



Romantic relationship formation, maintenance and changes in personal networks



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ABSTRACT

According to the social withdrawal hypothesis, a personal network becomes smaller when a person starts dating, cohabitates and marries. This phenomenon is widely established in the literature. However, these studies were usually done with cross-sectional data. As a consequence, it is still unclear whether or how personal networks actually change after the formation of a romantic relationship (i.e. dating), after starting cohabitation and after getting married. It is also unclear how long and to what extent social withdrawal continues. To overcome these shortcomings, we examine how the size and composition of personal networks change after relationship formation. We use two waves of the PAIRFAM dataset (2008 and 2011), which include information about 6640 Germans who were between 16 and 39 years of age at the time of the second interview in 2008. Results from fixed effects regression models underscore that the association between romantic relationships and changes in personal networks is more dynamic than previous studies suggested. For example, after the formation of a romantic relationship people show a decrease in non-kin contacts, while an increase in non-kin contacts is observed after two years of dating, as well as after two years of cohabitation. These network changes suggest that people adapt their social networks to the demands and constraints of each phase of a romantic relationship. Because the decline in network size after dating is not stable, there is no need to be afraid that those who have a romantic partner remain isolated from other relationships.

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How do personal networks change after dating, marriage and cohabitation? One of the hypotheses is that lovers are so “wrapped up” that they withdraw from social life and get a smaller network (Slater, 1963, p. 349). This is formulated in the withdrawal hypothesis (e.g. Johnson & Milardo, 1984; Kalmijn, 2003; Slater, 1963).

Previous studies have largely supported the withdrawal hypothesis. They either found that personal networks

became smaller after dating (e.g. Johnson & Leslie, 1982; Johnson & Milardo, 1984; Sprecher & Feilmlee, 2000) or that people with a romantic partner have fewer non-family ties compared to people without a partner (e.g. Kalmijn, 2003, 2012; Marsden, 1987; Moore, 1990). Nevertheless, a number of questions remain unanswered. First, the question remains to what extent social withdrawal continues after the initial months of dating. We know that networks tend to become smaller within the first year, but it is likely that the withdrawal tendency diminishes over time (Johnson & Leslie, 1982). In addition, the size of the personal network may even recover after some period of dating, among others because people get to know the

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personal contacts of their partner (Kalmijn, 2003). Second, as the effects of dating and marriage are not yet disentangled, it is unclear whether social withdrawal after the formation of a romantic relationship continues when people get married or start to cohabitate. In addition, network studies that included marital status often combined cohabiting and being married, so that their effects cannot be disentangled either. Third, previous research predominantly focused on rather general aspects of the personal network, such as the size and the composition of the personal network in terms of family and non-family network members (e.g. Kalmijn, 2012; McPherson, Smith-Lovin & Brashears, 2006). Hence, the question how other compositional characteristics of networks vary with romantic relationships is still not answered. For instance, does the formation of a romantic relationship affect the number of opposite-sex friends in the network? Fourth, since nearly all previous studies are based on cross-sectional data (see Kalmijn, 2012 for a notable exception), it is unknown whether couples actually withdraw from social life or whether people with a smaller network find a partner sooner.

To answer these questions, we employ a large scale panel dataset and examine how the size and composition (in terms of age, gender and kin versus non-kin) of personal networks change after the formation of romantic relationships and how these networks develop as romantic relationships continue. Scientifically and socially, this is important because social contacts can deliver intimacy, joy and support, are crucial for people's social-psychological and economic well-being, and can provide a connection to the outside world (Granovetter, 1973; Coleman, 1988; House, Landis & Umberson 1988).

1. Theory and hypotheses

1.1. Changes in the size of the personal network through social withdrawal

The hypothesis that people develop a smaller personal network after the formation of a romantic relationship found considerable support in the literature (e.g. Johnson & Leslie, 1982; Kalmijn, 2003, 2012; Johnson & Milardo, 1984; Song, 2012). Slater (1963), who was the first to call this phenomenon 'social withdrawal', explains this change by arguing that people have a limited amount of 'energy.' The idea of 'energy' may be understood as the time and resources, and the cognitive, physical and emotional capacity necessary to start and maintain social relationships (for similar notions, see Johnson & Leslie, 1982; Saramäki et al., 2014). According to Slater, when people start dating they are so 'wrapped up in each other' that hardly any energy is left for other things (Slater, 1963, p. 349), leading to a reduction in other social interactions. But it might not only be the case that people are wrapped up in their new relationships, also, their network members might (strongly) disapprove of the new partner (Sprecher & Felmlee, 2000). Likewise, according to balance theory (Heider, 1958), people will choose to become less close with friends who find it difficult to get along with their partner (see Granovetter, 1973, for the application of

balance theory to social networks). Especially at the start of a relationship, close contacts may disapprove of the new situation, because less time and energy is devoted to them. The intimate bond between two close friends can thus develop into a less intimate friendship or even acquaintanceship when one of them starts dating (Johnson & Leslie, 1982). These two processes, withdrawal by the newly dating individual from the social network as well as withdrawal by close network members from the individual, might even reinforce each other and result in a smaller personal network.

However, it is doubtful that social withdrawal persists. Research shows that already within the first year of a romantic relationship the great passion, euphoria, increase in heart rate and obsessive thinking about a partner disappears (Aron et al., 2005; Hatfield & Sprecher, 1986). As a result, time and energy may be released and used to reinforce the relationship with (previous) personal contacts. In addition, people may develop new social relationships after this initial phase of romantic love. For example, they may establish friendships with people who match their new status of having a partner and who support their relationship. Also, the social contacts of the romantic partner may present an attractive option to become close with. They probably share some of the interests or characteristics of the partner, and they may be met in various social contexts that are entered together with the romantic partner. In addition, the social contacts of the partner may become accustomed to the romantic relationship and see that it is serious, which increases their intention to become friends. This process can take up to a couple of years, if it even ends at all (Kalmijn, 2003; Parks, Stan & Eggert, 1983; Sprecher & Felmlee, 2000). Therefore, contrary to a continuing decrease in network size, after the initial period of 'immature love', the personal network may even grow for a while. No turning point has been indicated in research so far, but we propose that this turning point may be around two years. Research shows that the time and energy a romantic partner consumes already declines within the first year, for instance because of a decrease in excessive thinking about the partner (e.g. Aron et al., 2005). However, it can take years before the acceptance of family and friends for the romantic relationship stabilizes (Sprecher & Felmlee, 2000), and it probably takes more than a year before one becomes close enough with the partner's family and friends to consider them personal contacts, if that happens at all. Based on these insights and considerations, we propose that the turning point from a decline to an increase in network size is around two years.

