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# Social networks of visually impaired and blind adolescents. Structure and effect on well-being

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## Abstract

In this article, we examine the social networks of visually impaired and blind adolescents. Data were collected about the size and structure of their network, their subjective evaluation of the network, happiness, loneliness, and a number of individual characteristics. These results are compared with the results of comparable studies on non-handicapped adolescents. Multilevel analysis was used to describe structural and functional aspects of the personal networks. In addition, a structural equation model was used to examine if individual characteristics, including sociodemographic and vision-related characteristics, predict the aspects of the network, and if individual and network characteristics predict well-being. Well-being depends more on network aspects than on individual characteristics. © 2000 Elsevier Science B.V. All rights reserved.

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## 1. The importance of a personal network for visually impaired adolescents

Support received from social networks can buffer stress and improve coping in all stages of life. Many studies have stressed the close relationships among personal network characteristics and the mental and physical health of adults (Cohen and Wills, 1985; Cauce et al., 1994; Robinson, 1995). The size and composition of the network, closeness to other people, satisfaction, but also conflicts within networks are all important (Samuelsson, 1997). Social support to children and adolescents protects them from the negative effects on their mental health when they are exposed to stress, and support improves well-being, self-esteem and self-assurance (Heller et al., 1986; Sarason et al., 1990). Family support is very important, but so is the support of friends and other adults (Robinson, 1995).

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Our study is part of a larger project concerning the meaning of personal networks and social supports for the psychosocial adjustment of blind and visually impaired adolescents in the Netherlands (Kef, 1997, 1999; Kef et al., 1997). The theoretical framework of this study is based on the socio-ecological model, also called the psychosocial approach (Bronfenbrenner, 1979). In a socio-ecological model, development is influenced by personal individual factors, in interaction with environmental factors (Van der Ploeg and Scholte, 1990; Buysse, 1997). Three main subsystems within the social environment are distinguished in this model: the family, the school and the peer group. These subsystems form the social network of an adolescent. Furthermore, factors within the person — psychosocial characteristics — and macro-social factors — like unemployment, social economical status (SES) and biological disabilities—are distinguished in the model.

Besides the distinction in factors concerning the person, the social environment and demographic and macro-social factors, a second distinction in this socio-ecological model is the one between risk factors and protective factors. Examples of risk factors are: severe family conflict, receiving little social support, low self-esteem and ineffective coping skills. Examples of protective factors are: a supportive peer group and a positive personal disposition (Buysse, 1997).

This article addresses the question about what the differences are within the personal networks of blind and visually impaired adolescents, whether these differences depend on individual characteristics, and whether they affect the well-being of these adolescents. Furthermore, visually impaired adolescents will be compared with non-impaired adolescents. More precisely, the research questions are:

1. What are the structural and functional aspects of the personal networks of blind and visual impaired adolescents, compared with those of sighted adolescents?
2. Do differences in personal networks of blind and visually impaired adolescents depend on sex, age, socioeconomic status, living situation, degree of impairment or dependency in mobility?
3. What is the influence of differences in structural and functional network aspects on well-being?

### *1.1. Personal networks: structural and functional aspects*

Research on networks usually distinguishes between structural and functional network aspects (House et al., 1988; Sarason et al., 1990; Tracy and Whittaker, 1990; Buysse, 1997;), which are also described as quantitative and qualitative aspects of the personal network. Important structural aspects in theory and research are the size and composition of the network. Other structural aspects are accessibility, durability or length of relationships and density of a network. Functional network aspects refer to the quality and the content of a relationship. They refer to aspects like social support, reciprocity (balance of support provided and support received), intimacy and satisfaction with support.

Social support, both emotional and practical, is a central functional network aspect. Here, a distinction can be made between perceived and received social support. Perceived social support is an individual's assessment of the social support, based on the subjective interpretation of supportive interpersonal transactions, and the personal meanings the individual attaches to them. Received social support is the actual amount of support obtained from specific persons in a specific period, such as the amount of parental support in the past six months (Cauce et al., 1994). A second important functional aspect is satisfaction; satisfaction is an individual general evaluation of the perceived and received support (Antonucci and Akiyama, 1994).

### *1.2. Personal network and visually impaired persons*

It is generally recognized that both the visual loss itself, as well as its subsequent effects, cause unique difficulties in the emergence of a positive self-image, and confront impaired children and adolescents with considerable challenges (Cook-Clampert, 1981), especially regarding social contacts. These challenges are mediated by various factors: intrapersonal, interpersonal and situational factors. The impaired or sick person could feel that he/she has nothing to offer to other persons, other persons may be afraid of the illness or become burnt out, or a social stigma could cause negative reactions towards ill or impaired persons. Illness or disability involves a unique set of stressors, like unpredictability and social stigma. Stressors like these place substantial constraints on the ability to maintain and to restructure relationships (Lyons et al., 1995).

