e.g. Krause et al., 1990). *Extraversion* was measured by using the extraversion scale of the Big Five Inventory (BFI) (Denissen et al., 2008).

Finally, we measured the *degree to which a detainee was criminally active* by using information on the number of committed offenses in the past; the number of times in prison; the registered length of the criminal career; and the self-reported length of the criminal career. To overcome the problem of multicollinearity, we obtained z-scores of these variables and created one scale. The scale has a Cronbach’s alpha of 0.84. This last control variable was included to be sure that an effect of sentence length on relationship maintenance/formation was not biased by the criminal history of the respondent.

Additionally, we controlled for two characteristics of the network members. *Gender similarity* indicates whether the network member was a man (=1) or a woman (=0). *Age similarity* is the negative absolute age difference between the respondent and the network member. A value closer to zero indicates that the respondent and the network member were closer in age. Tables 2 and 3 present the descriptive statistics of all independent and control variables.

5.6. Analytical strategy

The analysis proceeds in two steps. To answer our first research question, we present descriptive statistics on network size and characteristics of the prisoners’ network members before and after their imprisonment (see Tables 4 and 5 and Fig. 1). To answer our second research question, we performed a multinomial multilevel regression analysis (Table 6). By using a multilevel analysis, we took into account the nested structure of our data (in our case: network members are clustered within respondents) and overcame

⁵ Other items were ‘new prisoners are quickly accepted in the group’; ‘the detainees take each other into account’; ‘the prisoners treat each other with respect’; ‘in general, detainees help and support each other’.

Table 2
Descriptive statistics of variables at respondent level ($n = 702$ respondents).

	Mean	SD	Minimum	Maximum	N
Sentence length (in days)	116.28	81.17	5	415	702
Returned to same place of residence					
Yes	0.60				702
No	0.31				
Had no place of residence prior	0.09				
Returned to same employer					702
Yes	0.06				
No	0.21				
Was no employee prior	0.73				
Returned to same romantic partner					702
Yes	0.26				
No	0.18				
Had no romantic partner prior	0.56				
Size of core discussion network prior	1.95	1.45	0	5	687
Socialization with other inmates	3.39	0.59	1	5	649
Distance prison to place of residence (km)	46.74	43.68	2	284	627
Criminally motivated (0–1)	0.14				702
Violence or sexual offense (0–1)	0.42				702
Age of respondent (in years)	31.11	10.85	18	65	702
Non-native Dutch (0–1)	0.30				702
Extraversion	3.51	0.61	1.5	5	640
Respondent was again in prison at R1 (0–1)	0.22				702
Pretrial release (0–1)	0.50				702
Criminal activity	−0.02	0.75	−0.91	1.76	702

Table 3
Descriptive statistics of variables at network member level ($n = 2079$ alters).

	%	Mean	SD	Minimum	Maximum	N
Role						1845
Partner	15					
Parent	23					
Brother/sister	10					
Other family member	7					
Friend	31					
Other	14					
Criminal network member (0–1)	15					2047
Gender similarity (0–1)	50					2017
Age similarity (in years)		−12.10	11.97	−59.00	0.00	1666
Contact frequency						1765
Less than weekly	10					
Weekly	36					
Daily	53					
Relationship duration (in years)		16.09	12.87	0.00	57.00	1756

the problem that standard errors are underestimated and spurious significant effects are found (Snijders and Bosker, 1999). We use multinomial logit models to relate characteristics of the prisoner and characteristics of the network members to the probability that core discussion relationship remained stable, dissolved or were newly formed from the period prior to imprisonment to six months after release. The baseline category in our multinomial logit models was a 'stable' core discussion network member. These network members were contrasted to the network members who were classified as 'dissolved – still in touch', 'dissolved – no contact', 'dissolved – no information' and 'new'. We report the relative risk

ratios, which can be interpreted as the relative risk that prisoners have a dissolved, or new core discussion relationship rather than a stable core discussion relationship.