The final steps in developing a mature relationship are often marriage or cohabitation. In the 1960s, Slater (1963) expected that social withdrawal would end after marriage. Marriage would signal that a relationship was steady, allowing the two individuals to broaden their view again to the outside world. Accordingly, the couple was supposed and pressured by societal norms, to enhance bonds with the wider social world. However, since the 1960s, marriage has lost much of its lustre, symbolized in the low number of marriages and high divorce rates (Cherlin, 2010). Contemporary marriage is more likely to symbolize that the partners have actually chosen for each other and are

willing to spend a large share of their life together (Hogerbrugge & Dijkstra, 2009; Soons & Kalmijn, 2009). Marriage is often portrayed as a greedy institution that causes people to spend more time on their partner and their home (Coser, 1974; Sarkisian & Gerstel, 2008). Research indicates that cohabitation has similar effects (Bidart & Lavenu, 2005; Hogerbrugge & Dijkstra, 2009). Consequently, after people get married or start to cohabitate, their sociability may decrease and result in a smaller personal network.

Although the size of the personal network may decline shortly after marriage, we propose that people are flexible and adapt to this new situation. They learn how to manage their time and develop personal relations that fit into their new lifestyle. For example, they may include other married couples within their personal network because interaction with other married couples is increasingly pleasant due to similar interests (Moore, 1990). In addition, the 'proof of affection' of the partner by marriage or cohabitation may lower the hesitancy of (close) friends to see the couple together (Sprecher & Feilmee, 2000). As a result, we expect that the size of a personal network recovers when marriage and cohabitation continues.

In sum, we hypothesize that:

H1. Personal network size declines within the first two years after the formation of the romantic relationship, but increases after two years.

H2. Personal network size declines (additionally) when people get married or start to cohabitate, but increases after two years.

1.2. Changes in the composition of the personal network through romantic love

Apart from a change in the size of the personal network, the composition of the personal network may change after starting a romantic relationship. First of all, a romantic relationship may affect the preferences for specific types of personal contacts. The main reason for a shift in preferences is that a partner fulfils several important functions for the individual, such that contacts who previously fulfilled these functions lose some of their importance. For two reasons, the network members with whom partners are especially likely to compete are good friends. First, as compared to more or less ascribed relationships with (in-law) family and next-door neighbours, friendships are achieved relationships that are more based on personal choices (Mollenhorst, Völker & Flap, 2008; Pahl, 2005). Therefore, people can more easily become less close with their friends in times they want to direct most of their time and energy to their romantic partner. And although relationships with relatives may remain close even in times of less frequent contact, friendships might be most vulnerable for a decline in time-investments because friends often regard frequent contact as a necessary condition for friendship. Second, a partner and friends may serve similar functions. For instance, friends and a partner both tend to offer companionship, understanding and emotional support (Kalmijn, 2003; Pahl, 2000). People might discuss personal worries or go to

parties with their romantic partner, which they previously did with friends. In other words, the romantic partner becomes the new best friend (Bucx, van Wel, & Knijn, 2012; Pahl, 2005; Rossi & Rossi, 1990). As a result, the number of close friends may decline, because these contacts become 'normal' friends or acquaintances. As discussed above, this process of declining friendships is not likely to persist. At a certain point the personal network has decreased to such an extent that enough time and energy remains to stay intimate with the remaining personal contacts. Thus, after a while, which we (again) define as two years, the size of the personal network may stabilize, though presumably at a somewhat lower level than before.

Romantic partners can also shift relational preferences by influencing people's habits and interests. People with an enduring romantic relationship enter a new phase in their life, which is often accompanied by marriage or cohabitation. That life phase is generally characterized by greater attachment to the partner and a more mature and calm life in which they feel less inclined, for instance, to go to parties. Therefore, they may seek personal contacts who share their (new) life-style (Hartup & Stevens, 1997). Although people with a romantic partner generally become less dependent on their family and neighbours for social support, the people who share their new life-style most may be their family members, neighbours, and other couples and parents. Family gains importance if one prefers having family being involved in the process of family formation, while similar feelings can be expected on the side of the relatives themselves (Fischer & Olicker, 1983; Moore, 1990). Neighbours gain importance when people become more engaged in the neighbourhood after having settled and thus having more opportunities to meet neighbours or when they get children and have their neighbours looking after their children from time to time (Kalmijn, 2012; Mollenhorst, Völker & Flap, 2008). And couples come relatively often in contact with, and may seek the company of other couples and parents because they enter similar social contexts and share similar interests (Moore, 1990). Naturally, after a period of time – say two years again – in which the changes in the composition of people's network have occurred, they may not further add family, neighbours, and other couples and parents to their personal network.

In sum, we hypothesize that:

H3. The number of close friends declines in the first two years of a romantic relationship, but stabilizes after these first two years.

H4. The number of personal contacts with family, neighbours, and other couples and parents increases in the first two years after one marries or starts to cohabitate, but stabilizes after these two years.

As mentioned above, romantic partners can introduce their friends and introduce each other to new places in which they can meet new people. Consequently, romantic partners increasingly know each other's personal contacts such that the network slowly starts to reflect the characteristics and preferences of the partner, among others with respect to age. Several reasons may be given

for this tendency. Partners, like others, tend to have friends of their own age (Mollenhorst et al., 2008). Therefore, if the romantic partner is (substantially) older or younger, he or she may introduce friends of an older or younger age, respectively. Furthermore, these partners may introduce them to contexts that are focused on their partner's age. For example, a teenager with an adult partner may join the partner's job meetings, which the teenager would otherwise not attend. As a result, people with a (substantially) younger/older partner may develop a younger/older personal network.