Several studies examined the networks of persons who were chronically ill or had a (physical) disability. Their results regarding the effects of disability on relationships are summarized by Lyons et al. (1995): reduced network size, reduced social contacts, changes in social space, remodeling of the network, including other persons with health problems and professionals in the network, higher percentage of kin members, lower number of friends, less shared activities, and increased value of relationships. Earlier research by one of us shows that visually impaired Dutch adults feel dependent on other persons and have lack of mobility and social contacts (Habekothé and Peters, 1993).

Several American studies investigated the personal network of visually impaired individuals. Weiner (1991) conducted a study of the social support networks of blind and visually impaired young adults in the United States. The size of their personal network was on average 10 persons. A large network was best predicted by the variables: having a job, a high level of mastery (locus of control,) being blind and being female. The most important sources of support were family and friends, with a great dependency on family for social support (Weiner, 1991).

A recent study (Wolffe and Sacks, 1997; Sacks and Wolffe, 1998) of 16 blind, 16 low vision and 16 sighted students — matched on age, sex, ethnicity, school grade, and geographic location — found that to live independently, visually impaired students required more support than sighted students. However, they had fewer friends that could provide support to them.

Rosenblum (1997) describes a pilot study among 22 visually impaired adolescents aged 13–19. The study found that the female respondents and the 13–15-year-old respondents had more intimate friendships than did the male respondents and the

16–19-year-old respondents. Only a few reported that their visual impairment affected what they did with their friends.

The average size of the networks of visually impaired adolescents in Finland proved to be slightly smaller than that of adolescents without impairment, but the difference did not reach statistical significance (Huurre and Aro, 1998). The average composition of networks of Finnish adolescents with a visual impairment and that of a comparison group sighted adolescents was quite similar. However, visually impaired adolescents less often had many friends, and they had less often dating experiences than sighted adolescents. Parents seemed slightly more supportive than friends for visually impaired Finnish adolescents. No difference was found on the amount of parental support between visually impaired adolescents and sighted adolescents (Huurre et al., 1999).

## 2. Procedure

### 2.1. Instruments

To determine the structural and functional network aspects, two instruments were used: the Social Network Map and the Social Network Grid (Tracy and Whittaker, 1990; Buysse, 1997). As Bien et al. (1991) show, variations of the network measurement instrument and the precise interviewing procedure have some effect on the data. To be able to compare our results with research on a similar group of non-impaired Dutch adolescents, we decided to use the exact measurement instruments and data collection procedures as used in Buysse (1997). Since the final questionnaire is quite long and because of the visual impairment of our respondents, we did not consider including other methods for collecting network data (for a brief historic overview, see Wellman, 1993).

The *Social Network Map* asks about network members in eight sectors: close family (parents and siblings), extended family (uncles, aunts, grandparents, etc.), friends, classmates/teachers/colleagues, clubmates, neighbors, professionals/therapists, and peers from the living group of the care-unit. For each sector, the question is posed if it contains relations that are important. Significant network members can only be listed in one sector: for instance, a friend from a football club can only be listed in the sector friends or the sector club. The respondents could decide in which sector to put each network member. Further information about the network composition was obtained, by asking for personal characteristics of the network members. For instance, how many network members are also blind or visually impaired?

The *Social Network Grid* asks for information about the quality of the relationship with network members, especially with regard to practical and emotional support. The Social Network Grid starts with questions on perceived and received practical support, followed by questions on perceived and received emotional support:

- How often would your — father — help you with practical problems, like driving you somewhere, helping with an odd job or taking care of your things when you go away?
- How often did you actually receive that kind of support from your — father —?

- How often would your — friends — help you with emotional problems, like comforting you when you feel sad, being there for you when you are feeling down and listening when you want to talk?
- How often did you actually receive that kind of support from your — friends —?

The response categories for perceived support are from 1 (never or almost never) to 3 (almost always or always), and for received support from 1 (never) to 6 (a few times every week). A third set of questions is about the reciprocity of the support relationship for each network member or group of network members. Response categories are:  $-1$  (receiving more support than giving), 0 (reciprocal relationship) to  $+1$  (giving more support than receiving). Two questions on satisfaction with network aspects were added. They deal with satisfaction with regard to practical and emotional support, with response categories from 1 (not satisfied) to 5 (extremely satisfied).

Both the Social Network Map and the Social Network Grid were originally constructed for personal face-to-face interviewing, using visual prompts (show-cards). With visually impaired respondents, this leads to practical problems. Therefore, both instruments were adapted for use with visually impaired respondents. Since this creates a rather complicated questionnaire, the interviews were conducted using computer assisted interviewing. Details of the data collection procedures are given below.

For happiness, the *Cantrill Scale* (Cantrill, 1965) was used, which measures general happiness. The response ranges from 1 (very unhappy) to 10 (very happy). For loneliness, an 11-item *Loneliness scale* for adolescents was used (De Jong-Gierveld and Kamphuis, 1985). The response ranges from 0 (not lonely) to 11 (extremely lonely).