The missing values on our independent and control variables were imputed using Multivariate Imputation by Chained Equations (MICE). It has been shown that this procedure provides reliable solutions to the missing data problem and provides better solutions than more conventional methods such as listwise deletion, dummy-variable adjustment or mean imputation (e.g. Schafer and Graham, 2002; Allison, 2001). Using MICE, we imputed the missing values ten times and performed the same multinomial multilevel

Table 4
Size of the core discussion network, separated for the six months prior to imprisonment and the six months after release.

		Prior to imprisonment			After release		
		%	Mean	SD	%	Mean	SD
Network size	0	17.5	1.95	1.45	17.2	1.95	1.47
	1	25.3			27.5		
	2	24.6			21.9		
	3	16.7			18.0		
	4	8.9			7.5		
	5	7.0			7.9		
N (respondents)		687			668		

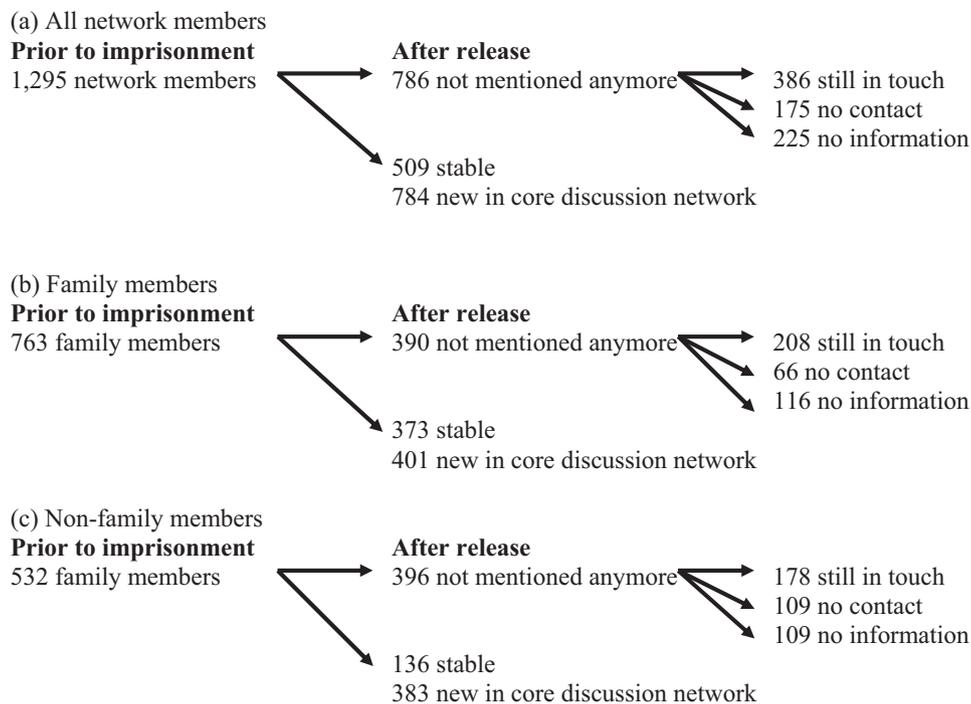


Fig. 1. Relationship changes from the six months prior to imprisonment to six months after release.

regression analyses on each imputed dataset. The results of the analyses were combined by using Rubin's calculations (Rubin, 1987). The mean and standard deviations of our independent and control variables were nearly identical before and after imputation. The number of missing values on each variable can be found in Tables 2 and 3.

In order to test whether a return to the same partner has an effect on prisoners' social relationships (see Hypotheses 1c and 1d), we excluded relationships with romantic partners from the analysis and performed an additional multinomial multilevel analysis. Moreover, to examine whether detainees who are motivated to commit crimes are more likely to invest in *criminal* relationships (Hypotheses 3c and 3d), we performed an additional multinomial multilevel analysis in which we included an interaction term between the variables 'criminal network member' and 'criminally motivated'.

