

Social capital affects the health of older people more strongly than that of younger people

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ABSTRACT

The study examines whether social capital affects health of older people more strongly than it affects health of younger individuals. Following Pierre Bourdieu's concept, social capital has been analysed on a cognitive dimension, distinguishing between institutional and informal social capital. The analysis is based on the data of the Austrian Health Interview Survey 2006–07 with a representative sample of 15,575 people. Multivariate linear regression models were calculated. Measures of health and social capital were operationalised by indices based on the quality of life inventory of the World Health Organization, the WHOQOL-Brief questionnaire. The analysis has shown institutional social capital to be significantly more important for health of older people (60 years or older) than for younger people. There is a gender difference in the interaction between informal social capital and age in their association with psychological health. In contrast to the sub-sample of women, the psychological health of older men is more strongly affected by a lack of informal social capital than that of younger men. Institutional social capital is of special importance for the health of older people. Therefore health-promotion activities for older people should include activities to strengthen their social capital.

KEY WORDS – social capital, health, older people.

Introduction

Many modern concepts of health which rely on a bio-psycho-social paradigm of health stress the importance of demands and resources an individual is exposed to. These demands and resources are located at three levels: the macro environment, the micro environment (external demands and resources) and the personal (internal demands and resources) (Freidl, Rásky and Stronegger 1999; Freidl *et al.* 2007).

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Research shows social inequality, and especially low income, to be an important factor in maintaining health (Brunner *et al.* 2009; Crimmins, Kim and Seeman 2009; Marmot *et al.* 2010; Rognerud and Zahl 2006; Zajacova, Dowd and Allison 2009). In order to understand the effects of social inequality on health it seems useful not just to analyse economic inequality but also other forms of social inequality. Social capital is such a dimension of social inequality.

There are several different definitions of social capital (Bourdieu 2005; Lin 2001; Putnam 2000). Numerous studies about social capital and health refer to Putman and operationalise social capital by measures of trust and participation (Giordano and Lindstrom 2010; Lindström 2005; Snelgrove, Pikhart and Stafford 2009). Harpham (2008) distinguishes between structural and cognitive social capital. Other researchers rely on Bourdieu's theory of social capital (Carpiano 2008). Bourdieu defines social capital as the entirety of actual or potential resources an individual has access to. These resources depend on belonging to certain groups. They can be based on material or symbolic exchange relationships and can be more or less institutionalised. In other words, the resources can be based on institutionalised guarantees such as legal claims or on subjective feelings like recognition, respect and friendship (Bourdieu 2005: 63ff). These subjective feelings belong to the cognitive dimension of social capital. Following Bourdieu, belonging to a certain group can be characterized by geographic neighbourhood, by the quality of the neighbourhood or by economic and social closeness (Bourdieu 2005: 64ff). One possibility to operationalise the quality of neighbourhood is to measure the satisfaction of individuals with their social bonds. Thus this satisfaction is a possible measure for the cognitive dimension of social capital, whether institutional or informal.

Research has shown social capital to be important for older people in general (Gray 2009) and to be a resource for maintaining health (D'Hombres *et al.* 2010; Ichida *et al.* 2009; Kawachi, Kennedy and Glass 1999; Kawachi, Subramanian and Kim 2008; Nummela *et al.* 2009; Snelgrove, Pikhart and Stafford 2009; Theurer and Wister 2009). Recent studies on social capital and health have started to investigate the associations between different dimensions of social capital and health. Results, however, remain inconsistent (Berry and Welsh 2010; D'Hombres *et al.* 2010; Saggpag *et al.* 2008; Snelgrove, Pikhart and Stafford 2009). Some research shows a particular association between social capital and the health of older people, suggesting that social capital is an important health resource for older people (Boneham and Sixsmith 2006). Others found social participation and access to help as two dimensions of social capital that are strong indicators for older people's health (Nummela *et al.* 2009).

Purpose

To our knowledge it has not yet been investigated systematically whether the strength of the association between social capital and health differs between age groups. The aim of our study was therefore to find out whether social capital is associated more strongly with the health of older people than of younger individuals and if such an effect can be observed even when controlling for socio-economic status. Previous studies (D'Hombres *et al.* 2010; Ichida *et al.* 2009; Nummela *et al.* 2009; Snelgrove, Pikhart and Stafford 2009) did not investigate the relationship between the cognitive aspects of social capital and health. Hence, in contrast to previous studies, we refer to Bourdieu's theory in order to analyse this association.

In addition, there is a need for research on more complex measures of social capital and its associations with health (Ziersch *et al.* 2005). In order to compile more detailed information about the effect of social capital on health in different age groups we investigated the association of the two dimensions of social capital (institutional and informal social capital) on two forms of health (physical and psychological health). We analysed institutional and informal social capital on the cognitive dimension, defined as follows:

- *Institutional social capital* corresponds to an individual's satisfaction with and perception of his/her access to different institutionalised resources.
- *Informal social capital*, on the cognitive level, corresponds to resources based on subjective feelings as well as on emotional and geographic closeness to other known people.