To measure the degree of visual impairment, the *Functional Vision Scale*, a self-report six-item questionnaire, was adapted from Weiner (1991). The items measure functional vision instead of visual acuity, for instance: can you see moving objects, like a car driving or people walking by? The Functional Vision Scale was used to construct three categories of visual impairment. If the respondents used braille, they were categorized as blind. If they could not read regular print, but did not use braille, they were categorized as severely visually impaired. If they could read regular print, they were categorized as moderately visually impaired. Dependency on other persons with regard to mobility was asked using a four-point scale, scored from 1 (not dependent on persons, only rarely on a mechanical device) to 4 (dependent on persons regarding mobility).

The living situation was assessed with the question: where do you live most days of the week: with your parents, in an institute or independently on your own? The socioeconomic status was measured by combining educational level and job status of both parents, the resulting SES score is standardized to a mean of zero and variance of one.

## 2.2. Data collection

In view of the complexity of the network questions, the data were collected by a face-to-face interview using a laptop computer (De Leeuw et al., 1995). Specific advantages of computer-assisted interviewing are: automatic routing in complex ques-

tionnaires, fewer questions inadvertently omitted, automatic check on valid response ranges, possibility of randomization in questionnaires, and better concentration of the interviewers on their interviewing task (Zandan and Frost, 1989; Couper and Groves, 1992; Witt and Bernstein, 1992).

The data were mostly collected using ‘computer-assisted personal interviewing’ (CAPI). To provide the respondents with a greater sense of privacy, and to improve comparison with other research that used paper-and-pen questionnaires with certain instruments, we used for some parts ‘computer-assisted self-interviewing’ or CASI, so respondents answered questions themselves. Details about the questionnaire implementation, and the adaptations needed for our special group of respondents are given in De Leeuw et al. (1997).

Sixteen interviewers, all female students of special education, attended a three-day interview training before starting the interviews. Most respondents were interviewed in their homes, some at their own request at school. No other persons were allowed to be present during the interview.

### **3. Respondents and reference group**

The target population of our study consists of blind and visually impaired adolescents from 14 to 24 years of age. The adolescents were approached by letter through the cooperation of special schools and rehabilitation centers. The adolescents had to indicate their willingness to participate in the study by returning an answer card, which 37% of the 950 adolescents we approached did.

In view of the large nonresponse, respondents and nonrespondents were compared on several characteristics: sex, age, degree of impairment and ethnicity. In addition, 20 nonrespondents were approached in a follow-up telephone interview, and asked to respond to several key questions from the interview schedule. There were no large differences between respondents and nonrespondents in either of the nonresponse studies.

The final sample size is 316, and 315 for the multivariate analyses because of a technical problem with the data of one respondent. The respondents lived all over the Netherlands. A summary of the distribution of individual background characteristics is presented in Appendix A.

We compare our results with those of a similar study on the social networks of non-handicapped Dutch adolescents (Buysse, 1997). This study surveyed the social networks and the importance of network aspects for the psychosocial development of adolescents ( $N = 63$ ) in the Netherlands (for details of this study, see Buysse, 1997).

### **4. Results**

The first research question concerns the structural and functional network aspects of blind and visually impaired adolescents, and the comparison of their results with those of non-impaired adolescents.

#### 4.1. Structural network aspects

##### 4.1.1. Network size

The average number of persons in the personal networks of blind or visually impaired adolescents is 15 persons (s.d. = 8). The smallest network consists of two persons and the largest of 49 persons. Small networks, defined as networks of fewer than 12 persons, are found for 41% of the blind and visually impaired adolescents. Large networks, more than 18 persons, are reported by 24% of the respondents.

The average size of the personal network of blind and visually impaired adolescents is significantly smaller than that of the reference group (Buysse, 1997) of sighted Dutch adolescents (mean = 20 persons, s.d. = 13,  $t = 3.04$ ,  $p < 0.001$ ). The occurrence of small networks is higher in the group of visually impaired adolescents.

##### 4.1.2. Network composition

Table 1 shows the reported sizes across the eight sectors, with standard deviation and corresponding variances. It is clear that friends contribute the most to the total network size, followed by close family, extended family, and acquaintances from school and work. The standard deviations show that the size of the sectors vary considerably.

The average number of friends for the total group of blind and visually impaired adolescents is four. More than 65% lists fewer than five friends. One third of our respondents mentioned having a steady girlfriend or boyfriend. The average number of close and extended family members that are of importance for the respondent is three. Parents are important for most respondents and named very frequently. The sectors schoolmates, colleagues and clubmates are not as large as the friends and family ones. The sectors neighbors, professionals and living group members are the smallest ones. Table 2 provides more information on the network composition.

