Health, Medical Risk Factors, and Bicycle Use in Everyday Life in the Over-50 Population

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Few middle-aged and elderly people get enough exercise from sports or leisure-time physical activity. Therefore, the impact of everyday physical activity on health is a matter of interest. The main objective of this study was to establish whether bicycle use in everyday life is positively associated with health. A sample of 982 randomly selected men and 1,020 women age 50–70 were asked in a computer-assisted telephone interview to provide information including a self-assessment of their health and physical activity. Self-assessed health correlates positively with bicycle use in everyday life (OR = 1.257; 95% CI: 1.031–1.532). Likewise, people who regularly cycle for transport are less likely to have medical risk factors (OR = 0.794; 95% CI: 0.652–0.967). This negative correlation is not diminished when sporting activity is controlled for. This indicates that positive effects of physical activity on risk factors can be also achieved solely by integrating more physical activity into routine everyday life.

Keywords: physical activity, bicycling, risk assessment, cross-sectional studies, interviews, regression analysis, aged

The major importance of physical activity for preventing and rehabilitating chronic diseases is undisputed. Most studies to date have focused on the effects of systematic sporting activity on health and shown that moderate endurance sports are cardioprotective (Hu et al., 2007; Wannamethee & Shaper, 2001). Furthermore, physical-endurance training positively affects individual risk factors for cardiovascular disease, such as hypertension and blood lipid levels (Boardley, Fahlman, Topp, Morgan, & McNevin, 2007; Kokkinos, Narayan, & Papademetriou, 2001; Panagiotakos et al., 2003; Pescatello et al., 2004). Finally, moderate endurance activity counteracts obesity and diabetes, conditions whose prevalence is increasing in Western industrialized nations (Chen & Mao, 2006; Sullivan, 2008).
Morrato, Ghushchyan, Wyatt, & Hill, 2005; Vatten, Nilsen, Romundstad, Droyvold, & Holmen, 2006; Villegas et al., 2006).

Physical activity is also of key importance in preventing and treating orthopedic diseases (Winett & Carpinelli, 2001). Systematic buildup of muscles by appropriate exercising is the main element here. People with an active lifestyle are less likely to develop chronic back pain (Hartvigsen & Christensen, 2007) and osteoarthritis (Mayer, Schmitt, & Dickhuth, 2003). Physical activity also helps prevent osteoporosis-related fractures (Augestad, Schei, Forsmo, Langhammer, & Flanders, 2004; Cosman, 2005; Gass & Dawson-Hughes, 2006) and significantly enhances mobility in the elderly (Brach, Simonsick, Kritchevsky, Yaffe, & Newman, 2004; Patel et al., 2006).

In Germany, depending on the age group, more than 30% of the adult population are totally inactive and almost 50% do not engage in sports (Mensink, 1999). Older adults in particular might be very reluctant to engage in regular sporting activity. Accordingly, few people in this age group are physically active to an extent sufficient to obtain protective effects (Allender, Peto, Scarborough, Boxer, & Rayner, 2006; U.S. Department of Health and Human Services, 1996). Against this background, investigating the health impact of physical activity is of signal importance. That is because not only sports training per se but overall activity helps reduce health risks—cardiovascular risks in particular; for example, going for walks on a regular basis is enough to have a positive impact on health (Hakim et al., 1999; Manson et al., 1999).

Previous studies on physical activity and health, mainly in younger age groups, have shown an inverse association between cycling to and from work and the risk for coronary heart disease and all-cause mortality (Andersen, Schnohr, Schroll, & Hein, 2000; Hu et al., 2007). Other epidemiological studies have documented significant relationships between greater active commuting frequency and positive health indicators including body-mass index, blood lipid profiles, and blood pressure (Sallis, Frank, Saelens, & Kraft, 2004). The database on sports, leisure-time physical activity, and active transportation in middle-aged and older adults in Germany, however, is incomplete. In particular, there is a lack of representative studies that correlate physical activity with health parameters in this age group.