6. Results

6.1. How do prisoners' social networks after release differ from their social networks prior to imprisonment?

The core discussion network of prisoners prior to imprisonment and their network after release is quite similar in network size (see Table 4). At both points in time, prisoners had on average about two people with whom they discussed important personal matters. Moreover, only few prisoners reported to have five core discussion partners. About 7% of the prisoners mentioned five network members with whom they discussed important personal matters prior to imprisonment, against 8% of the prisoners after release.⁶

In addition, Table 5 shows the characteristics of the core discussion network members prior to imprisonment and after release. At both measurements, parents and friends were most likely to be core discussion partners. Interestingly, prior to imprisonment, a somewhat higher proportion of the core discussion partners are

romantic partners and friends; while after release, a somewhat higher proportion of the core discussion partners are parents and other network members (i.e. network members who are not family members, romantic partners or friends).

Prior to imprisonment, 16% of the core discussion partners were criminal, while this percentage decreased to 12% after release. This result suggests that inmates do not replace their core discussion relationships with criminal ties (e.g. fellow inmates).

There are no differences between prisoners' core discussion network members before and after imprisonment in terms of gender, age similarity and relationship duration. Women make up half of the core discussion network; the average age difference between the prisoner and his network members is about fourteen years; prisoners knew their core discussion network members for about seventeen years. Finally, prior to imprisonment, a somewhat higher proportion of prisoners had contact with their core discussion network members on a daily basis than prisoners after release had (58% vs. 53%, respectively).

Fig. 1 provides information on the number of stable, disappeared and new network members in the core discussion network of prisoners. Information about the changes in relationships is presented for all core discussion relationships (Fig. 1a), for family core discussion relationships (Fig. 1b) and for non-family core discussion relationships (Fig. 1c). Prior to imprisonment, prisoners reported a total number of 1295 core discussion network members; 509 of these network members were also mentioned as core discussion network members after their release from prison (39%). Of the 786 network members who were not mentioned again as core discussion partners after imprisonment, 49% (386) were still in touch with the prisoner after release from prison while 22% (175) no longer had any contact with the prisoner. Of the remaining 225 'disappeared' network members, we have no information about contact frequency after release. Furthermore, we have found that after release, the ex-prisoners had a total number of 784 new core discussion network members. This number is about as large as the number of network members who disappeared from the core discussion network. From Fig. 1b and c, we may conclude that family core discussion relationships are more stable than non-family core discussion relationships. About half of the family members

⁶ Because there were relatively few prisoners who reported having five network members, it seems that truncating the number of network members to five is not likely to bias our results.

Table 5
Characteristics of the network members, separated for network members prior to imprisonment and network members after release.

	Prior to imprisonment			After release		
	%	Mean	SD	%	Mean	SD
Role						
Partner	16.9			13.8		
Parent	26.1			28.5		
Brother/sister	9.6			9.9		
Other family member	6.4			7.6		
Friend	30.1			25.2		
Other	11.0			14.9		
Criminal network member	15.7			12.4		
Gender similarity (0/1)	48.1			47.8		
Age similarity (years)		-13.69	12.47		-14.86	12.93
Contact frequency						
Less than weekly	8.6			11.2		
Weekly	33.9			35.7		
Daily	57.5			53.0		
Relationship duration (years)		17.18	12.68		17.54	13.07
N (network members)						

are mentioned as core discussion partners again after release; this percentage is about 25% for non-family relationships.

6.2. To what extent are a) characteristics of the prisoner and b) characteristics of the network members related to the stability, dissolution and formation of social relationships?

Table 6 presents the results of the multinomial multilevel regression analysis on relationship stability, dissolution and formation. Our analysis of *relationship dissolution* (vs. relationship stability) showed that prisoners who served a longer prison spell are slightly more likely to face relationship discontinuation (risk ratio = 1.023, $p < 0.05$, one sided). This supports Hypothesis 1a, that the longer offenders are incarcerated, the less likely it is that existing relationships are maintained. In line with Hypothesis 1b, we found that prison sentence length is positively associated with relationship formation (risk ratio = 1.024). An increase of a prison spell by ten days increases the probability that prisoners have new relationships by 2%. However, and contradicting Hypotheses 1c and

1d, the formation of new relationships is not related with having a new employer or living in a new neighborhood. In additional analyses, we also found no difference in relationship formation between prisoners who did and prisoners who did not return to the same romantic partner (see Table A in the appendix). We expected that prisoners, who could not return to the same social settings, are less likely to maintain their social relationships (Hypothesis 1c/d). We found only partly support for this with regard to residences (risk ratio = 1.823, $p < 0.01$) but not for returning to the same employer.