Likewise, personal networks can increasingly reflect the partner's sex, as (heterosexual) romantic partners introduce their same-sex friends to their partner (Kalmijn, 2002, 2003; Mollenhorst et al., 2008). However, people may be less willing to have intimate opposite sex friendships, because such relationships may have become less beneficial. For example, both men and women highly appreciate information from opposite sex friends about how to attract mates, but this information is less valuable when having a partner (Bleske & Buss, 2000). In addition, some people become jealous towards their partner's opposite sex friends, regarding these friendships as inappropriate and a threat to the romantic relationship (Kalmijn, 2002). We expect, however, that these factors are less important if the partner knows the opposite sex friend.

In sum, we hypothesize that:

H5. After the formation of a romantic relationship with an older or younger partner, the age composition of a personal network will increasingly reflect that of the romantic partner's age.

H6. After the formation of a heterosexual romantic relationship, the number of opposite sex friends declines, but to a relatively low extent if their partner knows their personal contacts.

To summarize, we examine how personal networks change after the formation of romantic relationships and how these networks develop as romantic relationships continue. In line with the most basic notion of the withdrawal hypothesis we first hypothesized that network size declines after the formation of a romantic relationship and after people start to cohabitate or get married (H1 and H2). Next, with regard to which ties are likely to decay and which might even become more important, we hypothesized that because friendships are mostly based on choices and because friends fulfil similar functions as partners, the number of friendships would decline most (H3). Contact with family, neighbours, couples and other parents would increase because people want to involve them in their new lives (family members in particular), come more into contact with them (neighbours) and have more similarities with them (couples and other parents) (H4). Finally, we looked more closely at other relevant characteristics of the social contacts and hypothesized that the age composition of the network starts to resemble the age of the partner (H5) and that networks will consist of less opposite-sex friends because that can be uncomfortable, in particular when one does not introduce them to the romantic partner (H6). We expect all these effects to be strongest just after

the formation of a romantic relationship and marriage, and that they will stabilize or become weaker in the longer run, for instance because a romantic partner gradually consumes less time and energy which creates new opportunities to invest in the network.

2. Data and measurements

2.1. The PAIRFAM dataset

To test the hypotheses, we use information from the German Family Panel Data (PAIRFAM) (see Huinink et al. (2011) and Nauck, Josef, Johannes, and Sabine (2013) for an extensive description of the data). The PAIRFAM data set includes four waves at the moment. The first wave was carried out between September 2008 and May 2009, the second between October 2009 and May 2010, the third between October 2010 and April 2011, and the fourth between October 2011 and May 2012. Only the second and fourth wave include a personal network questionnaire, and are therefore the only waves used in this study.

This data set is suitable for our research because it is one of the few large-scale data sets that includes an extensive network questionnaire and follows a relatively young sample of people over time. Respondents were born in 1971–73, 1981–83 and 1991–93, such that they were between 16 and 39 in wave 2, and between 18 and 41 in wave 4. This provides enough variation on romantic relationship status and the length of romantic relationships.

For the first wave, 42,000 addresses were randomly drawn from the population registers of 343 randomly selected communities in Germany. With a response rate of 36.9 percent, the first wave includes 12,402 respondents. Response rates below 40 percent are common in Germany, and the PAIRFAM data are thus not unusual in this respect. The non-response bias seems to be limited; frequency distributions do not differ largely from the Mikrozensus 2007, which is a compulsory survey for a one-percent sample of the German population (Suckow & Schneekloth, 2009). The second wave includes information about 9069 respondents (i.e. 73.1 percent of the respondents of the first wave). From these respondents, 6640 participated in the fourth wave (i.e. 70.4 percent of the respondents from the second wave). These respondents differ slightly from the respondents in the first wave on characteristics such as income and education. We control for these variables in the multivariate analyses.

2.2. Measurements

2.2.1. The personal network

In the PAIRFAM network module, three so-called 'name-generating questions' were used to delineate personal networks. These questions read:

1. 'With whom do you share personal thoughts and feelings or discuss things that you will not discuss with anyone?'
2. 'Which persons do you regularly meet for activities, for example sports, or when you go out (cinema, dancing), or when you just want to talk with someone?'

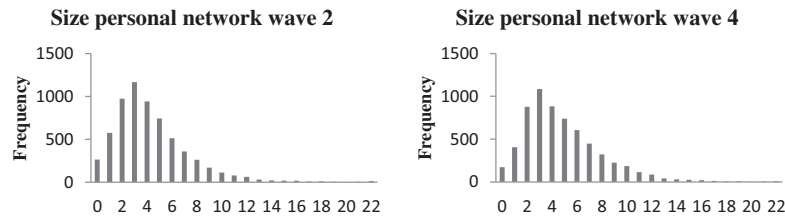


Fig. 1. Frequency distribution of the size of the personal network.

3. 'Who helps you whenever you need information or concrete advice on practical matters?'

To calculate the size of the personal network we took the number of persons respondents named in their answers to these name-generating questions. Respondents could also mention their partner as a network member. Whether or not the partner should be included in the measure of network size is arbitrary; however, because the withdrawal hypothesis argues that people withdraw from the social contacts they have next to their romantic partner this might be the preferred option. Still, including the partner is interesting as well, because it indicates the total access to social contacts. We therefore examine both options. Respondents named respectively in wave 2 and 4 on average 4.40 and 4.94 personal contacts including the partner, and 3.93 and 4.48 excluding the partner (see Table 2 for descriptive statistics, and Fig. 1 for the frequency distributions).

After establishing the size of the network, name-interpreting questions were asked to gain additional information on the network members. First, it was asked whether the personal contact was a *relative*. Afterwards, it was asked how people knew their non-family relationships. Respondents could indicate, among other options, that they knew the personal contact from the neighbourhood or their work. These persons are labelled as *neighbours* and *colleagues*, respectively. Next, for a maximum of eight personal contacts, further questions were asked. Because no specific questions were asked about whether people considered the personal contacts as friends, non-family (i.e. neighbours, colleagues and other non-family members) with whom respondents felt close (scoring at least 4 on a 5 point scale) are regarded as *friends*. In other words, the categories 'neighbours' and 'colleagues' include all relationships with neighbours or colleagues, irrespective of the closeness of these ties, while the category 'friends' is a subset of all non-family contacts, irrespective of whether they are neighbours or colleagues, with whom the respondent has a close relationship.

