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Social networks, social satisfaction, and place attachment in the neighborhood

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Abstract. Feeling socially integrated and being satisfied with one's social life are important indicators for happiness and well-being of individuals and for the strength of local communities. The effect of the living environment on social networks and the importance of local social contacts in the neighborhood have been addressed by many studies. However, social satisfaction has received little attention in these studies. The aim of this study is to describe and predict the effect of personal and neighborhood characteristics on social satisfaction mediated by the impact of place attachment and neighborhood networks. A path analysis is used based on survey and diary data collected among 177 respondents between April and May 2014 in Eindhoven and surroundings in the Netherlands. Results show that social characteristics of the neighborhood play an important role in explaining social satisfaction of individuals. In addition, results confirm the importance of participating in social activities and walking or cycling in the neighborhood.

1 Introduction

The satisfaction with the social network and social interactions is an important indicator for the quality of life, health, well-being, and happiness of people (Delmelle et al. 2013, Kawachi, Berkman 2001, Umberson, Montez 2010). Being satisfied with your own social contacts and social network could be described as 'social satisfaction'. Social relations and networks not only provide benefits at the individual level, but also at community level (Scheffert et al. 2008) and even at regional, national, or international level (Siegler 2014). People who are excluded from social relationships and social opportunities are less likely to be satisfied with their social life. Social interactions are important for feeling socially integrated and could decrease feelings of loneliness (Knipscheer et al. 1995). On the other hand, having a larger social network and more social interactions does not necessarily imply that people are more satisfied with their social life (Weijs-Perrée et al. 2015).

Geographical proximity facilitates face-to-face interactions between individuals (Foster et al. 2015). In addition, it is recognized that neighborhood characteristics could influence social network patterns (Cattel 2001). Although social relationships between local residents are usually regarded as weak relations, these relations are very important for local residents (Vermeij 2008). Weak local social relations could contribute to more familiarity, to the attachment to a place, feelings of safety, it may provide a bridge to stronger social relations (Buffel et al. 2011, Vermeij 2008), and probably eventually to higher social satisfaction levels. In addition, it is recognized that people discuss many

important matters with weak ties, because they are knowledgeable or that these weak ties are available at that moment (Small 2013). Although previous studies showed that neighborhood social networks are very important, research into the relation between neighborhood social networks and social satisfaction is still limited.

It is recognized that common memories and feelings about the neighborhood, length of residence, satisfaction with local social contacts, and support between local residents in the neighborhood could increase the attachment to a place (Cramm et al. 2012, Rubinstein, Parmelee 1992, van den Berg et al. 2014). In addition, neighborhood contacts are an important predictor for place attachment (Lewicka 2010). Therefore, if people are more attached to their living environment they will, most likely, be more satisfied with their social life in the neighborhood. Moreover, place attachment is also very important for the well-being and life satisfaction of individuals and it could decrease relocation tendencies (e.g. Greif 2009, Sirgy, Cornwell 2002, Theodori 2001).

It appears from existing literature that physical and social characteristics of the living environment and personal characteristics can influence the social network of individuals (e.g. Maas et al. 2009, van den Berg et al. 2011). However, still little is known about the effect of the living environment on social satisfaction. Knowledge about social satisfaction could give a better understanding to the importance of relationships between local residents, their social network and the impact this has on their attachment to the living environment. This knowledge is relevant to urban planners and policy makers who focus on creating livable and healthy social neighborhoods.

Weijs-Perrée et al. (2015) analyzed the relationships between personal and neighborhood factors, whereby characteristics of the social network, loneliness, and social satisfaction were examined. Their study focused specifically on mobility factors. Characteristics of neighborhood social networks were not included. However, neighborhood contacts are potentially important for feeling socially included, increasing life satisfaction, feeling attached to a place (e.g. Dallago et al. 2009, Livingston et al. 2008), and probably eventually for explaining social satisfaction. Existing knowledge on neighborhood social networks is fragmentary and rarely includes the link with social satisfaction. Therefore, the research objective of this study is to bring all existing concepts together into one comprehensive model and to analyze the (direct and indirect) effects of personal and neighborhood characteristics, place attachment, and social contacts in the neighborhood on social satisfaction.

Data was collected in 2014 in the Eindhoven region in the Netherlands among 177 respondents. Using the data set, a path model was estimated to address this research objective. The remainder of this paper is structured as follows. First, based on a literature review possible relationships are identified between local social contacts, personal and neighborhood characteristics, social satisfaction, and place attachment (Section 2). Next, Section 3 describes the data collection procedure, the sample, and the descriptive statistics. In Section 4, the analysis methods and results are addressed. Finally, Section 5 contains the conclusions and a discussion.

2 Local social network, place attachment and social satisfaction

The social network of an individual can be defined as a network of social relationships with family, friends, and neighbors and the characteristics of these relationships (Croezen 2010). It is recognized that the social network and social interactions are important for the life satisfaction of individuals (Delmelle et al. 2013, Helliwell, Putnam 2004); especially that the quality of, or the satisfaction with these social interactions could increase an individual's well-being (Pinquart, Sörensen 2000). Interacting with neighbors (e.g. exchanging favors and small talks) could increase the well-being (Cramm et al. 2012) and happiness of individuals (Taylor et al. 2001).

The neighborhood is a setting for local social interactions, which are important for the sense of belonging or community and the attachment to the neighborhood (e.g. Lewicka 2010, Vermeij 2008). A higher social cohesion level in the neighborhood can provide greater emotional and instrumental support from neighbors and can lead to more social interactions with neighbors (Windsor et al. 2012). Moreover, residents feel safer in

neighborhoods with a higher social cohesion level than in neighborhoods with lower levels of social cohesion (De Jesus et al. 2010).