Concerning Hypothesis 2a, the size of the core discussion network before incarceration is negatively associated with relationship formation (risk ratio = 0.56, $p < 0.001$). Further, socialization with other inmates is associated with dissolution of pre-existing relationships (risk ratio = 1.351, $p < .05$, one-sided). This support our hypothesis that detainees who are more involved in socializing with other inmates lose network members outside of prison (Hypothesis 2b). Our hypothesis that detainees who are incarcerated farther away from their homes will lose contacts is not confirmed (Hypothesis 3a). That is, relationship discontinuation is

Table 6
Multinomial multilevel regression analysis on relationship stability, dissolution and formation; relative risk ratios.

		Relational stability vs.			
		Dissolved but still in touch Risk ratio	Dissolved and no contact anymore Risk ratio	Dissolved and no more information Risk ratio	New relation Risk ratio
Hyp.	<i>Characteristics of the prisoner</i>				
1a/b	Sentence length/10	1.011	1.023+	0.990	1.024*
1c	Returned to same place of residence (ref=yes)				
	No	0.982	1.823**	1.517+	1.271
	Had no place of residence	1.472	1.854	2.368*	1.243
1d	Returned to same employer (ref=yes)				
	No	0.764	1.107	0.992	0.995
	Had no employer	1.058	1.916	1.235	0.985
2a	Size of the core network prior	1.157*	0.935	1.017	0.556***
2b	Socialization with inmates	1.242	0.997	1.351+	1.046
3a	Distance prison to place of residents	0.999	1.002	1.001	0.999
3b	Violent/sexual offense	0.920	2.178***	1.065	1.433*
3c	Contact frequency prior	0.730*	0.739	0.766	0.527***
3c	Relationship duration prior	1.000	0.958**	0.990	0.965***
3d	Criminally motivated	0.879	1.109	0.581+	1.082
	<i>Characteristics of the network member</i>				
3c	Role (ref = friend)				
	Partner	0.328***	0.526*	0.595+	0.239***
	Parent	0.256***	0.050***	0.263***	0.215***
	Sibling	0.643	0.151***	0.559+	0.729
	Other family	1.282	0.398+	1.066	1.281
	Other	1.118	1.224	1.216	1.710+
3e	Criminal network member	1.303	1.316	1.057	0.717

Note. * $p < .05$ one sided; ** $p < .05$; *** $p < .01$; **** $p < .001$; controlled for age, being native Dutch, extraversion, pretrial release, criminal activity, gender and age similarity.

not associated with levels of contact with other inmates, nor with the geographical distance between prison and detainees' places of residence.

In line with Hypothesis 3b, we found that prisoners who are suspected of involvement in a violent or sexual offense are more likely to face relationship discontinuation than prisoners who are suspected of involvement in other types of crimes (risk ratio = 2.18, $p < 0.001$). Furthermore, our results are consistent with Hypothesis 3c: detainees who have more family relationships and have relationships of a better quality before incarceration are more likely to maintain their social relationships. Prisoners who have known their network members for a longer period of time are less likely to face relationship discontinuation (risk ratio = 0.96, $p < 0.001$). Moreover, compared to prisoners' relationships with friends, we have found that relationships with parents (risk ratio = 0.05, $p < 0.001$), with brothers and sisters (risk ratio = 0.15, $p < 0.001$), with other family members (risk ratio = 0.40, $p < 0.1$), and with the romantic partner (risk ratio = 0.53; $p < 0.05$) are less likely to be discontinued.

We found no support for the hypothesis that detainees with criminal motivations are more likely to maintain their criminal relationships and form relationships with other criminal network members (Hypothesis 3d and 3e). The additional analyses in which we included an interaction term between criminal motivations and criminal network members showed that neither the main effects, nor the interaction term between criminal motivations and having criminal network members are significant (see Table B in the appendix).