Therefore we operationalise informal social capital by the quality of and satisfaction with social contacts rather than by their frequency.

Methods

Data

The data for the analysis were taken from the Austrian Health Interview Survey (ATHIS) 2006–07 (Klimont, Kytir and Leitner 2007). The ATHIS forms part of the European Health Interview Survey (EHIS) (European Commission 2010), carried out by Statistik Austria.

In the period between March 2006 and February 2007 a total of 15,474 individuals were interviewed by way of computer-assisted face-to-face interviews (CAPI). The random sample was drawn from the central population register; it is representative for the Austrian population. The response rate was 61.58 per cent (N = 15,474; 7,005 men and 8,469 women) out of a gross sample of 25,130 people).

Measures

The constructs investigated in this study were drawn from the quality of life inventory of the World Health Organization (WHO), the WHOQOL-Brief, Dependent Variables: Indices of Health.

Status

We measured health on two dimensions: physical and psychological health. The two dimensions of health were confirmed by a confirmatory factor analysis for the variables from the physical and psychological domains of the WHOQOL-Brief and calculated in accordance with the WHO specification (WHO 1998: 106).

Physical health was measured by the physical domain of health of the WHOQOL-Brief. The index reaches a Cronbach alpha of 0.90 (mean = 78.76, standard deviation (SD) = 19.70). The scale ranges from 0 (very poor health) to 100 (excellent health).

The second index (psychological health) was measured by the psychological domain of the WHOQOL-Brief. The index reaches a Cronbach alpha of 0.82 (mean = 76.38, SD = 15.21) and ranges from 0 (very poor health) to 100 (excellent health).

Independent variables

Social capital. Social capital was operationalised following Bourdieu's theory as explained in the introduction. All variables of the indices were taken from the WHOQOL-Brief social and environmental domains. The index of institutional social capital ranges from 5 to 25. The index of informal social capital has a range from 3 to 15. As both are sum-indices, they are not categorical but can be assumed to be metric. A value of 5 (institutional) or 3 (informal) indicates very low social capital, a value of 25 or respectively 15 indicates very high social capital.

Institutional social capital. The index 'institutional social capital' corresponds to the perception of and satisfaction with the access of individuals to different institutionalised resources. The index with a reliability of Cronbach alpha = 0.70 (mean = 20.36, SD = 2.91) is composed as the sum of the following five variables: 'How available to you is the information that you need in your day-to-day life?'; 'To what extent do you have the opportunity for leisure activities?'; 'How safe do you feel in your daily life?'; 'How satisfied are you with your transport?'; 'How satisfied are you with your access to health services?.'

Informal social capital. The dimension of informal social capital corresponds to resources based on subjective feelings as well as on emotional and geographic closeness to other known persons. The sum-index reaches a reliability of Cronbach $\alpha=0.62$ (mean=12.71, SD=1.72) and is composed of the following three items: 'How satisfied are you with your personal relationships?'; 'How satisfied are you with the support you get from your friends?'; 'How satisfied are you with the conditions of your living place?' The question on satisfaction with the conditions at the living place has been integrated in the index of informal social capital, based on the result of the factor analysis. As neighbourhood is one important aspect of conditions at the living place, it is likely that those interviewed interpreted the question in that way, so the variable refers to the factor of informal social capital.

Socio-economic status

In order to control for the impact of social capital on health, the following variables concerning the socio-economic position of the individuals were included in the model: equivalent income, level of education, job characteristics/position and the question on self-perceived quality of livelihood.

Equivalent income. We used the Organization for Economic Cooperation and Development (OECD) equivalence scale (OECD Social Policy Division 2009) to calculate the equivalent income per capita, irrespective of the sources of household income (mean=1103.06, SD=640.48).

Level of education. This was measured by an ordinal variable which distinguishes between five levels of education, including the years of schooling.

Job characteristics. These were measured by an ordinal index variable ranging from 0 to 3, ranging from unemployed (0) to persons in higher non-manual occupations (3).

Self-perceived quality of livelihood. Self-perception of livelihood was measured with the item: 'How do you get by with your money?' The range of the item lies between 1 – not at all and 5 – very well.

Age

In order to analyse the difference between younger and older persons, age was classified in four groups: 15–29 years (N=3,111), 30–44 years

($N=3,979$), 45–59 years ($N=3,759$) and 60 years or older ($N=4,625$). The age of 60 is an important cut-off point in Austria since many persons retire from gainful occupation at that age. For this reason the older age group is defined as 60 years or older.

Statistical analyses

The indices of health and social capital were confirmed by factor analyses. As extraction method, principal axis factoring was used. Orthogonal rotation (varimax) was also adopted.