Many researchers have studied social networks in the neighborhood and the effects of neighborhood factors on neighborhood contacts. These studies mainly focused on the size and composition of the social network and on the amount of social contact, rather than on the quality of this network (i.e. social satisfaction). For example, Thomése, van Tilburg (2000) and van den Berg et al. (2011) analyzed factors that influence the social network. Their results indicate that social network size and composition are affected by neighborhood characteristics such as the degree of urbanization, age-homogeneity, and the percentage of lower income households.

Social characteristics of a neighborhood, such as the proportion of non-western ethnic minorities and the proportion of people with a low income, have been found to increase the number of social interactions between neighbors (van der Houwen, Kloosterman 2011). A possible explanation is that in more homogeneous neighborhoods, people have more shared common beliefs, values, concerns and interests, and are therefore more likely to interact with each other (e.g. Farrell et al. 2004).

With regard to density, previous studies showed mixed results. According to Delmelle et al. (2013), a denser neighborhood increases face-to-face and spontaneous interactions between local residents. However, this finding is in contrast with findings of Brueckner, Largey (2008), van der Houwen, Kloosterman (2011) and Hanibuchi et al. (2012) who showed that a higher density level negatively affects the number and quality of social interactions in the neighborhood. In less dense areas, people probably have more need to interact with neighbors, because of the low supply of facilities (e.g. cafe's, museums, etc.) in the area (Brueckner, Largey 2008).

Besides neighborhood factors, several effects of personal characteristics on the number of local social interactions were found in previous research such as age, ethnicity, household composition, car ownership and employment (van den Berg et al. 2011, van der Houwen, Kloosterman 2011, Foster et al. 2015). Moreover, people with a higher income have a greater range of resources and therefore probably have more access to social contacts outside of the neighborhood and thus fewer neighborhood-based contacts (Moore et al. 2011). Also, home ownership and length of residence positively influence the knowing of and interacting with neighbors (Guest et al. 2006).

Experiences and memories with the neighborhood and the people who live there, could give a sense of security and familiarity and provide an individual identity. The collection of individual memories and common feelings about a location is also called 'place attachment' (Rubinstein, Parmelee 1992). Previous studies on place attachment showed that characteristics of the living environment affect the attachment to a place (e.g. Greif 2009, Hanibuchi et al. 2012, Livingston et al. 2008, van den Berg et al. 2014). For example, Livingston et al. (2008) argue that social cohesion is the most important neighborhood factor that affects place attachment. If people receive more emotional and instrumental support from neighbors, they probably also feel more attached to a neighborhood. Moreover, Hanibuchi et al. (2012) suggest that people living in urbanized areas feel less attached to their living environment. People who live in a high-density area probably have a lower need to interact with neighbors and are therefore less attached to their neighborhood. In addition, place attachment is also affected by the length of residence in the neighborhood, the satisfaction with the composition of the population, and the satisfaction with social interactions in the neighborhood (van den Berg et al. 2014).

Apart from the living environment, previous research also found influences of personal characteristics on place attachment. Homeowners and people who have a job and a high income were found to feel more attached to their living environment (Brown et al. 2003). These people often have a greater opportunity to live in a place or in a neighborhood where they feel connected or attached with. In addition, the attachment to a neighborhood is related to social networks in the neighborhood (Livingston et al. 2008). Cramm et al. (2012) and Dallago et al. (2009) suggest that a higher social cohesion level in the neighborhood and the quality of local social contacts lead to more emotional and instrumental support among neighbors and a sense of community. The attachment to the

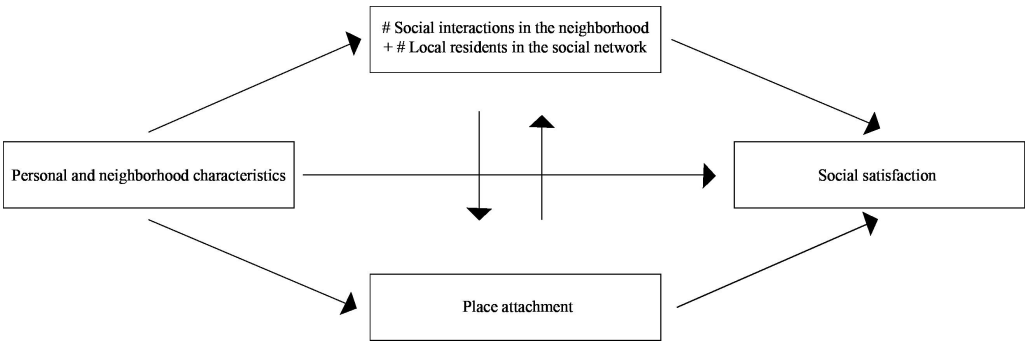

Figure 1: Conceptual model

living environment increases the quality of social relationships with local residents and the sense of community (Dallago et al. 2009). Sense of community is an important factor of quality of life (Kolodinsky et al. 2013). Moreover, if the quality of social interactions increases, the satisfaction with the social life will probably increase.

Most studies on social satisfaction have been conducted by social scientists and have rarely focused on neighborhood characteristics. For example, Bonsang, van Soest (2012) analyzed the determinants of social satisfaction among elderly people in eleven countries in Europe. They found that social satisfaction is affected by income and the participation in non-professional activities. Lansford et al. (1998) suggest that older adults are more satisfied than younger adults with the size of their social network. On the other hand, von Hippel et al. (2008) suggest that aspects of aging, such as spending more time alone, engaging in fewer social activities, and having a poorer working memory, negatively affect social satisfaction.

Social networks and social satisfaction have recently also been studied in travel behavior research (e.g. Carrasco et al. 2008, Delmelle et al. 2013). For example, the frequency of walking in the neighborhood improves health conditions and increases the number of spontaneous and intentional social interactions in the neighborhood (Glanz 2011, van Cauwenberg et al. 2014). Delmelle et al. (2013) found that social satisfaction is affected by personal, neighborhood, and mobility variables (e.g. health status, financial situation, residence time, car ownership, and the urban density). However, these studies did not analyze all concepts into one single comprehensive model.