The network of blind and visually impaired adolescents is mostly composed of non-kin members, although the difference between the kin and non-kin percentage is small. On average, 10% of the persons in the network are blind or visually impaired. Furthermore, the mean percentage of friends with a visual impairment is 24%. The

Table 1  
Size of the sectors by respondent ( $N = 316$ )

Sector	Mean	s.d.	Variance
Close family	3.1	1.34	1.8
Extended family	2.7	3.26	10.7
Friends	4.2	3.38	11.5
School/Work	2.1	2.60	6.8
Club	1.2	2.96	8.7
Neighbors	0.5	1.16	1.3
Professionals	0.7	1.24	1.6
Living group	0.1	0.58	0.3
Total network	14.7	8.00	63.9

Table 2

Network composition: background characteristics of network members by respondent ( $N = 316$ )

Percentages	Mean	s.d.	Min.–Max.
Kin members	44%	20%	0%–100%
Non-kin members	56%	20%	0%–100%
Visually impaired network members	10%	15%	0%–83%
Visually impaired friends	24%	35%	0%–100%
Range of age of friends	5 years	6 years	0–35 years
Professionals	5%	7%	0%–44%

average variation of age of the friends is 5 years. Many friends are much older than the respondents themselves. The mean percentage of professional care-workers is 5%.

Compared with sighted Dutch adolescents, blind and visually impaired adolescents list significantly fewer extended family members, neighbors and friends, resulting in a significantly smaller network (Kef, 1999). The percentages for kin members and non-kin members are almost the same for sighted Dutch adolescents (respectively, 47% and 53%, Buysse, 1997).

#### 4.2. Functional network aspects

##### 4.2.1. Social support

The results described in this section are based on the Social Network Grid (SNG, Tracy and Whittaker, 1990). The SNG distinguishes four types of support: practical and emotional support, and received and perceived support. Analysis revealed that all four support types for most network members show only small differences and are strongly correlated ( $p < 0.001$ ). This result, which has also been found by other researchers (Berndt and Perry, 1987; Sarason et al., 1987; Dubow and Ulmann, 1989; Furman and Buhrmester, 1992), makes a distinction between different types of support generally less meaningful. To simplify and order the results in this article conforming to other network research, the support scores were separately computed for five provider systems using a global social support score. The SNG uses a six-point scale for received support and a three-point scale for perceived support. To achieve equal weighing of all support types in the total social support score, the six-point scales were transformed into three-point scales. Subsequently, the four types of support were summed to a global social support score for all network members.

The mean social support scores of the SNG were computed for five support provider systems (Cauce and Srebnik, 1990): parents, siblings, extended family members, peers (partner, friends, classmates and living group members) and the formal network (professionals and teachers). In addition, the support scores of all the network members are also averaged into a total support score of the total network. In creating the scores of support provider systems and the total support score, the presence of a specific network member was taken into account. For instance, if a respondent listed no partner, the social support score for the provider system consisting of peers was computed using three network



groups (friends, classmates and living group members) instead of four. The social support scores of the SNG all range from: ‘1 = never or almost never supporting’ to ‘3 = almost always supporting.’ The results are presented in Table 3.

Table 3 shows that the blind and visually impaired adolescents perceive quite a lot of support from their network members. Parents and peers provide a lot of support. The formal network is more important for providing support than siblings or extended family members are.

Comparison with results of sighted adolescents in the Netherlands (Buysse, 1997) reveals that the mean score of social support for the total network of visually impaired adolescents is lower ( $t = 5.28$ ,  $p < 0.01$ ) than the total social support of non-impaired adolescents. When the results for distinct provider systems are examined, it became clear that the support from peers ( $t = 0.72$ ) and, surprisingly, professionals ( $t = 1.30$ ) did not significantly differ between the two groups. The reported social support from parents, siblings and extended family members is significantly lower in the group visually impaired adolescents compared with the results of sighted adolescents (parents  $t = 6.10$ ,  $p < 0.01$ ; siblings  $t = 4.94$ ,  $p < 0.01$ ; extended family  $t = 3.33$ ,  $p < 0.01$ ) (Kef, 1999).

#### 4.2.2. Reciprocity in social support

Reciprocity in social support was measured with the SNG. The adolescents were asked about the direction of support in each relationship, using a three-point scale: ‘+1 = more from me to them,’ ‘0 = reciprocal’ and ‘-1 = more from them to me.’ In this question, support implies a combination of emotional and practical support.

The results presented in Table 3 show that the average scores for reciprocity were in a negative direction for almost all support provider systems. The reciprocity score of all the network members together is also negative (-0.22). This means that the visually impaired adolescents characterize their relationships with regard to exchanging social support more as receiving than giving. The most reciprocal relationships with regard to social support are with siblings and peers. The most unequal relationship in that regard is, logically, the one with formal network members.