The associations between health status and social capital were analysed by calculating multiple linear regression models using the SPSS (version 17.0) procedure for general linear modelling. In total, four different multiple regression models with two different dependent variables (measures of health status) were calculated. In order to stratify by gender, each model was calculated two times, separately for men and women. The youngest age group was chosen as group of reference. In total six interaction terms (*see* Table 2) were calculated and integrated in the multiple regression model. Models with significant interaction terms were calculated for the total sample in addition to the gender-stratified analysis and are presented in figures. The values of the B coefficients were calculated with a confidence interval of 95 per cent.

When uncentred variables are used, correlations between dependent variables, in particular between dependent variables and interaction terms, can occur. This problem of multicollinearity can be avoided using centred variables for the interaction term (Aiken and West 1991: 35). To centre variables the following formula is used: $X_i - \text{mean score of } X$. Tolerance statistics showed no problems with multicollinearity. None of the models has a tolerance value lower than 0.70.

Results

Table 1 presents descriptives for institutional social capital, informal social capital, physical health and psychological health stratified by gender and age groups.

Associations between social capital and health adjusted by age and socio-economic status

All models calculated include institutional and informal social capital as independent variables. The described variables for socio-economic status

TABLE 1. Mean scores and standard deviations for measures of social capital and health, stratified by gender and age

	Institutional social capital	Informal social capital	Physical health	Psychological health
	<i>Mean score (standard deviation)</i>			
Male	20.51 (2.83)	12.69 (1.69)	80.40 (18.65)	78.28 (14.63)
Female	20.23 (2.97)	12.73 (1.71)	77.40 (20.43)	74.81 (15.51)
15–29 years	21.24 (2.59)	13.07 (1.68)	90.04 (11.15)	82.84 (12.34)
30–44 years	20.71 (2.68)	12.94 (1.68)	86.34 (13.91)	80.40 (12.65)
45–59 years	20.18 (2.90)	12.60 (1.74)	77.49 (18.43)	75.01 (14.77)
60+ years	19.61 (3.11)	12.36 (1.69)	65.69 (21.57)	69.71 (16.41)
Male 15–29 years	21.45 (2.51)	13.05 (1.65)	91.13 (10.28)	84.36 (11.95)
Male 30–44 years	20.69 (2.67)	12.85 (1.70)	86.30 (13.93)	81.46 (2.67)
Male 45–59 years	20.10 (2.88)	12.53 (1.70)	77.63 (18.44)	76.04 (14.60)
Male 60+ years	19.95 (2.98)	12.38 (1.65)	68.75 (20.63)	72.41 (15.69)
Female 15–29 years	21.04 (2.65)	13.09 (1.72)	88.98 (11.84)	81.35 (12.53)
Female 30–44 years	20.73 (2.69)	13.03 (1.68)	86.37 (13.89)	79.48 (12.64)
Female 45–59 years	20.22 (2.92)	12.66 (1.78)	77.38 (18.43)	74.18 (14.86)
Female 60+ years	19.36 (3.17)	12.34 (1.72)	63.47 (21.98)	67.74 (16.64)

and age were integrated as covariates. Interaction effects between age and social capital were calculated, in order to analyse age differences in the effect of social capital on health. The measures of health (physical health and psychological health) were varied over the different models (see Table 2). All other variables were kept stable for all models. All values are presented in Table 2; the most important results are described below.

Both institutional and informal social capital is strongly and statistically significantly associated with physical and psychological health. The more institutional social capital a person has, the better is his or her physical (males: $B=2.42^{***}$, females: $B=2.49^{***}$; significance level: $*** p<0.001$) and psychological health (males: $B=2.05^{***}$, females: $B=1.88$); and the more informal social capital a person has, the better his or her physical (males: $B=1.50^{***}$, females: $B=1.28$) and psychological health (males: $B=2.33^{***}$, females: $B=2.26^{***}$).

Both dimensions of health are associated more strongly with institutional and informal social capital than with indicators of socio-economic status. Institutional social capital and age are the strongest factors influencing physical health. Institutional social capital and informal social capital are the strongest factors influencing psychological health. Institutional social capital has a stronger influence than informal social capital on physical health and psychological health. There are no significant gender differences in the general results described above.

TABLE 2. Regression model for physical health and psychological health as dependent variables: coefficient B with a 95% confidence interval adjusted for institutional and informal social capital, and interaction terms