In summary, the literature review suggests that neighborhood interactions and networks are important indicators for the quality of the social life and the attachment to a place. We hypothesize that, in addition, social satisfaction may also be affected by personal and neighborhood characteristics, mediated by the impact of place attachment and local network characteristics. Although many paths have been reported in previous research, these paths have not been considered simultaneously in a single model or included social satisfaction in relation to neighborhood interactions. Therefore, this study aims to analyze more comprehensively the expected relationships between personal and neighborhood characteristics, the social network and social interactions in the neighborhood, place attachment, and social satisfaction. Figure 1 shows the expected paths, based on the reviewed literature.

3 Data collection, variables and descriptive statistics

To analyze the above-described relationships, a data collection instrument was designed. This data collection instrument consists of a questionnaire on social satisfaction, composition of the social network, place attachment, social cohesion, personal, and neighborhood characteristics and of a social interaction diary to collect data on social interactions. Respondents were asked to fill in the social interaction diary for a limited period of two days to obtain a higher response rate. This data collection instrument is similar to the data collection instrument used by van den Berg et al. (2011). For this study, using a

diary seems to be the most suitable method, because this method has some advantages over other data collection methods. Diaries can be used to collect data on events that are quickly forgotten, about sensitive and personal information, and information about individual's daily behavior or experiences (Corti 1993).

First, the index used to measure social satisfaction is composed of the answers to nine questions on respondents' satisfaction with their social network members (relatives, friends, direct neighbors, local residents, colleagues/ fellow students, club members and other non-kin), social network size and their social life in general. Satisfaction was measured on a 5-point Likert scale ranging from very dissatisfied (1) to very satisfied (5). In the analyses the total score of social satisfaction is used.

Next, the 12-item scale from Williams, Roggenbuck (1989) is used to measure place attachment. This scale contains 12 statements about the connectedness with the neighborhood, namely:

1. I feel that this neighborhood is a part of me
2. This neighborhood is the best place for what I like to do
3. No other neighborhood can compare to this neighborhood
4. This neighborhood is very special to me
5. I identify strongly with this neighborhood
6. I get more satisfaction out of being in this neighborhood than in another neighborhood
7. I am very attached to this neighborhood
8. Doing what I do in this neighborhood is more important to me than doing it in any other place
9. Being in this neighborhood says a lot about who I am
10. I wouldn't substitute any other area for doing the type of things I do in this neighborhood
11. This neighborhood means a lot to me
12. The things I do in this neighborhood I would enjoy doing just as much at a similar neighborhood

The respondents could rate these statements by strongly disagree (1), disagree (2), neutral (3), agree (4) strongly agree (5).

To collect data on social networks a set of name generators was used, which is similar to the name generators used by Carrasco et al. (2008) and van den Berg et al. (2011). The name generators are formulated as:

- Think about the people you feel very close to (people with whom you discuss important matters, keep regularly in touch with or that are there for you if you need help);
- Think about the people you feel somewhat close to (people that are more than just casual acquaintances, but not very close).

This approach was used to identify the number of social network members of respondents in seven social domains: friends, family, direct neighbors, local residents, club members, colleagues/fellow students and other non-kin. In this study, only information about the number of local residents (including the number of direct neighbors) in the social network is relevant.

Finally, information about social interactions was collected using a two-day social interaction diary. Respondents were asked to report social interactions outside of the household, which are more personal than just greetings. Data on social interactions such

as a joint activity (e.g. shopping, dinner or sports), having a conversation (face-to-face, by telephone, through the internet and social media) and sending or receiving a message by email, letter or text message was collected. In addition, respondents were asked to report information about the person they had a social interaction with (e.g. age, gender, social domain, and the strength of the relationship). In this study, only information about the social domain (local residents and direct neighbors) was used to determine the number of social interactions with local residents.

Data on age, gender, household composition, club membership, employment status, health, income, education level, ethnicity, and work status, was collected using a survey. In addition, the frequency of using a car (as driver and as passenger), train, bus/tram/metro, moped or scooter, a bicycle, and walking for transportation was asked. The frequency of using the different transport modes was measured on a seven-point scale ranging from never (1) to almost daily (7).

Regarding neighborhood characteristics, information about density, land use mix, the distance to and the number of facilities, composition of the population, the distance to green public areas, the percentage of non-western/western ethnic minorities and low income groups in the neighborhood, age groups in the neighborhood, and type of dwelling in the neighborhood (stacked or rental dwellings and the average value of per dwelling) were derived from Statistics Netherlands (CBS 2012) using the postal codes of the respondents.

The self-perceived social cohesion was measured using a tool from Frieling (2008). It contains seven questions about social contacts and the degree of solidarity between local residents, namely:

1. How often, in the past six months, did you have a chat with someone from the neighborhood? [once a year or less (1), a few times a year (2), a few times each month (3), once a week (4), a few times each week or more (5)]

2. If you are away from home, is there someone in your neighborhood who looks after your house, for example to make sure that there is no forced entry or give the plants some water? [almost never (1), usually (2), sometimes yes/no (3), usually (4), almost always (5)]

3. If something important happens in the neighborhood or with a neighbor, is there someone in your neighborhood who will make you aware of it? [almost never (1), usually (2), sometimes yes / no (3), usually (4), almost always (5)]

4. Do you feel involved with the people who live in your neighborhood? [with hardly anyone (1), with most people not (2), with some people yes / no (3), with most people though (4), with almost everyone (5)]

5. If there is a sad moment or a sad event in your life, are there local residents who help and support you? [almost never (1), usually (2), sometimes yes / no (3), usually (4), almost always (5)]