Furthermore, it was asked how people met their non-family network members. One of the options was that non-family personal contacts were *met through their partner*. For the non-family members not met through the partner, it was asked whether the partner knew them or not. These contacts and those met through the partner are coded as *known by the partner*. In addition to these questions, characteristics of the non-family personal contacts were collected. Respondents were asked about

the *age* and *sex* of the personal contact. Furthermore, it was asked whether the personal contact had *children below three years of age*. Unfortunately, respondents were only asked whether their personal contacts above 21 years of age were *married or in a civil union*.

It is of course not sure that the three name-generating questions provide a valid representation of the personal network. Important aspects of a network are not covered with this delineation. However, it does give a clue about the size of a personal network because one can expect that people who name more social contacts in reaction to these questions also have more social contacts in general (Van der Poel, 1993). Using more name-generating questions or other types of questions may lead to a better representation of the network and a more stable network through time. However, we have no reason to expect that our general conclusions would be different. Furthermore, much of the variety in network size and number of persons who named no contact may be explained by interview effects (Brüderl, Huyer & Schmiedeborg, 2013; Hox, 1994; Paik & Sanchagrin, 2013). Within the PAIRFAM data, around 40 percent of the variation in personal contacts can be attributed to interviewer effects (Brüderl et al., 2013). To identify the interviewers who are responsible for these interviewer effects we calculated exact binominal probability tests (Paik & Sanchagrin, 2013). Within wave 2 and wave 4, interviewer effects probably contaminated results in 4.0 and 4.6 percent of the cases respectively. This led us to exclude 6.7 percent of our respondents, thus ending up with 6194 respondents (Table 1).

2.2.2. Partnership and union status

To measure changes in romantic partnership status, we used information about whether respondents had a romantic partner in wave 2 and 4, and information about the relationship length in wave 4. With these variables we created six mutually exclusive dummy variables. The first four dummy variables are (a) having a relationship in wave 4 of less than 1 year, (b) having a relationship in wave 4 for more than 1 but less than 2 years, (c) having a relationship in wave 4 for more than 2 but less than 3 years, and (d) having a relationship in wave 4 for more than 3 years. The other two categories indicate that the respondent (e) remained single (no partner in both waves) or (f) broke up a relationship (partner in wave 2, but no partner in wave 4).

Furthermore, respondents could indicate that they were married, cohabiting, or divorced. Again dummy variables were created to measure changes in *union status*. These indicate whether respondents (a) remained

Table 1
Descriptive statistics.

	cor w2,4	Wave 2					Wave 4				
		n	Min	Max	Mean	SD	n	Min	Max	Mean	SD
Personal network											
No personal contacts (average)	.541	6194	0	22	4.40	3.03	6194	0	22	4.94	3.26
No personal contacts (excl. partner)	.536	6194	0	22	3.93	3.00	6194	0	1	4.48	3.23
Network composition											
No family members	.392	6194	0	9	1.28	1.25	6194	0	12	1.30	1.33
No family (excl. partner)	.364	6194	0	9	.84	1.07	6194	0	11	.86	1.13
No non-family	.525	6194	0	30	3.28	2.80	6194	0	29	3.80	3.00
No neighbours	.367	6194	0	10	.27	.70	6194	0	7	.30	.73
No colleagues	.460	6194	0	8	.26	.71	6194	0	10	.36	.87
No friends (incl. neighb. + coll.)	.489	6194	0	8	2.02	1.68	6194	0	8	2.21	1.75
Has a partner	.572	6194	0	7	.45	.93	6194	0	7	.61	1.16
Has children below 3 years of age	.375	6194	0	6	.27	.62	6194	0	6	.33	.72
No contacts from opposite-sex	.437	6194	0	7	.68	1.01	6194	0	7	.77	1.14
Average age personal network ^a	.872	3411	11	74	26.40	9.97	3528	14	69	28.29	9.74
Partnership status											
Has a partner	.565	6182	0	1	.60	.49	6186	0	1	.65	.48
Length relationship in months ^b	.973	3712	0	288	86.99	76.38	4016	0	288	94.55	82.76
Union	.796	6182	0	1	.41	.49	6174	0	1	.44	.50
Parental status											
Has no children	.921	6191	0	1	.34	.47	6194	0	1	.38	.48
Child between 0 and 1 ^c	.112	2087	0	1	.10	.30	2308	0	1	.09	.28
Child between 2 and 4 ^c	.241	2087	0	1	.19	.39	2308	0	1	.16	.37
Child above 5 years of age ^c	.699	2087	0	1	.71	.46	2308	0	1	.75	.43
Other control variables											
Age	.999	6194	15	39	26.33	8.60	6194	17	41	28.33	8.59
Sex (ref = man)	1.000	6194	0	1	.48	.50	6194	0	1	.48	.50
Following education	.738	6191	0	1	.45	.50	6194	0	1	.37	.48
Working	.605	6194	0	1	.47	.50	6194	0	1	.56	.50
Not going to school or working	.355	6194	0	1	.12	.33	6194	0	1	.12	.32
Income (/10,000)	.506	4979	0	30	2.65	1.49	5216	0	65	2.88	2.11
Self-rated health	.353	6191	0	4	2.77	1.03	6190	0	4	2.72	.98
Depression scale	.562	6187	0	3	2.33	.46	6180	0	3	2.27	.50

^a Only respondents with at least one personal contact who is not a partner, child or parent.^b Only respondents with a partner selected.^c Only respondents with children selected.

out of a union, (b) started to cohabitate between wave 2 and 4, (c) get married after being out of union (d), get married after cohabitation, (e) divorced, (f) remained married, (g) remained cohabiting, (h) remained divorced. Furthermore, respondents were asked to provide the age of the partner. To test whether the personal network begins to reflect the age of the partner, a variable was created which measures the *difference between the age of the romantic partner and the age of the respondent*.

2.2.3. Control variables

In the multivariate analyses, we use several control variables. First, we create a *child status* variable. In contrast to previous research (e.g. Munch, McPherson, & Smith-Lovin, 1997) we use the age of the oldest child. Unlike the youngest child that may not stay the youngest, the oldest child (nearly always) remains the oldest and can therefore be tracked throughout the waves. We differentiate between cases where the (a) oldest child is below 2, the (b) oldest child is between 2 and 5, and the (c) oldest child is 5 years or older. We do not make any further distinctions for children above 5 years of age

because of the small number of respondents who have a child above 5.