Dependent	Physical health		Psychological health	
	Men ($R^2=0.49$)	Women ($R^2=0.48$)	Men ($R^2=0.49$)	Women ($R^2=0.48$)
	<i>B (95% confidence interval)</i>			
Main effects:				
Institutional social capital	2.42 (2.27, 2.57)***	2.49 (2.35, 2.64)***	2.05 (1.93, 2.17)***	1.88 (1.77, 1.99)***
Informal social capital	1.50 (1.27, 1.74)***	1.28 (1.05, 1.51)***	2.33 (2.14, 2.52)***	2.26 (2.09, 2.44)***
Age in four groups (Ref: 15–29 years)				
30–44 years	–4.77 (–5.82, –3.72)***	–3.09 (–4.12, –2.06)***	–1.87 (–2.68, –1.05)***	–2.15 (–2.95, –1.35)***
45–59 years	–11.18 (–12.4, 10.11)***	–9.51 (–10.55, –8.46)***	–4.91 (–5.4, –4.08)***	–5.20 (–6.02, –4.39)***
60+ years	–17.47 (18.63, –16.31)***	–17.65 (–18.79, –16.51)***	–7.06 (–7.97, –6.16)***	–7.49 (–8.38, –6.60)***
Level of education (Ref: 5 highest)				
1 (lowest)	–4.37 (–5.94, –2.82)***	–3.89 (–5.35, –2.44)***	–2.14 (–3.35, –0.92)***	–2.43 (–3.57, –1.29)***
2	–2.27 (–3.73, –0.81)***	–0.76 (–2.23, 0.70)	–0.51 (–1.65, 0.62)	–0.06 (–1.20, 1.08)
3	–1.21 (–2.92, 0.49)	–0.61 (–2.12, 0.89)	–0.93 (–2.26, 0.40)	–0.35 (–1.53, 0.82)
4	–0.97 (–2.53, 0.59)	–1.01 (–2.53, 0.52)	–0.38 (–1.59, 0.84)	0.01 (–1.18, 1.19)

Position in job (Ref: 3 highest)				
o (lowest)	-6.58 (-8.65, -4.40)***	-6.89 (-9.15, -4.61)***	-2.40 (-4.06, -0.75)***	-4.11 (-5.89, -2.33)***
1	-2.61 (-3.74, -1.48)***	-1.73 (-2.89, -0.55)***	-1.11 (-1.99, -0.23)**	-0.38 (-1.29, 0.53)
1.5	-5.44 (-10.11, -0.77)*	-6.11 (-11.04, -1.17)*	0.01 (-3.62, 3.65)	-0.50 (-4.35, 3.34)
2	0.07 (-1.02, 1.16)	-0.02 (-1.11, 1.08)	-0.078 (-0.93, 0.77)	0.24 (-0.61, 1.09)
Getting by with money (ability to manage money) (Ref: very well):				
Not at all	-6.40 (-8.84, -3.96)***	-3.25 (-5.72, -0.79)**	-7.16 (-9.06, -5.26)***	-6.37 (-8.29, -4.45)***
Rather not	-3.24 (-4.76, -1.72)***	-4.03 (-5.48, -2.58)***	-4.74 (-5.92, -3.55)***	-5.05 (-6.17, -3.92)***
Rather well	-0.92 (-1.98, 0.13)	-0.57 (-1.58, 0.45)	-1.96 (-2.78, -1.15)***	-1.79 (-2.58, -1.00)***
Well	-0.27 (-1.24, 0.71)	0.64 (-0.29, 1.58)	-1.23 (-1.99, -0.47)***	-0.36 (-1.09, 0.36)
Equivalent income in euros	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)
Interaction effects:				
Age 30-44×inst soc cap	0.64 (0.22, 1.06)***	0.16 (-0.24, 0.56)	-0.13 (-0.46, 0.19)	0.26 (-0.05, 0.57)
Age 30-44×inf soc cap	0.32 (-0.35, 0.98)	0.49 (-0.14, 1.13)	0.59 (0.07, 1.10)*	-0.08 (-0.58, 0.41)
Age 45-59×inst soc cap	1.27 (0.85, 1.69)***	1.04 (0.65, 1.44)***	0.22 (-0.11, 0.55)	0.51 (0.19, 0.81)
Age 45-59×inf soc cap	0.50 (-0.19, 1.19)	0.23 (-0.41, 0.86)	0.79 (0.26, 1.34)***	0.14 (-0.36, 0.63)
Age 60+×inst soc cap	2.31 (1.91, 2.71)***	2.19 (1.79, 2.58)***	0.62 (0.30, 0.93)***	1.08 (0.78, 1.39)***
Age 60+×inf soc cap	0.17 (-0.49, 0.83)	-0.36 (-1.03, 0.31)	0.89 (0.37, 1.41)***	0.19 (-0.33, 0.71)

Notes: Ref: category of reference. inf soc cap: informal social capital. inst soc cap: institutional social capital.

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

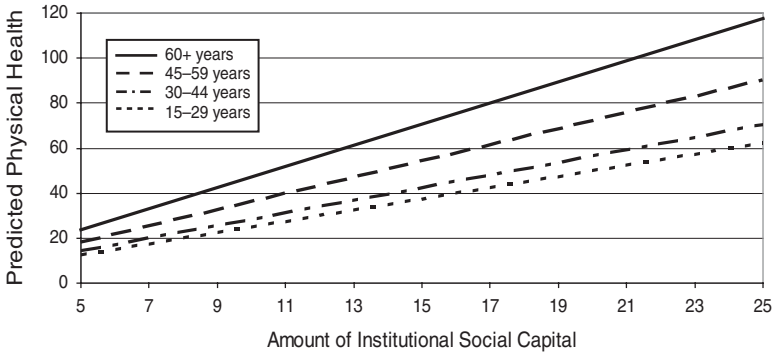


Figure 1. Predicted physical health by institutional social capital in age groups.