6. Are there sometimes any neighborhood parties, barbecues or other activities in the neighborhood, for which the whole neighborhood is invited? [IF YES] How often do you go to these parties, barbecues or activities? [almost never (1), usually (2), sometimes yes / no (3), usually (4), almost always (5)]

7. Have you in the past year collaborated with other local residents to organize something in the neighborhood, for example, to organize a neighborhood party or activity, or to make a neighborhood newspaper [IF YES] How often have you met in the past year with these local residents? [not collaborated (1), collaborated about once every half a year (2), collaborated about once every three months (3), collaborated about once every two months (4), collaborated about every month or more frequently (5)]

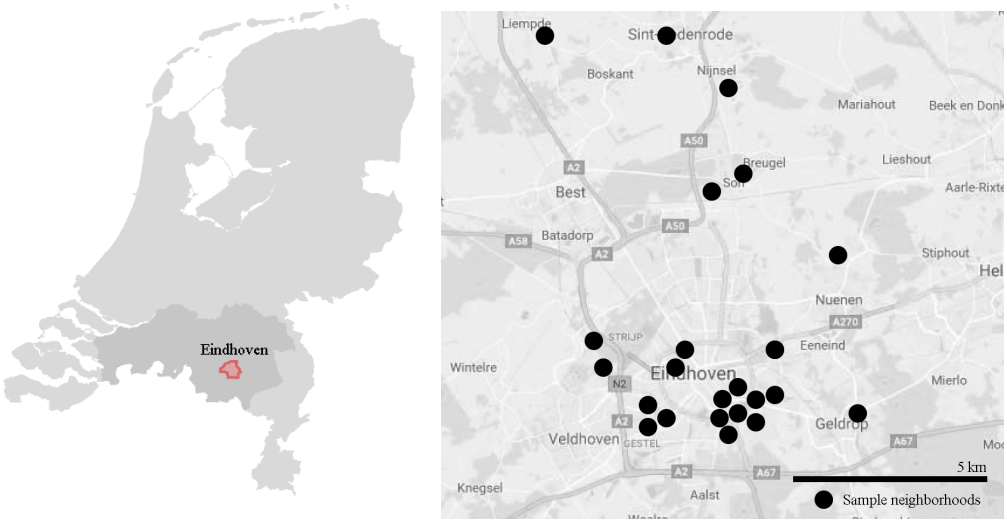

Figure 2: Sampled neighborhoods in Eindhoven and surrounding towns

3.1 Data collection

The aim of this dataset was to collect data among the same respondents that took part in a study of van den Berg et al. (2011) in 2008. In 2008, respondents were randomly selected in the Eindhoven and surrounding towns (Nuenen, Gerwen, Geldrop, Son en Breugel, Liempde, Nijnsel and Sint Oedenrode; see Figure 2). A total of 747 respondents participated in 2008 and 523 addresses of these respondents were known. Between April and May 2014, these 523 respondents were personally approached at their home and the respondents who were not at home, were called subsequently. If people were willing to participate, they received a social interaction diary, which was collected a week later. A total of 141 useful (27% of the 523 respondents that participated in 2008) diaries returned. The overall response rate is only 18% of the randomly selected 747 residents in 2008. Besides these addresses, 47 new respondents were selected, which consist of acquaintances and some randomly selected addresses and a total of 36 useful diaries returned. This resulted in a total of 177 respondents. Out of these respondents, eight respondents only filled in the questionnaire or kept the diary for only one day.

3.2 Descriptive statistics

Table 1 shows the basic sample characteristics of the 177 respondents. As can be seen, the sample contains a higher percentage of women than men. Next, the sample also contains a higher percentage of people aged older than 65 years compared to the Dutch population, municipality of Eindhoven (Gemeente Eindhoven 2017), and the sample of van den Berg et al. (2011). Women and older people probably spend more time at home, so it is more likely that they would answer the door and participate in this study. The sample contains a high percentage of people with a higher education, which is also observed in the sample of 2008. This is probably due to the fact that people with a higher education level are more willing to participate in a research. Compared to the sample in 2008, this sample has a high percentage of people who do not work. These people spend more time at home and therefore probably have more time to participate in this research.

In addition, 18% of the respondents in the sample walk (almost) every day for transportation in the neighborhood and only 9% never walk for transportation in the neighborhood. Almost half of the respondents cycle (almost) every day (42%).

It is assumed that social satisfaction is an interval variable and the total score of the nine items on social satisfaction will be used in the analyses. This total score consists of the score for satisfaction with the different social categories (i.e. friends, family, direct neighbors, local residents, colleagues/fellow students, and club members), satisfaction with the size of the social network, and satisfaction with the social network in general.

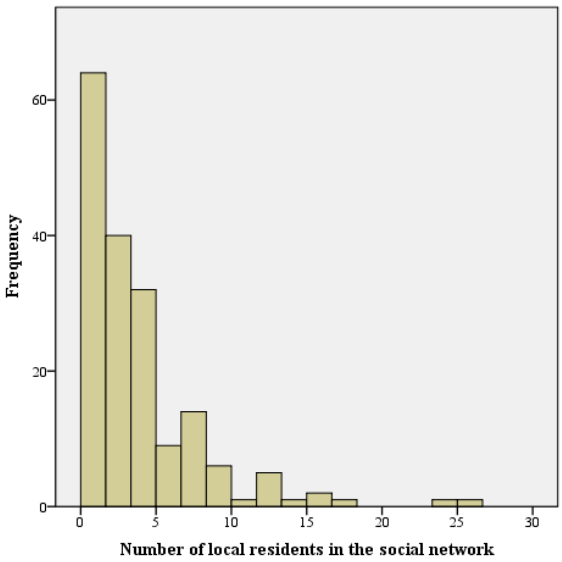

Figure 3: Distribution of the number of local residents in the social network

The Cronbach's Alpha for the total score of social satisfaction is 0.758, which means that the internal consistency of the items is good. The mean total score of social satisfaction is 34.63 and the mean on a five point Likert scale is 3.8.