7. Conclusion and discussion

In the present study, we compared the core discussion network of prisoners prior to imprisonment with the core discussion network of prisoners after their release from prison. The aims of this study were twofold. First, we described the differences and similarities between the core discussion network of prisoners before and after imprisonment. Second, we examined the characteristics of the prisoners and their network members that relate to the probability that prisoners have stable, disappeared or new core discussion network members.

We found that the size of the core discussion network did not change from the period prior to imprisonment to six months after release. Both prior to imprisonment and after release, prisoners had about two people with whom they discussed important personal matters. Despite the stability in network size, our results revealed a high level of turnover in the core discussion networks of prisoners. Only about 40% of the network members remained in the network, while the others were replaced. For comparison, [Mollenhorst et al. \(2014\)](#) found a turnover rate of 70% among the general Dutch population over a seven-year period. Although a degree of caution needs to be exercised when comparing our results with results of [Mollenhorst et al. \(2014\)](#), it seems that a turnover rate of 60% among prisoners is relatively high. Especially if one considers that most prisoners in our sample were re-interviewed six to eighteen months after the first measurement. Our results also show that it is important to examine network changes at the relationship level because examining the social networks at the aggregate level alone – as done in studies published so far on prisoners – may result in missing important changes in the social networks of detainees.

The descriptive analyses revealed that the new core discussion members of prisoners are not necessarily fellow inmates. We observed that prisoners after release knew their core discussion network members on average for about seventeen years. This result indicates that most new core discussion network members were already in the social network of prisoners prior to imprisonment. It seems that detainees are more likely to lose their friendships and to fall back on family ties after their release from prison. Furthermore,

most disappeared core discussion network members did not completely leave the network of prisoners, but stayed in touch with the prisoner after release. Interestingly, in a multilevel model predicting the probability that members disappeared completely from the network (i.e. dissolved – no contact), we have found most support for our hypotheses on relationship dissolution. Because these relationships truly disappear, we believe these findings strengthen our conclusions about the characteristics of the prisoner and the characteristics of the network member that relate to the likelihood that relationships dissolve.

From our multilevel analysis we can draw four main conclusions. First, relationship dissolution and relationship formation are more likely if prisoners are incarcerated for a longer period of time. This finding supports the meeting opportunity argument. Feld argues that reduced meeting opportunities increase the likelihood that relationships are discontinued; whereas participation in new social settings creates opportunities to meet (potential) new network members. In line with this, [Conti and Doreian \(2010\)](#) showed the importance of meeting opportunities for interracial relationships. However, in light of our finding that new core discussion network members are generally known for a number of years, as discussed above, it seems rather unlikely that meeting fellow inmates leads to the formation of core discussion relationships that are also maintained after release. Rather than creating core discussion relationships with fellow inmates, we suspect that prisoners use existing social ties as substitutes for their dissolved core discussion relationships. More generally stated, the argument that meeting opportunities influence relationships is confirmed for the dissolution of ties, rather than for the formation of new ones. We focused on stronger ties, and probably these ties need more time to evolve. Therefore, prisoners include family members for discussing personal things and replace family members and friends who have been lost.

A second major conclusion is that relationship dissolution is more likely if prisoners do not return to the same place of residence after release. Again, this result provides support for the theory of foci of activity. This finding also has relevant policy implications, because it implies that a return to the same place of residence would help former prisoners to maintain their core discussion relationships. Although further research is needed on the consequences of network change for the risk of re-offending and post-release life outcomes, it is important to recognize the deteriorating effect that a loss of housing can have on prisoners' core discussion network. It is also interesting that returning to the same employer did not matter for relational changes. Probably the embeddedness in the neighborhood is much more important for our sample than the embeddedness in work relationships.

Third, both relationship dissolution and relationship formation depend on characteristics of the core discussion network prior to imprisonment. It seems that having family relationships and having relationships of a better quality make both the decay and the formation of relationships less likely. Social capital theory provides an explanation for these findings by suggesting that the costs of ending social relationships are higher if one has put more time and energy into a social relationship. The size of the core discussion network prior to imprisonment is negatively related to relationship formation. This finding confirms the idea of relationship alternatives: one is less likely to establish new social relationships if one already has many (attractive) network partners.