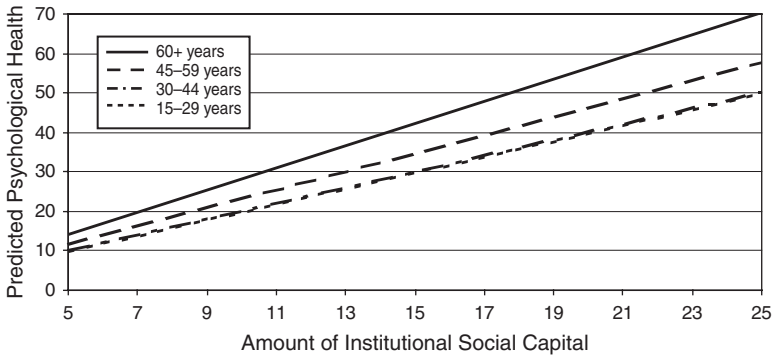


Figure 2. Predicted psychological health by institutional social capital in age groups.

Interaction effects between age and social capital concerning health

Institutional social capital is significantly more important for physical health (males: $B=2.31^{***}$, females: $B=2.19^{***}$) and psychological health (males: $B=0.62^{***}$, females: $B=1.08^{***}$) of older people (60 years or older) than for younger people. Figures 1–3 show the associations between institutional social capital and physical/psychological health, as well as the association of informal social capital with psychological health for the unstratified sample (men and women together).

The figures show the association between the amount of social capital and health predicted by social capital and interaction terms. Predicted values were calculated as functions of the B -values of the respective dimension of social capital and of the B -value of the interaction term of the respective

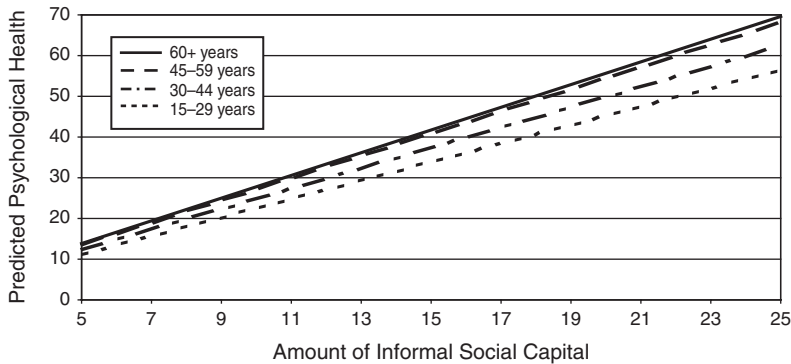


Figure 3. Predicted psychological health by informal social capital in age groups.

age group. In doing so, the following formula was applied:

$$Y = [B(\text{institutional social capital}) + B(\text{age group} \times \text{institutional social capital})] \times \text{institutional social capital}.$$

Figure 1 demonstrates a steeper ascent of the regression line for the older than for younger individuals. This goes to show that institutional social capital is more strongly related to older people's physical health than to that of younger ones. Figure 2 shows similar differences for the association of institutional social capital with psychological health. Figure 3 shows that informal social capital is more strongly related to the psychological health of older individuals and of 45–59-year-olds than to that of younger persons.

Although men's and women's health are related to social capital in a similar way, there is a gender difference in the interaction between informal social capital and age regarding their association with psychological health. There is no significant interaction to be found between age and informal social capital in the association with psychological health of women; for men, however, a significant interaction could be found. Older men's psychological health is more strongly affected by a lack of informal social capital than that of younger ones ($B = 0.89^{***}$).

Discussion/limitations

To our knowledge this is the first study which, as a result of a systematic comparison, has revealed that the association between social capital and health is significantly stronger among older people than among

younger ones. Both institutional and informal social capital are significantly positively related to physical as well as to psychological health in all age groups. Consistent with previous research (Grundy and Sloggett 2003) we found social capital to be important for the health of older people. In addition to previous research we showed that there is a significant interaction between institutional social capital and physical as well as psychological health. Social capital is more important for health of older than of younger men and women.

As institutional social capital comprises *inter alia* access to information, to transportation, to health services and to opportunity for leisure activities, one explanation for the higher importance of institutional social capital on the health of older people could be that younger individuals have better opportunities to compensate for lacking institutional social capital than do older men and women. This result is consistent with research showing that environmental characteristics like mobility barriers and transportation facilitators are associated with the daily activities, performed by older people with functional limitations (Keysor et al. 2009).

Another explanation could be that social capital might add up to cumulative effects over the years. So, difficulties in compensating for low social capital in younger years could also have negative effects on health in later years.