The total reciprocity score is significantly more negative in the reference group of non-impaired adolescents ( $t = 2.67$ ,  $p < 0.01$ ). This result is mainly caused by the tendency of more reciprocal supporting relationships with parents ( $t = 1.88$ ) and ex-

Table 3  
Social support and reciprocity for different support provider systems (mean support and standard deviation)

Support provider system	Support	s.d.	Reciprocity	s.d.
Parents	2.3	(0.38)	-0.37	(0.48)
Siblings	2.0	(0.54)	0.05	(0.47)
Extended family	1.9	(0.43)	-0.14	(0.55)
Peers	2.3	(0.45)	-0.04	(0.35)
Formal network	2.1	(0.47)	-0.80	(0.39)
Total score	2.2	(0.30)	-0.22	(0.26)

tended family members ( $t = 1.28$ ) for the group visually impaired adolescents. For both groups of adolescents, most reciprocal support relationships are with siblings and peers (Kef, 1999).

#### 4.2.3. Satisfaction

The satisfaction with the emotional support and practical support had to be evaluated by the respondents for all their network members together. The responses for satisfaction with emotional support and practical support correlate strongly ( $p = < 0.001$ ). Therefore, the answers to these questions were combined in one dimension for satisfaction with social support, with a range of answers between not satisfied (1) and extremely satisfied (5). The average score for satisfaction with support is 3.80 (s.d. = 0.70), which is between satisfied and very satisfied. From the total sample ( $N = 316$ ), 58% is (extremely) satisfied. The Dutch reference project did not offer possibilities to compare results with regard to this functional network aspect.

### 4.3. Structural and functional network differences and respondent characteristics

The second research question inquires whether sociodemographic and vision-related characteristics affect the structural and functional aspects of the personal network of visually impaired adolescents. For the structural network aspects, we consider the distinction between different network sectors by applying a multilevel regression model — using MLn (Rasbash and Woodhouse, 1995) — which is described below. For the functional network aspects, we use the global social support score and satisfaction with support, and apply a standard multiple regression model.

#### 4.3.1. Multilevel analysis of structural network differences

Our network data consist of a series of repeated measures for each person, reflecting the network size in specific sectors. A flexible model to analyze such data is the multivariate multilevel model (cf. Raudenbush et al., 1991; Goldstein, 1995). In this model, we consider the individuals as the highest level. Within each individual, we have eight repeated measures, one for each of our eight sectors in the network. The sectors are entered into the multilevel regression equation as eight dummy variables; there is no intercept in this regression model. The regression coefficients for the dummy variables represent the average addition to the total network size by the sector, and the residual errors represent each individual's individual deviation from that average.

The advantage of a multilevel approach instead of the more usual MANOVA is the greater flexibility of the multilevel model. Individual characteristics are incorporated as covariates. It is useful to enter individual covariates in two steps. In the first step, a covariate is entered directly, which implies that it affects all network sectors to the same extent. In the second step, interactions are specified between the sectors and the covariates. Table 4 presents therefore the results of a succession of three models: model 1 with only sector dummies, model 2 with individual characteristics added as covariates, and model 3 with added selected interactions.

Table 4 presents regression coefficients and residual error variances.  $P$ -values are given between parentheses. Table 4 also presents a statistic called the deviance. For two

Table 4

Results network size modeling (regression coefficients and variance components, *p*-values in parentheses)

	Model 1: sectors only	Model 2: + covariates	Model 3: + interactions
<i>Sectors</i>			
close family	3.1 (0.08)(0.00)	2.9 (0.12)(0.00)	2.8 (0.15)(0.00)
extended family	2.7 (0.18)(0.00)	2.5 (0.20)(0.00)	2.4 (0.22)(0.00)
friends	4.2 (0.19)(0.00)	4.0 (0.21)(0.00)	3.8 (0.22)(0.00)
school/work	2.1 (0.15)(0.00)	1.9 (0.17)(0.00)	1.8 (0.19)(0.00)
club	1.2 (0.17)(0.00)	1.0 (0.19)(0.00)	0.9 (0.21)(0.00)
neighbors	0.5 (0.07)(0.00)	0.3 (0.11)(0.00)	0.2 (0.14)(0.08)
professionals	0.7 (0.06)(0.00)	0.5 (0.11)(0.00)	0.4 (0.14)(0.00)
living group	0.1 (0.03)(0.00)	−0.1 (0.10)(0.16)	−0.2 (0.13)(0.06)
<i>Covariates</i>			
sex		0.0 (0.04)(0.99)	0.1 (0.07)(0.08)
age		0.1 (0.03)(0.08)	0.1 (0.03)(0.05)
SES		0.0 (0.02)(0.99)	0.0 (0.02)(0.99)
live in an institute		0.5 (0.07)(0.00)	0.3 (0.11)(0.00)
live independently		0.1 (0.08)(0.08)	0.3 (0.10)(0.00)
degree of impairment		0.0 (0.03)(0.99)	0.0 (0.04)(0.99)
dependency in mobility		0.0 (0.03)(0.99)	0.0 (0.04)(0.99)
<i>Interactions</i>			
sex * friends			0.8 (0.36)(0.01)
live in an institute * professionals			0.8 (0.20)(0.00)
live in an institute * living group			0.7 (0.16)(0.00)
live independently * extended family			1.4 (0.52)(0.00)
live independently * friends			1.5 (0.54)(0.00)
degree of impairment * extended family			0.6 (0.24)(0.00)
dependency in mobility * extended family			0.5 (0.21)(0.00)
<i>Variance components<sup>a</sup></i>			
Sectors	Variance (s.e.)	Variance (s.e.)	Variance (s.e.)
close family	1.8 (0.14)	1.8 (0.15)	1.8 (0.14)
extended family	10.6 (0.85)	10.6 (0.84)	10.2 (0.82)
friends	11.3 (0.90)	11.2 (0.89)	10.7 (0.85)
school/work	6.8 (0.54)	6.8 (0.54)	6.7 (0.54)
club	8.7 (0.69)	8.7 (0.70)	8.7 (0.69)
neighbors	1.3 (0.11)	1.3 (0.10)	1.3 (0.11)
professionals	1.0 (0.07)	0.9 (0.07)	0.9 (0.07)
living group	0.3 (0.03)	0.3 (0.02)	0.3 (0.02)
<i>Deviance:</i>	9780.9	9717.3	9668.1