The sum score of the 12 items for measuring place attachment was used in the analyses. The internal consistency of the items is good; with a Cronbach's Alpha of 0.908. As can been seen in Table 2, the mean total score of the self-rated place attachment is 38.56, with a standard deviation of 7.37. In addition, the average number of local residents (including direct neighbors) in the social network of the respondents is 3.56. Figure 3 shows the distribution of the number of neighbors in the social network. The high number of local residents in the social network is probably due to the fact that the respondents in this study lived in the neighborhood for a longer time. In addition, this could be related to the fact that people who have more social interactions (with neighbors) are probably more willing to participate in this study. This should be taken into account when interpreting the results. The average number of social interactions with local residents per respondent in two days is 0.96, with a standard deviation of 1.48. Figure 4 shows the distribution of the number of interactions with neighbors during the two days of the interaction diary.

The following five different classes of urban density are distinguished by the Dutch Bureau of Statistics (CBS 2012), namely:

1. Very high density (2500 or more addresses per km2)
2. High density (1500 to 2500 addresses per km2)
3. Moderate density (1000 to 1500 addresses per km2)
4. Low density (500 to 1000 addresses per km2)
5. Very low density (less than 500 addresses per km2)

Most of the respondents in the sample live in a neighborhood with more than 1000 addresses per km2 [(35%) moderate density, (21%) high density, or (23%) very high density]. Only 10% lives in a low-density area and 11% lives in a very low-density area.

In addition, the sum score of the answers on the 7 questions from Frieling (2008) was used in the analysis. The mean total score of the self-perceived social cohesion is 22.98, with a standard deviation of 5.60. The Cronbach's Alpha of the total score of social cohesion is 0.827. The mean percentage of western ethnic minorities in the neighborhoods is 12% and also the mean percentage of non-western ethnic minorities is 12%.

Table 1: Basic sample characteristics

	Sample 2014 (%)	Sample 2008 (%)	Netherlands (%)	Eindhoven (%)
Gender				
Male	38	39	50	51
Female	62	61	50	49
Age				
Age (<40 years)	16	37	48	52
Age (40-65 years)	49	49	36	32
Age (>65 years)	35	15	16	16
Household composition				
One person household	13	11	37	39
Couple without children	45	34	29	28
Couple with children	36	47	27	21
Single parent family and other	6	7	7	12
Income				
Low income (<€3000 net/month)	54	58	71	
High income (>€3000 net/month)	41	33	29	
(Missing)	5	9		
Education				
Primary education	19	23	29	34
Secondary education	31	31	43	38
Higher education	50	46	28	27
Work				
No work	54	35	48	
Part time work	28	38	21	
Full time work	18	27	31	
Club membership				
No club membership	33	30		
One or more club memberships	67	70		

Note: N=177

4 Methods and results

A path analysis was used to analyze simultaneously the relations between the independent variables (i.e. personal and neighborhood characteristics) and the dependent variables (i.e. place attachment, social network in the neighborhood, and social satisfaction) and also the relations between the dependent variables in a single model. This analysis is an extension of the multiple regression analysis and a special case of Structural Equation Modelling (SEM). Compared to SEM, where also latent variables (i.e. unobserved variables) can be included, a path analysis only includes observed or measured variables. A path analysis can estimate simultaneously direct and indirect effects (Streiner 2005).

This section describes the results of the path analysis. The statistical software package LISREL (Jöreskog, Sörbom 2008) was used for estimating the model. The maximum likelihood method (ML) was used to estimate the models, because compared to other estimation methods, ML generally performs best (Iacobucci 2010). The maximum likelihood estimation is appropriate for small sample sizes and non-normally distributed variables (Suhr 2006).

First, based on the literature review, potentially significant relations between personal (i.e. age, gender, income, education level, health, household composition, work status, transportation modes, car ownership, home ownership, type of dwelling, and length of residence) and neighborhood characteristics (i.e. density, social cohesion level, ethnicity neighborhood, income levels in the neighborhood, average value of the dwellings, and distance to facilities), place attachment, number of interactions with local residents, size

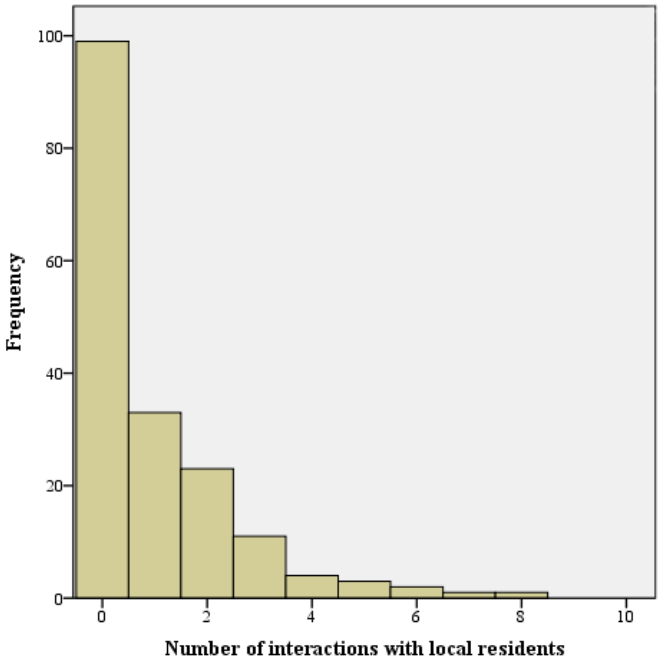

Figure 4: Distribution number of social interactions with local residents

of local social networks, and social satisfaction were identified using bivariate analyses. The relationships that were significant at the 0.10 level were then entered in the model. Second, to obtain a better model, the direct effects that were not significant at the 0.10 level in the path model were removed stepwise (e.g. education level, density levels, length of residence, home ownership, gender, or health). The variable age was also included expressed in log. However, this this did not lead to a better fitting model. Therefore, it was chosen to include age as a linear continuous variable. This resulted in a final model shown in Figure 5. Table 2 shows the mean and standard deviation of the significant variables that were included in the final model.