A high level of informal social capital is significantly related to good physical health, but there is no significant age difference in this association. This could be due to the fact that younger people are less able to develop good coping and compensatory strategies for a lack of informal social capital than older ones. A lack of satisfying personal relationships might even cause more stress for younger individuals than for older ones, as they are more commonly expected to have satisfying relationships. Thus a lack of informal social capital cannot be compensated by younger individuals in the same way as this is possible for institutional social capital.

There is a gender difference in the interaction effect regarding the association of informal social capital with psychological health. Whereas institutional social capital is more strongly related to older men's and to older women's health than to the health of younger individuals, there is a significant interaction between informal social capital and psychological health in men but not in women. There is a stronger association between informal social capital and psychological health in older than in younger men.

For women, there are probably no age effects in this association because younger women do not have better coping strategies for compensating for a lack of informal social capital than older women do.

But what would cause older men's psychological health to be more seriously affected by a lack of informal social capital than that of younger men? According to previous studies, the decline in social capital with advancing age can be due to the fact, that older people have fewer good friends (Gray 2009). In addition, managing life in retirement seems to be particularly important for men (Yeh and Lo 2004). Therefore an explanation for the gender differences described could be that informal social capital, such as satisfaction with friendships, is important for women during their whole lifespan. For men, in contrast, the importance of informal social capital increases upon retiring from paid work. Therefore older men might need to develop coping strategies for the lack of informal capital which women may have already developed in earlier years of life. Another explanation could be that the item measuring satisfaction with the living place (which includes the relationship with neighbours) is an important factor influencing the psychological health of women during their whole lifecourse given that many Austrian women spend a considerable part of their time at home. For the men on the other hand, it can be presumed that they do not spend much time at home before retirement. When retiring they are suddenly much more exposed to their neighbourhood and influenced in their psychological health by the quality of their vicinity. That could indeed explain the age effect in the association of informal social capital with male psychological health.

As the relationship of cognitive institutional social capital with physical health is stronger than with psychological health, we argue that the cognitive dimension of institutional social capital is a very important health resource for physical health. This is also consistent with the World Bank social capital assessment tool (SOCAT) (World Bank 2010), which includes questions about institutional resources for individuals.

Limitations and strengths

A limitation of our study is that directionality of the associations is not entirely clear. As the study is based on cross-sectional data it might be the fact that not only social capital is affecting health but also health status could affect aspects of institutional social capital as well as of informal social capital. Some previous studies showed longitudinally that the amount of social capital in the first point in time had no significant effect on psychological health to a later point in time (Choi and Kim 2011).

Research has shown that health is related to the capacity to reciprocate (Gray 2009; Wenger *et al.* 1996). As poor health can diminish the possibility to give help, poor health can be a condition which leads to a reduction of social capital (Gray 2009). As informal social capital includes aspects of

receiving help from others it is possible that not only a lack of social capital is affecting health but also that bad health leads to poor informal social capital.

Another limitation of the study could be that by taking nearly all variables from the WHOQOL-Brief we stayed within the measurement of quality of life. But on the other hand, the domains are measuring different constructs. The physical and the psychological domain of the WHOQOL-Brief are high-quality measures of physical and psychological health which have been widely tested and extensively validated (World Health Organization 1998). Therefore it seemed to be worth staying within the items of one instrument in order to use a well-tested and validated instrument.

In addition, a limitation of the study is the relatively high level of non-response (36.9%) in the data set. In order to deal with this problem, missing values were systematised and an imputation procedure was applied by the Austrian federal statistical agency (Statistik Austria). Nevertheless some bias might arise because of missing data. As Statistik Austria uses an advanced system of several contacts for their survey, bias mostly could arise due to people not willing to respond more than due to a problem of reaching people. We therefore controlled the analysis for differences in socio-economic status with variables like age, education, position in job and income.

One strength of our study is the high quality of the database. With a representative sample of more than 15,000 individuals, valid statements on the Austrian population can be made.

A second important strength of our study is that we used scales and indices for both health and social capital. Whereas many studies on social capital take single variables as measures, the measurement with composite scales is more valid for these complex constructs.

Conclusions

We conclude that even if the direction of causation between social capital and health is not entirely clear and might be bi-directional, it can be argued that both institutional and informal social capital could be improved in particular for older individuals with bad health.

As social capital seems to be important for the health of older people, we agree with previous research in demanding that different forms of social capital should be strengthened with riskprevention and healthpromotion activities (Bergh, Hagquist and Starrin 2010; Boneham and Sixsmith 2006). Such activities should aim, in particular, to strengthen aspects of cognitive institutional social capital and should include health promotion as well as

risk prevention. As health is influenced by satisfaction with aspects of social capital it is essential that all activities follow participatory approaches. Older men and women should therefore be engaged in the whole process of planning and realization of such activities.