<sup>a</sup>All variables are significant at  $p < 0.01$ .

nested models, the difference in their deviances is distributed as a chi-square statistic, with degrees of freedom equal to the difference in the number of estimated parameters. This can be used to conduct an overall test for the improvement of a model compared to a simpler model.

The regression coefficients in the first model, the ‘sectors only’ model, reflect the contribution of the specific sectors to the network size. Since there is no intercept, and the sectors are coded as 0/1 dummies, each coefficient can be viewed as the net contribution to the total network size by that sector.

The second model in Table 4 adds a number of individual characteristics as covariates that affect all sectors. Only one covariate, ‘living in an institute,’ has a significant effect on the network size. Respondents who live in an institute, list on average 0.5 more network members. There is a marginally non-significant effect for ‘age’ and ‘living independently’; older and independently living respondents tend to list more network members. For all other covariates, the general effect is clearly non-significant.

The third model in Table 4 adds significant interaction terms. The first entry, ‘sex\*friends,’ with a regression coefficient of 0.8, indicates that females tend to list 0.8 more network members in the sector ‘friends.’ Living in an institute has two specific effects: these respondents list on average 0.8 more professionals, and 0.7 more peers from their living group. In the third model, there is also a general effect of living in an institute, with a (significant) regression coefficient of 0.3, meaning on average listing 0.3 more persons in the network as a whole. Thus, living in an institute predicts a total of 1.8 more network members. Living independently also predicts listing more extended family (1.4) and friends (1.5), again in addition to a small general effect (0.3). Thus, the total effect of living independently is 3.2 more network members. Finally, both respondents with a larger degree of visual impairment, and respondents who are dependent on others for their mobility, list more extended family, but these effects are smaller. Other interactions — not in Table 4 — were clearly not significant.

The results in Table 4 include estimates of the variance of the regression coefficients across respondents. The variances of the sectors ‘friends,’ ‘extended family,’ ‘club,’ and ‘school/work’ are considerable. This means that the respondents differ much in the sizes of these sectors and, thus, in the composition of their networks.

4.3.2. Analysis of functional network differences

Table 5 presents the results of a multiple regression analysis of the dependent variables ‘total social support’ and ‘satisfaction with support’ with several individual respondent characteristics as predictors.

Table 5  
Functional network aspects and respondent characteristics (regression coefficients, standard errors and p-values)

Dependent variable	R	Predictors	b (s.e.)	p
Social support	0.29	sex	0.15 (0.04)	0.000
		living independently	-0.13 (0.05)	0.010
		living in an institute	0.10 (0.05)	0.034
		dependency in mobility	-0.03 (0.02)	0.108
Satisfaction	0.18	sex	0.22 (0.08)	0.004
		age	-0.08 (.050)	0.090

A high amount of social support is weakly predicted by sex (females reported more support), not living independently, and living in an institute. The direction of the (non-significant) relation for dependency in mobility is not as expected. A high level of satisfaction with support is predicted by sex (females are more satisfied) and age (younger adolescents are more satisfied).

#### 4.4. The influence of structural and functional network aspects on well-being

The third research question asks whether the differences in structural and functional network aspects affect feelings of well-being, as indicated by happiness and loneliness.

##### 4.4.1. Happiness and loneliness

Happiness was measured by using the Cantrill scale, with a minimum score of 1 and a maximum of 10. The results for loneliness can vary between the minimum score of 0 and a maximum score of 11. Our sample had a mean of 7.9 on happiness (s.d. = 1.8) and 2.7 on loneliness (s.d. = 2.6). These results indicate that, in general, blind and visually impaired adolescents experience a high feeling of happiness, while the majority of the group is not very lonely. However, about 15% of the group still experiences severe feelings of loneliness, as indicated by a score of six or higher on the loneliness scale. The results of visually impaired adolescents concerning happiness and loneliness did not significantly differ from those of non-impaired adolescents (Kef, 1999).