Furthermore, we control for respondent's age because older people may sooner experience certain life course transitions and a change personal network (Carstensen, 1992). Furthermore, we control for income, and information on their daily activities because changes in these factors probably come after certain life course changes such as marriage, while they simultaneously may affects one's personal network (Kalmijn, 2012). As daily activities people could indicate whether they followed education, and/or worked, and/or had another daily activity, such as housekeeping. Finally, we use information about respondent's physical and mental state because life course transitions such as marriage and divorce may affect health and people's personal network (Williams & Umberson, 2004). To this end, we included well-known questions about people's feelings of health and depression. Feelings of health were assessed with a question on how well one felt over the past four weeks in general. Respondents could answer on a 5-point scale ranging from bad to very good. Feelings of depression are measured with 10 items of the STDS-T-scale. This scale includes items such as 'I am

Table 2
Changes in the personal network by changes in time, relationship, union and parental status.

Transition	N	Size		Composition								Characteristic						
		Total	Total – part	Family	Family – part	Own	In- Law	Non- Family	Friend	Neighb.	Work	Via part	Part knows	Part close	Has Child	Has partner	Age Dif	Opposite gender
Time	6194	.54	.50	.02	–.01	.00	.02	.52	.18	.03	.10	.04	.46	–.33	.07	.16	.26	.09
Relationship status																		
No partner → No partner	1682	.47	.47	–.09	–.09			.55	.24	.01	.09				.05	.29	.30	.15
No partner → Partner <1y	719	.49	.06	.44	–.00	.40	.02	.06	–.18	–.06	.06	.07	1.89	.11	.07	.22	.35	–.49
Partner <1y → Partner <2y	456	.59	.02	.63	.07	.57	.03	–.15	–.36	–.03	.11	.21	2.49	–.08	.06	.18	.21	–.24
Partner <2y → Partner <3y	299	.85	.78	.24	.17	.23	.05	.59	.09	.06	.18	.13	.88	.03	.06	.23	.68	.07
Partner <3y → Partner >3y	347	.71	.77	–.08	–.02	–.15	.05	.78	.43	.06	.22	.11	.73	.03	.14	.26	.51	.17
Partner >3y → Partner >3y	2194	.50	.53	.01	.04	–.03	.05	.52	.18	.07	.09	.06	.51	–.17	.07	.00	.11	.05
Partner → No partner	486	.63	1.31	–.80	–.12	–.72	–.04	1.50	.90	.11	.12				.05	.26	.15	.58
Union status																		
No Union → No union	3088	.54	.48	.01	–.06	.01	.00	.53	.18	.00	.09	.02	.39	–.64	.06	.31	.33	.34
No Union → cohabitation	315	.13	–.16	.32	.03	.26	.06	–.28	–.17	–.02	.11	.09	1.39	.25	.16	.05	.27	–.05
No union → married	71	.45	.37	.25	.15	.07	.13	.25	–.14	.03	.11	.11	1.10	.03	.11	.04	.01	.20
Cohabitation → cohabitation	456	.85	.86	.06	.07	–.01	.06	.78	.32	.11	.20	.04	.75	–.15	.28	.02	.08	.55
Cohabitation → married	148	.24	.28	–.01	.04	–.05	.03	.31	.06	.07	.20	–.12	.11	–.04	.11	.00	–.25	.35
Married → married	1750	.53	.57	.02	.06	–.01	.05	.54	.19	.07	.07	.02	.48	–.20	.05	.00	.20	.39
Union → divorce	203	.77	1.10	–.42	–.08	–.36	–.02	1.25	.52	.10	.16				.02	.03	–.01	.61
Divorce → divorce	248	.40	.31	.08	.00	.03	.06	.32	.27	–.04	.15				.02	.00	.43	.25
Parental status																		
No child → No child	3850	.56	.50	.02	–.03	.01	.01	.53	.17	.01	.11	.04	.46	–.41	.07	.26	.34	.11
No child → Child <2y	305	.25	.28	–.05	–.01	–.07	.03	.32	.02	.01	.08	.02	.51	–.30	.18	.03	–.01	–.10
Child <2y → Child <5y	269	.38	.42	–.06	–.03	–.12	.04	.49	.31	.07	.09	.07	.40	–.15	–.04	.01	.36	.11
Child <5y → Child >5y	279	.38	.56	–.06	–.01	–.12	.04	.49	.31	.07	.09	.07	.40	–.28	–.04	.01	.17	.03
Child >5y → Child >5y	1469	.48	.57	–.10	.07	–.11	.03	.57	.24	.11	.07	.01	.51	–.26	.28	.02	.03	.09

Note: Number of respondents does not count up to 6194 for all groups due to missing values or unlikely options.

depressed' and 'I am sad'. Answer categories ranged from 0 'almost always/depressed' to 3 'almost never/not depressed'. Cronbach's alpha was .861 for wave 2 and .883 for wave 4.

2.3. Analytic strategy

To test our hypotheses, we used fixed effect models (Allison, 2009). These models only look at within-person variation. Hence, the coefficients represent the association between changes in the independent variables and changes in the dependent variable. Therefore, variables that explain between-person variation can be ignored. These are time-invariant variables such as age and sex. As a result, no main effects of these variables can be added to the model. However, these variables can enter the model in interaction with the time-variant variables, by which they can be interpreted as the change in coefficient between the waves.

Most of our dependent variables are count data. These dependent variables are: number of personal contacts (i.e. network size), family, non-family, friends and contacts with same gender, and the average age of the personal contacts. For their respective models we use fixed-effects Poisson regression. An assumption of this model is that the mean and variance are equal. However, the variances of our dependent variables are larger than the means, such that we have overdispersion. To overcome this problem, one can estimate a fixed-effects negative binomial regression model. Unfortunately, we were not able to estimate such a model because there is no true unconditional fixed-effects version of this model, while the alternative – controlling for between-person variables with many dummies – was too computer-intensive (Allison & Waterman, 2002). As an alternative, we adjust the standard errors via bootstrapping.

The other variables (number of neighbours, colleagues, contacts with a child, and contacts with a partner) are initially also count data. Because few respondents named more than one person on these questions, these variables did not follow a Poisson distribution. Therefore, we created binary variables that measure whether respondents named, for instance, at least one neighbour. To estimate these models we use fixed-effects logistic regression.