Table 3 shows the unstandardized coefficients and t-statistics of direct and (significant and non-significant) total effects of the final model and Table 4 shows the goodness-of-fit of the model. The model provides an adequate fit of the data, as the value of Chi Square divided by the degrees of freedom and the Normed Fit Index is close to 1 and the value of RMSEA is (close to) 0 (Golob 2003). In addition, the value of the model's Akaike information criterion (AIC) is close to the value of saturated AIC (Golob 2003). Overall, the results show a good fit of the model to the data.

4.1 The effects between endogenous variables

Place attachment was found to have a positive effect on the number of social interactions with local residents. This result suggests that people who are more attached to a neighborhood have more social interactions with local residents. This finding is in line with the literature, which suggests that place attachment affects the quality of social relationships with local residents (Dallago et al. 2009). However, no significant direct or indirect effect was found of place attachment on the number of local residents in the social network.

As can been seen in Table 3, place attachment is positively affected by the number of local residents in the social network. This result is in line with Lewicka (2010), who argued that neighborhood ties and sense of security are the social predictors of place attachment. van den Berg et al. (2014) found that place attachment is affected by the satisfaction with social contacts in the neighborhood. People are probably more satisfied with their social contacts in the neighborhood if they have more local residents in their social network. Therefore, they will probably feel more connected to their living environment.

Table 2: Variables considered in the analysis

	Mean	St. Dev.
Endogenous variables		
Social satisfaction	34.63	3.93
Place attachment	38.56	7.37
Number of local residents	3.56	4.40
Number of social interactions with local residents	0.96	1.48
Exogenous variables		
Personal characteristics		
Age	56.42	15.25
Low income (<€3000 net/month) (dummy)	0.23	0.42
Club membership (dummy)	0.67	0.47
Working (dummy)	0.46	0.50
Home ownership (dummy)	0.81	0.39
Length of residence	21.13	13.48
Car ownership (dummy)	0.90	0.30
Frequency of walking for transportation in the neighborhood	2.98	1.26
Frequency of cycling	5.63	1.88
Neighborhood characteristics		
Very high density (>2500 addresses per km^2) (dummy)	0.23	0.42
Social cohesion	22.98	5.60
% Non-western ethnic minorities	11.80	7.12

Notes: N=177

Regarding the effects of place attachment on social satisfaction, place attachment was found to have a positive effect on social satisfaction. This result implies that people who are more attached to their living environment are more satisfied with their social life. This finding is in line with results of an earlier study that showed an indirect effect of place attachment on social satisfaction, mediated by self-perceived loneliness (Weijs-Perrée et al. 2015). Overall, the results show that the attachment to the living environment plays an important role in explaining social satisfaction, and therefore the well-being of individuals.

As can been seen, no significant direct effect was found of the number of local social interactions on social satisfaction. On the other hand, an indirect positive effect was found of the number of local residents in the social network on social satisfaction, mediated by place attachment. People who have more local ties, with whom they feel somewhat or very close with, feel more attached to their neighborhood than people with less local ties. In addition, no significant direct or indirect effect was found of the number of local social interactions on social satisfaction. Weijs-Perrée et al. (2015) found a direct effect of the number of social interactions on social satisfaction. However, they focused on the total number of social interactions (e.g. friends, family, neighbors, club members, colleagues) and did not focus on specifically social interactions with local residents.

4.2 The effects of exogenous variables

Regarding the effects of personal and neighborhood characteristics on the number of local residents in the social network, the results show that frequency of walking for transportation in the neighborhood has a positive effect. This finding is in line with existing literature, which shows a relation between social interactions and frequency of walking. For example, findings of Glanz (2011) and van Cauwenberg et al. (2014) suggest that walking leads to more spontaneous social interactions. Also, frequency of cycling was found to positively affect the number of local residents in the social network. This is probably due to the fact that during cycling spontaneous social interactions with local residents are more likely to occur than when using a car as transport mode. Weijs-Perrée et al. (2015) found a similar relation between the number of social interactions and the

frequency of cycling. Very high density was found to have a negative direct effect on the number of local residents. This finding suggests that people living in a neighborhood with a very high density level have 3.11 fewer local residents in their social network than people living in a neighborhood with a high, moderate, low, or very low density. This result is in line with findings of Thomése, van Tilburg (2000) and van den Berg et al. (2011). The length of residence also showed a significant direct effect on the number of local residents in the social network. People who live for a longer time in the neighborhood probably had more time to bond with other local residents.

Regarding the effects of personal and neighborhood characteristics on the number of social interactions in the neighborhood, age was found to have a small negative effect. The estimated value of the path coefficient suggests that every year increase in age results in 0.02 social interactions with local residents per two days fewer. The average total number of social interactions in the neighborhood per two days is 1.01.This means that for every year increase in age, the number of social interactions with local residents decreases by 1.98% (3.65 social interactions). Although this is a small decrease, it suggests that elderly have fewer social interactions with local residents than younger people. In addition, home ownership was found to have significant effect on the number of social interactions in the neighborhood. This is in line with findings of previous research (e.g. Guest et al. 2006). Social cohesion, very high density, low income, car ownership, length of residence, frequency of walking, and frequency of cycling were found to have an indirect effect on the number of social interactions with local residents.