Fourth, relationship dissolution and relationship formation are more likely if prisoners are accused of committing a violent or sexual crime. The fact that suspects of violent or sexual crimes are more likely to have dissolved core discussion relationships is in line with our expectations, based on the theory of social signaling. Suspects of these types of crimes are also more likely to form new relationships, however, which we did not expect. Again, the

latter result seems to reflect a substitution effect. To cope with the loss of relationships, prisoners who were accused of committing a violent or sexual crime may intensify social relationships that were already in their network. In future research, it would be interesting to further examine what types of relationships replace the dissolved relationships. For instance, a substitution effect whereby friends are replaced by family members would still suggest that suspects of violent or sexual crimes have difficulties establishing new social relationships.

Of the three theoretical principles which we used to establish our hypotheses, meeting opportunities, relational alternatives and investments; we found evidence for all the three. Interestingly, in previous studies the importance of relational alternatives could not be established that clear (Volker et al., 2007).

While our study improves our understanding of the changes in the social networks of prisoners, there are some limitations that should be noted. First, we used data on male prisoners aged between 18 and 65 who were born in the Netherlands and who were in remand custody for about 3 weeks. In addition, our findings are based on prisoners with relatively short prison spells, ranging from a few weeks to a maximum of one year. Hence, it may not be possible to generalize our results to prisoners with longer sentences as well as to female prisoners. In addition, prisoners suspected of property offenses and with a more elaborate criminal history were somewhat underrepresented in the sample. However, the magnitude of the underrepresentation was relatively small

– see note 3. We therefore expect that this did not substantially affect the generalizability of the results. Second, we defined new network members of prisoners as those who were mentioned as core discussion partners for the first time. Because most new core discussion network members are not truly new but were already present in prisoners' lives, future research should use more name generator questions to obtain a more complete view of the social networks of prisoners. In this way, it is possible to gain more insight into the network position that new core discussion network members had prior to imprisonment, and the network functions that they fulfilled at previous measurements.

In conclusion, our results show that more changes occur in prisoners' social network than one would expect by just looking at network size. Although the size of the core discussion network of prisoners is relatively stable, it appears that there is a high turnover of core discussion network members from the period prior to imprisonment to the period after release. We have found that the formation and the decay of relationships depend on the sentence length, a residential move after release, network characteristics prior to imprisonment and the type of offense. Our study revealed that prisoners experience fewer changes in their core discussion network if they are imprisoned for a short period of time, can return to the same place of residence, are socially surrounded by relatives, had strong social relationships prior to imprisonment and were not involved in violent or sexual offenses.

Appendix A.

Table A1
Does a return to the same romantic partner affect prisoners' social relationships?^a

Stable vs.	Dissolved – still in touch Risk ratio	Dissolved – no contact Risk ratio	Dissolved – no information Risk ratio	New Risk ratio
Characteristics of the prisoner				
Sentence length/10	1.009	1.028	0.993	1.025 [*]
Returned to same place of residence (ref = yes)				
No	0.987	1.782 [*]	1.713 [*]	1.388
Had no place of residence prior	1.513	2.434	2.643 [*]	1.202
Returned to same employer (ref = yes)				
No	0.749	1.057	1.073	1.157
Was no employee prior	0.953	2.028	1.250	1.055
Returned to same romantic partner (ref = yes)				
No	1.057	1.152	1.101	1.280
Had no romantic partner prior	0.678	0.867	0.967	0.766
Size of core discussion network prior	1.120	0.905	1.004	0.518 ^{**}
Socialization with other inmates	1.314	1.100	1.444	1.103
Distance between prison and place of residence	1.000	1.005	1.002	1.000
Average contact frequency prior ^b	0.739	0.727	0.834	0.636 ^{**}
Average relationship duration prior ^b	0.996	0.952 ^{**}	0.986	0.957 ^{**}
Criminally motivated (0–1)	0.884	0.972	0.614	1.082
Violence or sexual offense (0–1)	0.987	2.376 ^{**}	1.039	1.487 [*]
Characteristics of the network member				
Role (ref = friend)				
Partner				
Parent	0.330 ^{***}	0.057 ^{***}	0.302 ^{**}	0.243 ^{***}
Brother/sister	0.675	0.154 ^{***}	0.591	0.785
Other family member	1.340	0.384	1.062	1.263
Other	1.159	1.261	1.256	1.765 [*]
Criminal network member (0–1)	1.439	1.483	1.177	0.736
Control variables				
Gender similarity	0.962	1.108	1.510 [*]	1.310
Age similarity	1.000	0.972 [*]	0.995	0.982
Age of respondent	1.005	1.028	1.033 [*]	1.025
Non-native Dutch (0–1)	1.927 ^{**}	1.453	1.384	1.219
Extraversion	0.950	0.715	1.063	1.043
Respondent was again in prison (0–1)	0.591 [*]	0.874	0.817	0.680
Pretrial release (0–1)	1.055	1.287	1.230	1.170
Criminal activity	0.977	0.846	0.764	0.986
Intercept	0.921	0.499	0.052 [*]	10.290 [*]