We applied multiple imputation to deal with missing values, which ensures that no selective respondents dropped out. Multiple imputation estimates the missing values and accounts for uncertainty in these predictions by generating a number of datasets with imputed values. The spread between the imputed values through the models reflects the uncertainty about the missing data. We used the Mice multiple imputation programme for R to construct five of these data sets, which is generally sufficient for accurate predictions (Van Buuren & Groothuis-Oudshoorn, 2011). It is noteworthy that income was imputed because 25.3 percent of the respondents had not filled in their income in wave 2 or 4, while all other variables have less than 5 percent missing values. After the creation of these datasets, we

performed the analyses on each dataset. Afterwards, we pooled the results to form a final estimate (Rubin, 1988).¹

3. Results

3.1. Describing changes in personal networks

Table 2 describes the changes in the personal network after changes in time, status and duration of romantic relationship, union status, and parental status. The 6194 respondents in our sample on average reported an increase in network size of .54 between wave 2 and 4. Hence, in further analyses (i.e. in Table 3) we controlled for an average increase in network size and compared, for instance, respondents who remained single with those who found a romantic partner between both waves. Non-family network members accounted for most of the increase between both waves (.52), while the number of family members was stable (.02).

With respect to relationship status we found that people who remained single showed the smallest increase in network size (.47), while the largest increase can be observed for people who had a romantic relationship for over two years in wave 4 (.85), also when a partner was excluded from the personal network (.78). Respondents who ended their relationship showed a stronger increase in network size (.63) than people who remained single, especially if the partner was not counted as network member (1.31). Those who ended their relationship showed a strong increase in the number of non-family relationships (1.50) while naming fewer family members as personal contacts (−.80). Their reduced contact with family members is not due to ended contact with in-laws, as respondents rarely mention family in-laws as personal contacts, but largely accounted for by the loss of the partner as personal contact. Contrary to our expectations, respondents hardly indicated that a personal contact was first met through the romantic partner. However, many personal contacts are introduced to the romantic partner within the first (1.89) and second (2.49) year of the relationship. Furthermore, after the formation of a romantic relationship, people hardly add contacts with either a partner or child to their network, while during the first two years of the relationship less people of the opposite sex are included in the network.

With regard to union status, we found that people who started cohabiting and people who got married after cohabitation showed the smallest increase in network size (.13, and .24, respectively), while the largest increase is

¹ We also performed several robustness checks. Most notably, we compared the models with and without bootstrapping, income (which had many missing values), and multiple imputation. These models showed some additional significant effects, but were in general highly similar. Nevertheless, the bootstrap and imputed models are presented here because they are somewhat more conservative and it is likely that they are slightly more accurate. Furthermore, some scholars argued that the association between partnership status and the personal network differs between men and women (Fischer & Oliker, 1983; Moore, 1990; Impet & Peplau, 2006; Song, 2012; Kalmijn, 2002, 2012). Separate models for men and women, however, did not yield significantly different results. All these additional models are available upon request from the authors.

Table 3

Fixed effects regression of network size, composition and influence of the partner (Model 7 through 10 logistic regression, other Poisson regression).

	Size		Composition						Characteristics			
	Total	Total – part	Family	Family – part	Non-K	Friend	Neig.	Coll	Has Child ^a	Has Part ^a	Age	Opposite gender
	1	2	3	4	5	6	7	8	9	10	11	12
Time (ref = wave 1)	.124**	.036	.395	.053	.035	–.083	–1.075	.914	.604	.758	.090**	–.105
Relationship duration (w1 to w4)												
Remaining single	.006	.095**	–.442**	–.088	.125**	.179**	.247	–.396	–.277	.062		.851**
No partner → Partner <1y (REF)												
Partner <1y → Partner <2y	.036	.014	.139~	.067	–.021	–.059	–.456	.524	–.067	–.024		–.429*
Partner <2y → Partner <3y	.086~	.185**	–.205*	.149	.181**	.132~	.393	1.352*	.033	.242		.629**
Partner <3y → Partner >3y	.055	.182**	–.409**	–.080	.241**	.303**	.622	1.506**	1.444**	.818~		.572**
Partner >3y → Partner >3y	–.035	.059	–.373**	–.101	.105**	.139~	.008	.540	.266	.591		.543**
Partner → No partner	.025	.261**	–.991**	–.103	.345**	.434**	1.152**	.129	.247	.665~		.215**
Union status												
No Union → No union (REF)												
No Union → cohabitation	–.092*	–.116*	.036	.036	–.167**	–.076	.033	–1.147*	–.721~	.603		–.144
No union → married	–.017	–.009	.059	.158	–.045	–.135	.574	–2.321*	–.972	1.133		–.086
Cohabitation → cohabitation	.112*	.147**	.073	.199~	.118~	.080	1.558**	–.462	.172	1.036*		.308~
Cohabitation → married	–.007	–.002	.074	.204	–.047	–.048	.868	–.673	–1.462*	.475		.138
Married → married	.061	.092	.053	.204~	.057	.010	.785	–1.251*	–1.116*	–.256		.209
Union → divorce	.075	.134*	–.182~	–.010	.179**	.085	.218	–.631	–1.074*	.106		.990**
Divorce → divorce	–.016	–.023	.036	.042	–.045	.051	–.708	–1.171**	–.452	–.777**		–.022
Partner												
No Contacts known by partner												.293**
Difference age partner with own age											.002	
Child status (w1 to w4)												
No child → No child (REF)												
No child → Child <2y	–.075~	–.077	–.057	–.066	–.057	–.053	–.338	–.802~	.251	.101	–.009	–.115
Child <2y → Child <5y	–.026	–.036	–.005	–.055	–.015	.096	.127	–.032	–.519	.000	.016	.296~
Child <5y → Child >5y	.008	.021	–.040	–.017	.031	.062	1.247*	–.698~	.832*	1.392**	–.005	–.073
Child >5y → Child >5y	.041	.040	.094	.102	.031	.045	–.198	–.268	–.524*	–.191	–.013	.054
Other control variables												
Following education	–.016	–.016	–.075	–.117	.029	.030	–.777*	–.228	.136	–.542~	.009	–.077
Working	–.043	–.047	–.028	–.033	–.034	.015	–.484	1.473**	.262	–.527~	.029	.096
Not working or going to school	–.016	–.015	–.038	–.064	–.006	.008	–.242	.061	1.041**	–.612~	.013	.052
Income	.003	.003	.006	.005	.003	.002	.161**	.097	–.019	.000	.001	–.028
Health	–.022**	–.023*	–.013	–.013	–.032**	–.008	–.192*	–.156~	.013	–.130~	–.002	.012
Depression	.071**	.063**	.087*	.076~	.057*	.071*	.427*	.310	.388*	.223	–.003	.124~
Age * Time	–.001	–.001	–.003	–.004	–.001	.001	.491	.301	.350	.003	–.001	.008