With regard to place attachment, the results show that a low income negatively affects place attachment. An explanation could be that people with low incomes often have less choice where to live and are therefore probably less attached to their living environment. In addition, people with low incomes often live in (social) rental dwellings and the attachment to the living environment of tenants is probably weaker than the attachment to the living environment of home owners, as was found by Brown et al. (2003) and van der Houwen, Kloosterman (2011). Second, social cohesion was found to have a positive direct effect on place attachment. It implies that people who live in a neighborhood with a high social cohesion level feel more attached to their neighborhood. This finding is in line with findings from other studies (e.g. Livingston et al. 2008, van den Berg et al. 2014). Finally, car ownership was found to have a significant negative effect on place attachment. People who own a car, probably are more able to maintain social contacts and to use facilities (e.g. shopping or sport facilities) at a further distance. Therefore, they probably feel less attached to their neighborhood.

Some of the personal and neighborhood characteristics were not found to have a direct effect on social satisfaction, but an indirect effect mediated by the other dependent variables. Social cohesion was found to have a significant indirect effect on social satisfaction, mediated by place attachment. Club membership is found to have a positive direct effect on social satisfaction. This implies that people who are a member of one or more clubs are more satisfied with their social life. This finding is in line with Bonsang, van Soest (2012). They concluded that non-professional activities affect the satisfaction with social contacts. Next, working is also found to have a positive direct effect on social satisfaction. This finding suggests that people who are employed are more satisfied with their social life than people who are not employed. Having a job provides social interactions with colleagues and could increase the feeling of being socially integrated. This probably explains the fact that the social satisfaction of people who have a job is higher than of people who are unemployed. These findings imply the importance of participating in social activities and being socially included for the quality of the social network. Moreover, the percentage of non-western ethnic minorities in the neighborhood is found to have a negative effect on social satisfaction. This implies that people living in neighborhood with a higher percentage of non-western ethnic minorities are less satisfied with their social life. This is in line with findings of van der Houwen, Kloosterman (2011) who suggest that a larger proportion of non-western ethnic minorities negatively affect the number of social interactions between local residents. In addition, indirect effects on social satisfaction were found of low income, frequency of cycling, frequency of walking for transportation, very high density, and the social cohesion level in the neighborhood.

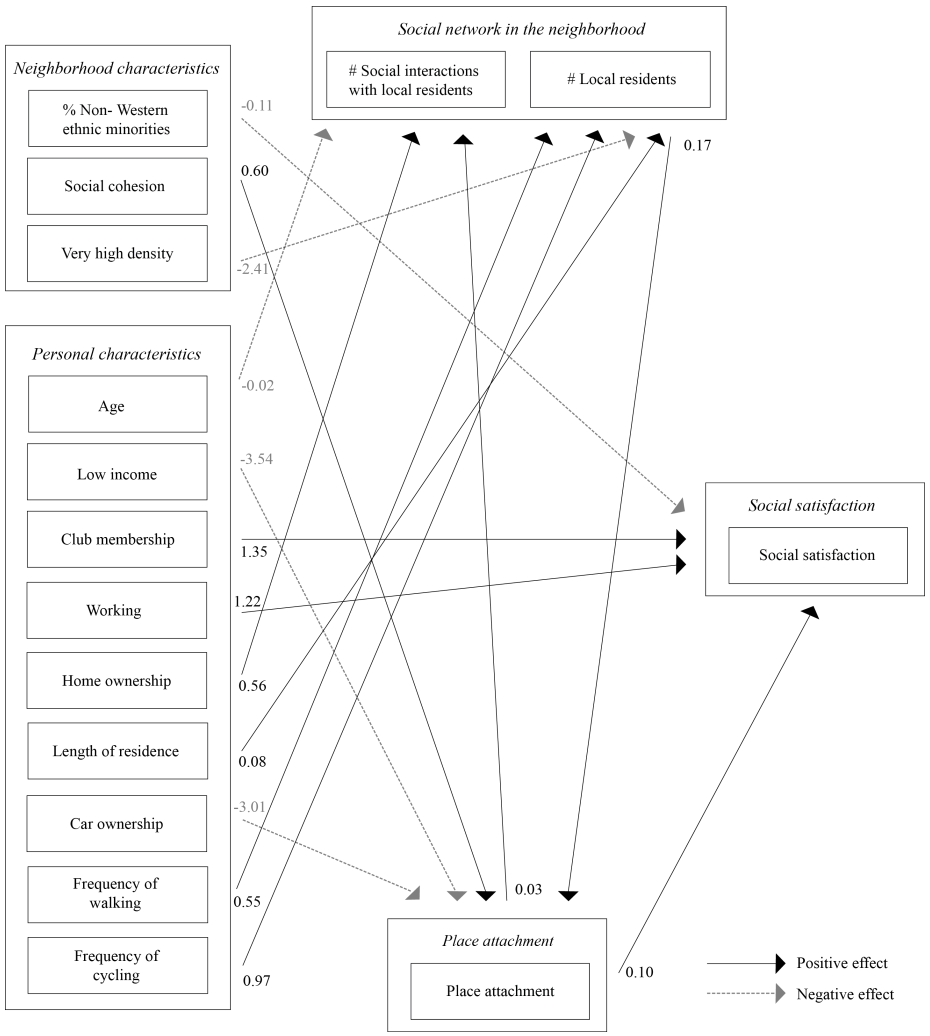

Figure 5: Estimated path model

5 Conclusion and discussion

The aim of this study is to analyze the (direct and indirect) effects of personal and neighborhood characteristics, place attachment, and social contacts in the neighborhood on social satisfaction, simultaneously in a single model. In addition, to understand the importance of the neighborhood for explaining social satisfaction, local social network characteristics and place attachment were included. Based on data collected using a social interactions diary and survey among 177 respondents in the Eindhoven region, a path model was estimated.