Looking at the mobility patterns in Germany, 60% of everyday trips are made using individual motorized transport—23% on foot, 9% by bicycle, and 8% by public transport. Of bicycle trips, 37% are for leisure pursuits, 23% are for shopping, and 21% are job related. In Germany 47% of citizens rarely or never use a bicycle; this percentage is much lower in rural areas (Institute for Applied Social Sciences & German Institute for Economic Research, 2004).

This article looks at the relation between health and everyday physical activity in the form of bicycle use as a means of everyday transport in an elderly population. The purpose of this study was to analyze whether there is an association between bicycle use in everyday life and health—irrespective of sporting activity. Alongside an estimation of general well-being, the article takes a closer look at orthopedic and cardiovascular diseases and the pertinent risk factors.
Methods

Participants
The empirical basis for this investigation is data from the study Living an Active Life—Age and Aging in Baden-Wuerttemberg. This cross-sectional study is a source of contemporary and retrospective data on health, activity, and lifestyle in the elderly population in southern Germany. The survey is representative for the federal state of Baden-Wuerttemberg; a corresponding level of representativeness is likely for similar federal states. A sample of 982 men and 1,020 women age 50–70 (mean: 59.86) took part in the study. They were randomly selected from the total Baden-Wuerttemberg population, and 95% of study participants were German nationals.

Instrumentation
Whenever possible, the construction of the questionnaire was based on already validated instruments—such as the German national health survey 1998 (Bellach, Knopf, & Thefeld, 1998). In some cases, validated questions required minor modification or addition in accordance with the specific research interest. In this instance, additional experts for the particular specialist area were consulted and asked to evaluate and optimize the questions developed.

Demographics. Sociodemographic and socioeconomic variables were documented in a standardized part of the survey (Working Committee of the German Institutes for Marketing and Social Research, Working Group of the Socioscientific Institutes, & German Federal Statistical Office, 2004).

Bicycle Use. Everyday-life physical activity was investigated first of all on the basis of a dichotomous reply variable: “The next part is about bicycling for transport, using a bicycle for shopping, going to work, or similar. Did you perform this activity regularly over the past 12 months?” Regularly was defined as at least once a week. The next step was to determine the number of hours per week spent cycling for practical everyday-life purposes. There were two questions: Participants were asked to think of a typical week in summer and winter and differentiate according to season, as bicycle use fluctuates between seasons. The mean of the two seasonal values was then calculated. As a control variable, participants were also asked about the nature, duration, frequency, and intensity of sporting activity.

Health. Participants were asked to rate their general health on a scale from 1 (very good) to 5 (very poor). To investigate diseases and risk factors, participants were asked, “Did a doctor ever diagnose you with any of the following diseases?” There followed a list of cardiovascular and orthopedic diseases: arteriosclerosis, coronary artery disease, angina pectoris, heart attack, heart failure, disorders of heart rhythm, aortic aneurysm, stroke, peripheral arterial occlusive disease, osteoarthritis of the hip or knee joints, rheumatoid arthritis of the joints or spine, osteoporosis, and chronic back pain. Hypertension, dyslipidemia, diabetes, and degree of overweight (the latter rated according to WHO criteria) were documented as medical risk factors.
Procedures

Approval of the ethics committee of the Medical Faculty of Heidelberg was obtained, and all participants consented to take part in the study. At the beginning of the interview, the participants were told about the purpose of the survey, the voluntary nature of participation, and the anonymity of the processed data. Data were collected anonymously without disclosing the participant’s identity and transferred blinded to the authors.

Data were generated by an external university phone laboratory in the period from May to October 2006. All interviews were computer assisted. The questionnaire employed was integrated in The Survey System software (Creative Research Systems, Petaluma, CA), which enabled simultaneous data acquisition and storage, hence precluding transfer errors.

Data were collected from a random sample of telephone numbers sampled on the basis of the Gabler–Häder method (Gabler & Häder, 1997). The target participants were then identified on the basis of a two-stage selection process. A telephone number was selected from the number pool on the basis of a random algorithm, and the household thus selected was contacted by phone. The target participant was defined as the 50- to 70-year-old person whose birthday was most recent.