To study the influence of network aspects on well-being, we add individual characteristics, in order to control for these. For the analysis, we employ a MIMIC model. A MIMIC (*M*ultiple *I*ndicator, *M*ultiple *C*auses) model is a structural equation model with one latent construct. The latent construct is indicated by one or more observed variables, and affected by one or more predictor variables (cf. Bollen, 1989, p. 331). Our MIMIC model is presented in Fig. 1.

The model contains one latent construct 'well-being,' which is indicated by the observed variables happiness and loneliness. Among the predictor variables used to predict the latent construct of well-being, we distinguish between two sets of variables. The first variable set, from severity of impairment to living in an institute, concerns individual characteristics. The second set, from network size to satisfaction with support, concerns network aspects. We have used the Amos program (Arbuckle, 1995) to obtain maximum likelihood estimates for the parameters in the model. The overall model fit is good, as indicated by the model test ( $\chi^2 = 9.3$ ,  $df = 9$ ,  $p = 0.41$ ), and the goodness of fit indices (GFI = 1.00, TLI = 0.99, RMSEA = 0.01). The model in Fig. 1 predicts 33% of the variance of the latent construct well-being, and 34% of the observed variable happiness and 51% of the observed variable loneliness. Table 6 presents the parameter estimates.

As Table 6 shows, only one individual characteristic significantly affects the latent construct well-being: the individual's dependence on others for mobility. Living in an institute and sex are marginally insignificant. Of the three network aspects, two have a clearly significant effect on well-being: satisfaction with support and network size. The total amount of support received is marginally insignificant. It appears that network

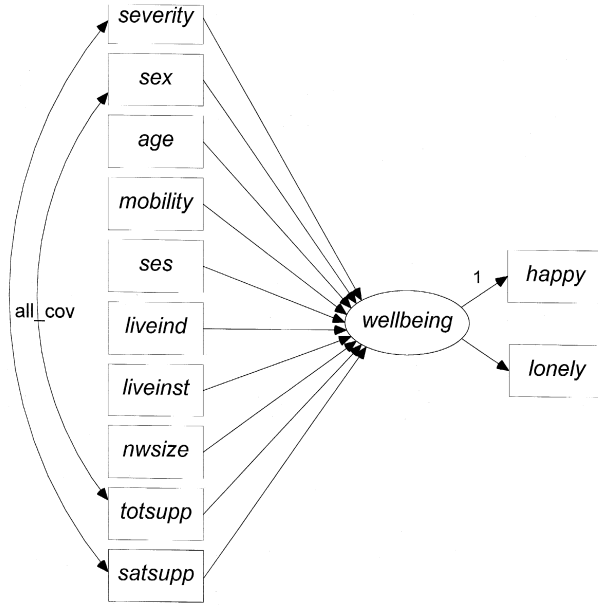


Fig. 1. MIMIC model for well-being of visually impaired adolescents.

aspects are more important than individual characteristics for the well-being of our visually impaired respondents.

The relative influence of individual characteristics and network aspects can be compared formally within the structural equations framework. If we restrict all paths

Table 6

Unstandardized parameter estimates of the MIMIC model for the effect of individual and network characteristics on well-being

Path from	Path to	Path coefficients (s.e.)	p-value
degree of impairment	well-being	0.08 (0.09)	0.19
sex	well-being	-0.21 (0.15)	0.08
age	well-being	-0.11 (0.10)	0.13
dependency in mobility	well-being	-0.18 (0.09)	0.02*
SES	well-being	0.01 (0.07)	0.44
living independently	well-being	-0.02 (0.23)	0.46
living in an institute	well-being	0.32 (0.21)	0.06
network size	well-being	0.02 (0.01)	0.04*
total support	well-being	0.34 (0.23)	0.07
satisfaction with support	well-being	0.73 (0.13)	0.00*
well-being	happiness	1.00 (fixed)	
well-being	loneliness	-1.82 (0.31)	0.00*

\* Significant at  $p < 0.05$ .

from the individual characteristics to well-being to zero, we have a model that is a subset of the model in Fig. 1. The difference between the chi-squares of the model in Fig. 1 and of the restricted model, is a chi-square variate, with degrees of freedom equal to the difference in degrees of freedom of the two models (Bollen, 1989). This provides an omnibus test for the hypothesis that all individual variables may be omitted. This test is significant ( $\chi^2 = 16.6$ ,  $df = 7$ ,  $p = 0.02$ ), and the amount of variance in well-being that is explained drops from 33% to 25%, which shows that we may not totally ignore the individual characteristics. If we restrict the network variables to have no effect on well-being, the model deteriorates much more ( $\chi^2 = 56.3$ ,  $df = 3$ ,  $p = 0.00$ ), and the amount of explained variance drops from 33% to 6%. The network variables are clearly important, and more so than the individual characteristics.