Social satisfaction can be considered as the quality of social life, which is therefore an indicator for an important aspect of the well-being of an individual. The estimated path model shows a good fit to the data. The model structure showed that several neighborhood and personal characteristics directly or indirectly (mediated by place attachment) influence social satisfaction. Particularly, the social dimension of the neighborhood plays a relevant role in explaining the total social satisfaction of individuals. This study provides more insight in the relations between social satisfaction, neighborhood networks, and place attachment and contributes to the knowledge gap on social satisfaction, which received still little attention in existing studies.

A previous study showed that the number of social interactions is positively related to social satisfaction (Weijs-Perrée et al. 2015). However, findings in this study show no direct relation between the number of social interactions with neighbors and social

Table 3: Path analysis model estimates

From	To							
	Social satisfaction		Place attachment		# Local residents		# Social interactions local residents	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
Effects between the endogenous variables								
Social satisfaction t statistic								
Place attachment t statistic	0.10** 2.78	0.10 2.78					0.03* 1.66	0.03 1.66
# Local residents t statistic		0.02 1.66	0.17** 2.08	0.17 2.08				
# Social interactions t statistic						0.60 2.05		
Effects of the exogenous variables								
Age t statistic							-0.02** -2.12	-0.02 -2.12
Low income t statistic		-0.35 -2.02	-3.55** -2.95	-3.55 -2.95				
Club membership t statistic	1.35** 2.37	1.35 2.37						
Working t statistic	1.17** 2.22	1.22 2.33						
Home ownership t statistic							0.56* 1.90	0.56 1.90
Car ownership t statistic			3.02* 1.77	3.02 1.77				
Length of residence t statistic					0.08** 2.61	0.08 2.61		
Frequency of walking t statistic				0.16 1.67	0.97** 2.84	0.97 2.84		
Frequency of cycling t statistic					0.55** 2.40	0.55 2.40		
Very high density t statistic					-2.42** -2.32	-2.42 -2.32		
Social cohesion t statistic		0.06 2.57	0.60** 6.73	0.60 6.73				
% Non-western ethnic minorities t statistic	-0.11** -2.93	-0.11 -2.93						
R^2	0.17		0.31		0.17		0.07	
R^2reduced	0.14		0.29		0.14		0.05	

Notes: unstandardized effects, *Significant at 0.1 level, **Significant at 0.05 level

satisfaction. This suggests that interactions with neighbors are less important than interactions with other people (e.g. family, friends, club members, colleagues) for the satisfaction of people's social life. However, it is recognized that these weak ties (i.e. neighbors) are important to discuss important matters with and to feel supported by (Small 2013, Cramm et al. 2012). Further research is needed to analyze how interactions with different weak and stronger ties could influence the total social satisfaction.

Results of this study also show that the frequencies of walking and cycling in the neighborhood have a positive effect on the share of local residents in the social network. Therefore, it is important that neighborhoods provide safe and attractive walking and cycling routes, and an attractive level of facilities that encourage cycling and walking in the neighborhood to create a healthy social environment.

Although this research showed that characteristics of the neighborhood, local ties, and place attachment are important for explaining social satisfaction, several questions remain for future research. In this study, data was collected on personal social interactions that are more than just a greeting. However, greetings are typically neighborhood social interactions; including these typical neighborhood social interactions could give more insight in the importance of local social contacts. In addition, people sometimes interact

Table 4: Goodness-of-fit statistics of the model

Statistic	Value
Degrees of Freedom	38
Minimum Fit Function Chi Square	60.35
Chi Square / Degrees of Freedom	1.59
RMSEA	0.054
Model AIC	252.28
Saturated AIC	272.00
Normed Fit Index	0.93

with neighbors only once a month or less (e.g. event in the neighborhood). Using a larger time-window of the interaction diary (i.e. more than two days), more typical interactions with neighbors could be captured. In addition, the data collection method and collecting a second wave of data among the same respondents from a study in 2008 led to a somewhat biased sample (i.e. more women, elderly, and people with a higher education level). A more representative sample of the area could increase the interpretation and generalizability of the results.

For further research, it would furthermore be interesting to analyze more detailed information on characteristics of social interactions between local residents (e.g. frequency, type, purpose, the importance of these social interactions, and location). Moreover, it would be interesting to analyze the negative effects of neighborhood social interactions on the number of social interactions outside of the neighborhood, because these interactions could limit social opportunities to outside of the neighborhood (e.g. Pinkster 2014). In addition, using a larger dataset and comparing the results of this study to other cities in the Netherlands or other countries, could give a better impression of patterns and routines of people's activities in neighborhoods. Another limitation of this research is the lack of information on residential selection which is dependent on residential preferences and restrictions (e.g. price of a dwelling). For example, people with lower incomes have more restrictions in their choice of where they want to live. This residential selection could also influence their social life. It remains, thus, a challenge for future research to avoid selection bias in research on neighborhood effects on people's social life. Furthermore, this study did not include information of the labor market (e.g. percentage of employed people in the neighborhood) or work-related characteristics (e.g. job quality). People who are more satisfied with their work life are probably also more satisfied with their social life. Including this information could give more insight into the effects of neighborhood contacts on social satisfaction, mediated by the effect of characteristics of the job status at an individual level and the labor market at the neighborhood level.

Nevertheless, findings of this study are relevant for urban planners and policymakers, who increasingly focus on improving the livability, social cohesion, and the social status of residents in urban areas. We argue that the structure of the living environment generally affects the quality of the social life of individuals. Our findings suggest that the self-perceived social cohesion level and place attachment could be increased by, for example, creating meeting spaces that encourage social interactions (e.g. green spaces), investing in safety, organizing social activities, or involving local residents in new policy plans for the neighborhood. Local residents should also be stimulated to socially mix with people from different backgrounds to increase trust levels and strengthen social cohesion in local communities. This reduces problems such as anti-social behavior, crime, and lack of trust (Randall 2012). Local policies should stimulate people to participate in social and community activities, by for example, establishing and supporting local organizations and local activities/events (Forrest, Kearns 2001).

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