~ $P < .10$.* $P < .05$.** $P < .01$.^a Only people above 21 years of age selected.

observed for people who remained cohabiting (.85). Furthermore, people who got divorced showed a large increase in network size (1.10, excluding the partner), in particular because of an increase in number of non-kin (1.25). They also showed the largest increase in opposite sex contacts in their network (.61).

3.2. Fixed-effects regression on changes in the personal network

Table 3 presents the outcomes of the fixed-effects models. Models 7 through 10 present results of logistic regression analyses, while the other models present results of Poisson regression analyses. The time variable in Model 1, a Poisson regression model, can be interpreted as that, controlled for the other factors, the average size of the personal network was larger in the fourth wave than in the second wave ($b = .124$). There was an increase of

13.20 percent ($100(\exp(.124) - 1)$). This corresponds with an average increase in network size of .54 as presented in Table 2 (which was without control variables). The time variable in Model 7, a logistic model, can be interpreted as that respondents in the fourth wave were 2.99 ($\exp(-1.075)$) times less likely to include a neighbour in their network than respondents in the second wave. The time variable allows us to control for these effects.

According to our first hypothesis, after the formation of a romantic relationship, the size of personal networks should first decrease and recover after two years. Our second hypothesis likewise predicts that, after union formation, the size of personal networks should first decrease and recover after two years. Model 1 shows that there are no significant differences in the changes in the number of personal contacts between people who remained single ($b = .006$) and people who entered into a romantic relationship (=reference category). Model

2 shows that when the partner is excluded, people who entered a romantic relationship showed a decrease in network size (.095 for people who remained single). Thus, in line with the withdrawal hypothesis, people who start a romantic relationship become less involved with their other social contacts.

Model 1 shows that when the partner is included in the network, after two years of being in a relationship people showed an increase in network size ($b = .086$) compared to people who recently entered a relationship. This effect is only borderline significant, while staying longer in a romantic relationship does not significantly affect network size. Model 2, in which partners are excluded from the network, however shows a significant increase in network size after being in a romantic relationship for two or three years ($b = .185$ and $b = .182$, respectively). Hence, our results indicate that – when the partner is excluded from the network – the network recovers after two years, which is in line with our first hypothesis. In line with our second hypothesis, respondents show a decrease in the number of social contacts when they start cohabiting ($-.092$ and $-.116$ for Model 1 and 2, respectively). We find no (additional) decrease in network size after getting married. Note, however, that the networks of those who started cohabiting may recover, given that the networks of those who remain cohabiting show an increase in network size ($b = .112$, and $b = .147$ for Model 1 and 2, respectively).

There is a considerable amount of mutations in the composition of the personal network as well (Model 3 through 8). Compared to people who remained single, respondents who started a romantic relationship first showed a (relative) increase in the number of family members in their personal network ($b = -.442$ for remaining single), and a decrease in the number of non-family ties ($b = .125$ for remaining single). Conversely, after two years of being in a romantic relationship people showed a decrease in the number of family ties ($b = -.205$) and an increase in non-family ties ($b = .181$) compared to people who recently entered a relationship. This is in line with our third hypothesis and (the first part of our) fourth hypothesis. However, Model 4 shows that the initial increase of family members after the formation of a romantic relationship and the later decrease in family members is only observed when the partner is included in the network. Hence, the initial increase is because the partner is mentioned as network member (and considered a family member), while the later decrease indicates that people are less likely to name their romantic partner as network member after being in a relationship for two years. Interestingly, after ending a romantic relationship, respondents seem to fall back on non-family contacts ($b = .345$), in particular friends ($b = .434$) and neighbours ($b = 1.152$), instead of on family ($b = -.991$). Again, the decrease in family members can be explained by the loss of the partner as network member. Moreover, as compared to those who remain out of union, respondents who got divorced show a decline in the number of family members in their network ($b = -.182$) and an increase in non-family contacts ($b = .179$). Those who stay cohabiting include more neighbours in their network ($b = 1.558$), while the number of colleagues declines when one starts a union (i.e.

marriage or cohabitation) ($b = -2.321$, and $b = -1.147$, respectively), stays married ($b = -1.251$), and divorces ($b = -1.711$).

According to our fourth hypothesis, people who entered into a romantic relationship should include more people with a partner or child in their networks. Models 9 and 10, show that, as expected, when people continue their romantic relationship they are more likely to include people with a partner and a child (below 3 years) in their network, but only after three years ($b = .818$, resp. $b = 1.444$). In addition, when people continue cohabiting, the number of network members with a partner increases ($b = 1.036$). When people get divorced, but surprisingly also when they get married or remain in a union (i.e. marriage or cohabiting), their number of network members with small children decreases ($b = -1.074$, $b = -1.462$, and $b = -1.116$, respectively). This may reflect that people who marry or remain in a union enter a life stage in which they leave behind the time when small children are involved.

In contrast to our fifth hypothesis (Model 11), even in the simplest model we do not find that respondents who have a romantic partner older than themselves also have an older network. Taking the average difference between the age of the respondents and the average age of the personal network did not yield any significant effect either. Nevertheless, additional analyses of the pooled (cross-sectional) data of wave 2 and 4 showed that respondents with an older partner also had a network consisting of older network members². This is due to a selection effect, namely that people with relatively older network members (in wave 2) are more likely to find an older partner (in wave 4)³. Thus, people with an older partner already had the ‘older’ network prior to entering into a romantic relationship and did not acquire it through their partner.