As an example for a health-promotion activity, it would be important to analyse what information is most important for older people and the ways they access the information they need. Health-promotion activities should then aim to improve the access to information according to the expressed needs of the target population. Another example of the importance of participatory activities could be the improvement of public transport with the focus on health promotion as well as on risk prevention. Satisfaction with transport is an important aspect of institutional social capital, and depends on numerous characteristics of public and individual transport, on the one hand, and of the individuals accessing different means of transport, on the other hand. For health promotion in the context of public transport it would be important to know exactly what older people need in order to be able to use transport and to stay mobile. Needs for infrastructural changes should be reviewed for each regional context, and possible improvements should then be developed together with the target population. But infrastructural changes in public transport should also be carried out following guidelines for risk prevention, in particular in the prevention of falls which can occur, for example, when entering a tram or bus or in case of sudden braking.

Concerning the improvement of informal social capital, previous research called for increasing social support and facilitating of friendships for elderly people (Yeh and Lo 2004). Participatory health-promotion activities should focus on age and in particular on gender, as there are gender differences in the age-effects in the association of informal social capital with health. Participation in the development of such a health-promotion activity itself could represent an amelioration of informal social capital.

As our results show the importance of institutional as well as of informal social capital for health, it would be advised to improve preventive activities aiming at both dimensions. Prevention therefore should be planned in an intersectoral context, including as many different aspects of social capital as possible. We argue, to base our study on Bourdieu's theory of social capital helped to gain new insights in the field of research on social capital and health.

For future research we conclude that the processes of social capital affecting health and the ways in which different dimensions of social capital affect health should be studied in more detail. This could include studies on the interplay of structural and cognitive social capital in their associations with health.

References

- Aiken, L. and West, S. 1991. *Multiple Regression: Testing and Interpreting Interactions*. Sage, Newbury Park, California.
- Bergh, D., Hagquist, C. and Starrin, B. 2010. Social relations in school and psychosomatic health among Swedish adolescents—the role of academic orientation. *European Journal of Public Health*, **21**, 6, 699–704.
- Berry, H. and Welsh, J. A. 2010. Social capital and health in Australia: an overview from the household, income and labour dynamics in Australia survey. *Social Science & Medicine*, **70**, 4, 588–96.
- Boneham, M. A. and Sixsmith, J. A. 2006. The voices of older women in a disadvantaged community: issues of health and social capital. *Social Science & Medicine*, **62**, 2, 269–79.
- Bourdieu, P. 2005. *Die verborgenen Mechanismen der Macht*. Hamburg: VSA-Verlag.
- Brunner, E., Shipley, M., Spencer, V., Kivimaki, M., Chandola, T., Gimeno, D., Singh-Manoux, A., Guralnik, J. and Marmot, M. 2009. Social inequality in walking speed in early old age in the Whitehall II Study. *Journals of Gerontology: Biological Sciences and Medical Sciences*, **64A**, 10, 1082–9.
- Carpiano, R. M. 2008. Actual or potential neighborhood resources for health. What can Bourdieu offer for understanding mechanisms linking social capital to health? In Kawachi, I., Subramanian, S. V. and Kim, D. (eds), *Social Capital and Health*. New York: Springer, 83–93.
- Choi, N. and Kim, J. 2011. The effect of time volunteering and charitable donations in later life on psychological wellbeing. *Ageing & Society*, **31**, 4, 590–610.
- Crimmins, E., Kim, J. and Seeman, T. 2009. Poverty and biological risk: the earlier ‘aging’ of the poor. *Journals of Gerontology: Biological Sciences and Medical Sciences*, **64A**, 2, 286–92.
- D’Hombres, B., Rocco, L., Sturcke, M. and McKee, M. 2010. Does social capital determine health? Evidence from eight transition countries. *Health Economics*, **19**, 1, 56–74.
- European Commission 2010. *EHIS European Health Interview Survey Database*. Available online at http://ec.europa.eu/health/ph_information/dissemination/reporting/ehss_02_en.htm [Accessed 20 May 2011].
- Freidl, W., Fazekas, C., Raml, R., Pretis, M. and Feistritzer, G. 2007. Perceived social justice, long-term unemployment and health. A survey among marginalised groups in Austria. *Social Psychiatry and Psychiatric Epidemiology*, **42**, 7, 547–53.
- Freidl, W., Rásky, E. and Strongegger, W. 1999. Operationalisation of a demand/resource model of health: an explorative study. *Journal of Epidemiology and Community Health*, **53**, 3, 187–8.
- Giordano, G. N. and Lindstrom, M. 2010. The impact of social capital on changes in smoking behaviour: a longitudinal cohort study. *European Journal of Public Health*, **21**, 3, 347–54.
- Gray, A. 2009. The social capital of older people. *Ageing & Society*, **29**, 1, 5–31.
- Grundy, E. and Sloggett, A. 2003. Health inequalities in the older population: the role of personal capital, social resources and socio-economic circumstances. *Social Science & Medicine*, **56**, 5, 935–47.
- Harpham, T. 2008. The measurement of community social capital through surveys. In Kawachi, I., Subramanian, S. V. and Kim, D. (eds), *Social Capital and Health*. New York: Springer, 51–63.
- Ichida, Y., Kondo, K., Hirai, H., Hanibuchi, T., Yoshikawa, G. and Murata, C. 2009. Social capital income inequality and self-rated health in Chita peninsula, Japan: a