Note. N = 1782 network members; 587 respondents.

^{*} p < .05.

^{**} p < .01.

^{***} p < .001.

^a Romantic partners are excluded from the analysis. We included the variable that measures whether or not prisoners returned to the same romantic partner.

^b For the aim of the analysis, we calculated the average contact frequency and relationship duration of prisoners prior to imprisonment.

Table B1
Do prisoners who are motivated to commit crimes invest more in criminal relationships?^a

Stable vs.	Dissolved – still in touch Risk ratio	Dissolved – no contact Risk ratio	Dissolved – no information Risk ratio	New Risk ratio
Characteristics of the prisoner				
Sentence length/10	1.011	1.023	0.989	1.024 [*]
Returned to same place of residence (ref=yes)				
No	0.982	1.823 ^{**}	1.521	1.271
Had no place of residence prior	1.473	1.856	2.425 [*]	1.252
Returned to same employer (ref=yes)				
No	0.766	1.098	1.018	1.006
Was no employee prior	1.062	1.905	1.263	0.997
Size of core discussion network prior	1.157 [*]	0.938	1.013	0.555 ^{***}
Socialization with other inmates	1.243	0.994	1.359	1.049
Distance between prison and place of residence	0.999	1.002	1.001	0.999
Average contact frequency prior ^b	0.732	0.735	0.773	0.530 ^{***}
Average relationship duration prior ^b	1.000	0.958 ^{**}	0.990	0.965 ^{***}
Criminally motivated (0–1)	0.851	1.164	0.443 [*]	0.978
Violence or sexual offense (0–1)	0.920	2.186 ^{***}	1.064	1.433 [*]
Characteristics of the network member				
Role (ref = friend)				
Partner	0.327 ^{***}	0.531	0.589	0.238 ^{***}
Parent	0.257 ^{***}	0.050 ^{***}	0.266 ^{***}	0.216 ^{***}
Brother/sister	0.643	0.150 ^{***}	0.560	0.730
Other family member	1.281	0.397	1.077	1.287
Other	1.120	1.219	1.236	1.726 [*]
Criminal network member (0–1)	1.248	1.320	0.892	0.646
Cross-level interaction				
Criminally motivated x criminal network member	1.182	0.964	2.254	1.515
Control variables				
Gender similarity	0.980	1.158	1.479	1.284
Age similarity	0.990	0.967 [*]	0.993	0.979 [*]
Age of respondent	0.994	1.005	1.014	1.009
Non-native Dutch (0–1)	2.123 ^{***}	1.611 [*]	1.546 [*]	1.349
Extraversion	0.989	0.772	1.215	1.101
Respondent was again in prison (0–1)	0.650	0.860	0.802	0.718
Pretrial release (0–1)	0.974	1.090	1.108	1.122
Criminal activity	1.037	1.041	0.938	1.074
Intercept	0.872	1.124	0.101	19.479 ^{**}

Note. N = 2079 network members; 620 respondents.

^{*} p < .05.

^{**} p < .01.

^{***} p < .001.

^a We included the interaction term between criminal motivations and criminal network members.

^b For the aim of the analysis, we calculated the average contact frequency and relationship duration of prisoners prior to imprisonment.

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