According to our sixth hypothesis, we expected a decline in the number of opposite-sex friends after people establish a romantic relationship, while this decrease should be smaller if the partner knows the personal contacts. Indeed, people include fewer opposite-sex contacts when entering into a romantic relationship (Model 12; $b = .851$ for remaining single compared to partnership). This effect is smaller, however, for a person whose romantic partner knows many of his or her friends ($b = .293$). Interestingly, this decrease in number of opposite-sex contacts continues throughout the first year of the romantic relationship but respondents begin to include more opposite-sex contacts in their network after one year of being in a romantic relationship ($b = .629$), a process that seems to continue for some years, and also takes place when they quit their relationship ($b = .215$) and get divorced ($b = .990$).

4. Conclusion

According to the withdrawal hypothesis, people withdraw from social life after the formation of a romantic

² $b = .389$, controlled for their own age, model available upon request.

³ $b = .753$, model available upon request.

relationship. As a result, people may miss the connection to and support from network members. This raises the question whether people actually withdraw from their social networks, or more generally, how networks change from the moment one starts dating. To answer this question, we studied how changes in romantic partnership and union status are associated with changes in the personal network of adults between 16 and 41 years. We improved upon previous research in four ways. First, we did not only examine what happens to personal networks when people enter such a relationship, but also how personal networks develop while maintaining a romantic relationship. Second, we distinguished between having a romantic partner and forming a union (i.e. getting married or starting cohabitation). Third, we investigated a broad range of personal network characteristics, not only including the type of relationship to network members but also the family situation and sex of the network members. And fourth, we are among the first to use panel data to investigate how changes in romantic partnership and union status relate to changes in personal networks.

Our results indicate that changes in personal networks after the formation of a romantic relationship are more dynamic than previous studies suggested. In line with the withdrawal hypothesis, we found that people withdraw from their social contacts after the formation of a romantic relationship. However, this was mostly accounted for by the fact that people included their partner in their personal network, replacing one other social contact. Thus, total network size hardly changed. Moreover, our results indicate that the number of network members (partners excluded) increases after being in a relationship for two years.

Social withdrawal is also observed for people who started cohabitation, but not when people got married. Even when the partner was included in the network, we found a decrease in network size only for those who started cohabitation. When cohabitation continues, network size increases again. Apparently, in contrast to marriage, cohabiting initially costs a lot of time and energy resulting in a decline in network size, but later can lead to additional opportunities and an increase in network size. In other words, there is a clear effect of cohabitation on personal networks, while no (additional) effect is found for getting married.

Furthermore, we found that network composition substantially changes if people maintain their romantic relationship. Besides adding their partner, people who begin a romantic relationship do not significantly add family members to their network, while they do withdraw from non-family members. Intimate relationships with non-family, such as friends, are not institutionally embedded and relatively flexible, which may make them more prone to relationship decay (Pahl, 2005). However, it appears that many people adapt rather quickly to their new situation of being in a romantic relationship, such that after two or three years they include more non-family network members (friends and colleagues) while being less inclined to mention their romantic partner as network member. These findings support the argument that due to time, resource and cognitive constraints, people can only

have a limited number of personal contacts (Saramäki et al., 2014). Apparently, when people form new ties or become closer to some of their personal contacts, relationships with other contacts simultaneously decay or even disappear. Who people include in their personal network probably corresponds with the needs they have and constraints they face within each phase of their romantic relationship. This suggests that, contrary to what the withdrawal hypothesis predicts, people adapt their social network to the demands of each phase of a romantic relationship without an overall decrease in network size on the long run.

Furthermore, our results indicate that having a romantic partner also influences other compositional characteristics of the personal network. For example, people who entered into a romantic relationship lowered their number of opposite-sex contacts. This supports the idea that people do not like or are not supposed to have close relationships with opposite-sex friends while being in a romantic relationship. However, when partners are longer than two years together, their number of opposite-sex friends increases. In addition, the number of opposite-sex friends is larger among those whose romantic partner knows many of his/her personal contacts. These results suggest that trust in a partner, whether that is because of relationship duration or because of having shared friends, is crucial for having opposite-sex friends. When people end their relationship or get divorced, they also include more opposite-sex friends in their network, suggesting a renewed focus on the opposite sex (see Bleske & Buss, 2000). Altogether, these results suggest that people adapt their personal network to suit their new relationship and the preferences of their romantic partner.

Furthermore, we found that after about three years after the formation of a romantic relationship, people have significantly more network members with a partner and/or a child. Thus, it takes some time before homophily in terms of family situation appears in the network. However, we did not find support for the idea that the age of the romantic partner affects the age composition of the personal network. It seemed that respondents with an older partner had an older network prior to finding their partner.

Our study has a couple of limitations that might be dealt with in future research. First, an assumption underlying several of our hypotheses was that people include their partner's friends in their personal network. In contrast to previous research (Kalmijn, 2003), we found hardly any respondents who did so. One explanation for this is that the romantic partner's friends are introduced but do not become close personal contacts. Alternatively, people may already know their partner's friends and therefore don't regard them as met through their partner.

Second, it will be interesting to investigate people's dating history. The idea is that people withdraw from their personal network after entering a romantic relationship. However, when people break up and enter a new relationship shortly after they entered a romantic relationship, it is questionable that they would withdraw again or further from their remaining personal contacts. In that case they would end up with an unrealistically small social network.

A third suggestion is to go beyond the number of (specific types of) personal contacts by investigating more

closely who these contacts are and how the relationship with them evolves. For example, the withdrawal hypothesis would predict that personal contacts who remain in the network after the transition to parenthood may be seen less often. Unfortunately, because we could not follow each specific social contact over time, we do not know how specific relationships change. Further research, with more precise network questions in which social contacts can be followed over time, is therefore needed.

A final suggestion is to more precisely estimate when certain changes in the personal network occur. For example, our results indicate that the number of network members increases after being in a relationship for two years. Future research may want to examine the exact timing and reasons behind this change in the network.

In conclusion, changes in personal networks after the formation of a romantic relationship are dynamic. People seem to adapt the size and composition of their personal networks to the demands of each phase of a romantic relationship and the preferences of their partner. Thus, although people may initially withdraw from social life and be 'wrapped up in their relationship' (Slater, 1963, p. 349), this seems to be only of temporary nature. Hence, (most) people seem to be well capable of adjusting their personal network to the additional demands of a romantic relationship and the support it offers, while maintaining close network connections to the 'outside world' in the long term.

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