## 5. Conclusions

Our first research question investigates the structural and functional aspects of the personal networks of blind and visually impaired adolescents. The average network size is 15 persons and small networks often occur. These results confirm results of other studies with visually impaired persons (Weiner, 1991; Huurre and Aro, 1998; Sacks and Wolffe, 1998). The largest sectors in the network are extended family, friends, and close family. The majority of network members is non-kin, 10% of the network members is also visually impaired, and professionals are, on average, only a small part of the network (5%). Compared with sighted Dutch adolescents, blind and visually impaired adolescents list fewer extended family members, neighbors and friends, resulting in a significantly smaller network (Kef, 1999; Kef et al., 1997). In the Netherlands, there has been a strong movement toward integration of impaired and handicapped individuals in the general society. It appears that, with regard to blind and visually impaired adolescents, this movement has not succeeded in providing them with personal networks of similar sizes to those of non-handicapped peers. The relatively small network of blind and visually impaired adolescents might be explained by their reduced mobility, which creates certain restraints that negatively influence the number of network members, as demonstrated in Lyons et al. (1995).

Blind and visually impaired adolescents perceived a lot of social support, especially from parents and peers. Compared with sighted adolescents, blind and visually impaired adolescents received less support, but not from peers (Kef, 1999; Kef et al., 1997). During adolescence, a balance of experiences with social support and autonomy is crucial for healthy social-emotional functioning (Bryant, 1989). This attitude is also reflected in the reciprocity score, which is only slightly unbalanced. A Finnish study found no differences considering the amount of parental support between visually impaired adolescents and sighted adolescents (Huurre et al., 1999). We found that visually impaired Dutch adolescents perceived less support from their parents than non-impaired adolescents. The amount of peer support was the same in both groups, as in the Finnish study. The majority of the blind and visually impaired adolescents is satisfied with support. In general, blind and visually impaired adolescents experience a high level of happiness and they are not feeling very lonely. To conclude, the results of

the two groups — visually impaired adolescents and non-impaired adolescents — show similarities and differences. More differences were found for the structural network aspects than for the functional network aspects. The visual impairment does have an impact, but not a large one.

The second research question concerned differences within the group of visually impaired adolescents. A few effects of sex, age, SES, living situation, degree of impairment and dependency in mobility on the network aspects were found. The living situation of the respondents affects especially the size of the sectors living group members and professionals and the amount of social support. Samuelsson (1997) also found some influence of housing conditions on networks of non-impaired children. Female respondents list more friends and tend to have larger networks, as found in many studies (Weiner, 1991; Buysse, 1997; Samuelsson, 1997; Huurre and Aro, 1998). Blind respondents list more extended family members than visually impaired respondents did. Dependency in mobility influenced especially the size of the sector extended family members and the amount of social support. Age does not have a large effect on network aspects, quite surprisingly considering the development in adolescence and the results presented by Samuelsson (1997). In sum, a mix of personal characteristics and environment characteristics influences structural and functional network aspects, but generally spoken their influence is low.

What is the effect of network aspects on well-being? Structural equation modelling shows that the satisfaction with the social support and network size have a positive effect on well-being. Surprising is the result that social support has only a marginally insignificant effect on well-being. Other studies have found larger effects of social support of network members (e.g., Sarason et al., 1990). The combination of variables used in the structural equation modeling might have influenced this result, as may the combining of support of different provider systems. The significance of, for instance, parental support and peer support for well-being may differ, as Kef (1999) demonstrated.

Of the included individual characteristics, only the degree of independence in mobility influences well-being (more independent, higher well-being). Not needing the assistance from persons for mobility, so feeling independent in that regard, is apparently very important in the life of blind and visually impaired adolescents, a result we also found in an earlier study (Habekothé and Peters, 1993). Sex and living in an institute are marginally insignificant. Females are inclined to be less happy, and respondents who live in an institute appear to feel more happy. The last result was not expected on the basis of the literature.

Restriction of specific paths in the structural equation model shows that network aspects influence well-being more than individual characteristics do. Other structural equation analyses (Kef, 1999) demonstrated that including more background characteristics improved the model only slightly, indicating again that the network factors had more meaning than individual and context variables did. This result ties in with the few differences in the personal networks we found relating to individual characteristics, and it confirms the significance of social networks for well-being as mentioned in the literature. The basis of the structural equations analyses was our theoretical framework: the socio-ecological model, including risk and protective factors. It proved to work very



well in our study and provided an insight into how to identify successful groups and groups more at risk.

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## Appendix A. Summary of background characteristics of research respondents ( $N = 316$ )

Characteristic	Percentage
Male	53%
Female	47%
14 through 18 years of age	46%
18 through 21 years of age	31%
21 through 24 years of age	23%
Blind	19%
Severely visually impaired	18%
Moderately visually impaired	63%
Sometimes using a device with regard to mobility	64%
Always using a device with regard to mobility	15%
Sometimes need help from a person regarding mobility	18%
Very often need help from a person regarding mobility	3%
Living with parents	74%
Living in an institute	13%
Living independently	13%

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