- multilevel analysis of older people in 25 communities. *Social Science & Medicine*, **69**, 4, 489–99.
- Kawachi, I., Kennedy, B. P. and Glass, R. 1999. Social capital and self-rated health: a contextual analysis. *American Journal of Public Health*, **89**, 9, 1187–93.
- Kawachi, I., Subramanian, S. V. and Kim, D. (eds) 2008. *Social Capital and Health*. New York: Springer.
- Keyser, J. J., Jette, A. M., LaValley, M. P., Lewis, C. E., Torner, J. C., Nevitt, M. C., Felson, D. T. and the Multicenter Osteoarthritis (MOST) Group 2009. Community environmental factors are associated with disability in older adults with functional limitations: the MOST study. *Journals of Gerontology: Biological Sciences and Medical Sciences*, **65A**, 4, 393–9.
- Klimont, J., Kytir, J. and Leitner, A. 2007. *Österreichische Gesundheitsbefragung 2006/07. Hauptergebnisse und methodische Dokumentation*. Statistik Austria, Vienna.
- Lin, N. 2001. *Social Capital—A Theory of Social Structure and Action*. Cambridge University Press, Cambridge.
- Lindström, M. 2005. Social capital, the miniaturisation of community and consumption of homemade liquor and smuggled liquor during the past year: a population-based study. *European Journal of Public Health*, **15**, 6, 593–600.
- Marmot, M., Atkinson, T., Bell, J., Black, C., Broadb, P., Cumberland, J., Diamond, I., Gilmore, I., Ham, C., Meacher, M. and Mulgan, G. 2010. *The Marmot Review: Strategic Review of Health Inequalities in England Post-2010*. Available online at <http://www.ucl.ac.uk/gheg/marmotreview/Documents/finalreport/FairSocietyHealthyLives> [Accessed 4 July 2010].
- Nummela, O., Sulander, T., Karisto, A. and Uutela, A. 2009. Self-rated health and social capital among aging people across the urban–rural dimension. *International Journal of Behavioural Medicine*, **16**, 2, 189–94.
- Organization for Economic Cooperation and Development (OECD) Social Policy Division 2009. *What Are Equivalence Scales?* Available online at http://www.oecd.org/home/0,2987,en_2649_201185_1_1_1_1_1_1,00.html [Accessed 17 August 2009].
- Putnam, R. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.
- Rognerud, M. and Zahl, P.-H. 2006. Social inequality in mortality: changes in the relative importance of income, education and household size over a 27-year period. *European Journal of Public Health*, **16**, 1, 62–8.
- Sagpag, J. C., Aracena, M., Villarroel, L., Poblete, F., Berrocal, C., Hoyos, R., Martínez, M. and Kawachi, I. 2008. Social capital and self-rated health in urban low income neighborhoods in Chile. *Journal of Epidemiology and Community Health*, **62**, 9, 790–2.
- Snelgrove, J. W., Pikhart, H. and Stafford, M. 2009. A multilevel analysis of social capital and self-rated health: evidence from the British Household Panel Survey. *Social Science & Medicine*, **68**, 11, 1993–2001.
- Theurer, K. and Wister, A. 2009. Altruistic behaviour and social capital as predictors of well-being among older Canadians. *Ageing & Society*, **30**, 1, 157–81.
- Wenger, G. C., Davies, R., Shahtahmasebi, S. and Scott, A. 1996. Social isolation and loneliness in old age. *Ageing & Society*, **16**, 3, 333–58.
- World Bank 2010. *Instruments of the Social Capital Assessment Tool*. Available online at <http://siteresources.worldbank.org/INTSOCIALCAPITAL/Resources/Social-Capital-Assessment-Tool-SOCAT-/annex1.pdf> [Accessed 23 March 2010].
- World Health Organization (WHO) 1998. *WHOQOL User Manual*. WHO, Geneva.
- Yeh, S. C. J. and Lo, S. K. 2004. Living alone, social support, and feeling lonely among the elderly. *Social Behaviour and Personality*, **32**, 2, 129–38.

- Zajacova, A., Dowd, J. and Allison, E. 2009. Socioeconomic and race/ethnic patterns in persistent infection burden among U.S. adults. *Journals of Gerontology: Biological Sciences and Medical Sciences*, **64A**, 2, 272–9.
- Ziersch, A. M., Baum, F. E., MacDougall, C. and Putland, C. 2005. Neighbourhood life and social capital: the implications for health. *Social Science & Medicine*, **60**, 1, 71–86.

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