A comparison of the data from the current study with the data of the 2004 microcensus from the German Federal Statistical Office for the 50- to 70-year-old population of Baden-Wuerttemberg revealed differences—in some cases major—with respect to the variables of age, gender, and education. To ensure that the study was representative, a weighting factor was determined in cooperation with ZUMA (Center for Survey Research and Methodology, Mannheim, Germany), and the dataset was weighted before the statistical analyses were performed. This was done in two steps. First, a design weighting was conducted as a function of the number of phone connections and target persons per household. Subsequently, adaptation weighting was done on the basis of German 2004 microcensus data according to the variables of age, gender, and education. After the data were weighted, the frequency distributions for age, gender, and education corresponded to the microcensus data for this age group in Baden-Wuerttemberg, Germany (Table 1).

Detailed information on the methods and procedures of the study Living an Active Life—Age and Aging in Baden-Wuerttemberg is published in Becker et al. (2007).

Statistical Analyses

The associations between cycling in everyday life and general health, presence of medical risk factors, and medically diagnosed cardiovascular and orthopedic diseases were determined first on a bivariate basis using chi-square testing. In the case of significant outcomes, logistic-regression analysis was used to investigate the relation between cycling and the health variables, controlling for central covariates such as age, gender, education, and sporting activity. This was intended to examine the extent to which cycling in everyday life in itself is a determining parameter for the dependent variable or whether individual associations disappear when other variables are included and held constant.
Several models were calculated for the regression. Model 1 represents the correlation between the dependent variable and cycling for transport, while controlling for age, gender, and education. Model 2 controls for these factors and for sporting activity, too. To identify any gender-specific connections, a third model was calculated separately for men and women.

Following standard procedure, bi- and multivariate analyses were only done on full data sets. All tests were two-tailed at a level of significance of \( p \leq .05 \). The analyses were conducted using the statistical program SAS, version 9.02 (SAS Institute Inc., Cary, NC).

### Results

Of the participants, 1,408 (70.3%) said their health was good to very good, and 44.6% of respondents said they used a bicycle for everyday errands. Further uni-
variate analyses showed that 63% of the 50- to 70-year-old participants had at least one medical risk factor. The prevalences of medically diagnosed cardiovascular and orthopedic diseases were 15.1% and 28.4%, respectively.

Bivariate analyses did not identify any associations between bicycle use in everyday life and medically diagnosed cardiovascular or orthopedic diseases. The same applies to the logistic-regression analyses, which controlled for the variables of age, gender, education, and sporting activity.

The bivariate analyses, however, disclosed a highly significant difference in the self-assessment of general health and the use of cycling as a means of transport ($\chi^2 = 5.960$, $p = .0146$). With respect to the prevalence of risk factors, it was also shown that those who use a bicycle regularly are significantly less likely to present any of the defined medical risk factors ($\chi^2 = 5.276$, $p = .0216$). These differences concerning self-assessment of health and presence of risk factors do not depend on the extent of daily bicycle use (measured in hours per week).

**Bicycle Use in Everyday Life and Subjective Health**

Logistic-regression analysis showed that the observed correlation between cycling for transport and subjective health remained in evidence when the sociodemographic variables of age, gender, and education are controlled for. Men and women 50–70 years old who used a bicycle for transport were 1.3 times more likely to rate their health as being good or very good versus participants who did not use a bicycle on a regular basis (Table 2, Model 1). This correlation loses importance, however, when sporting activity is included in the model as a control variable (Table 2, Model 2).

In the gender-specific analysis, for men, a correlation between cycling and subjective health was no longer apparent when the variables of age, education, and sporting activity were controlled for. In contrast, women using a bicycle on a regular basis were almost 1.6 times more likely to rate their health as being good or very good (Table 2, Model 3).

**Bicycle Use in Everyday Life and Medical Risk Factors**

The correlation between bicycle use and medical risk factors remained even when the covariates were controlled for. Participants who regularly use a bicycle for transport had a 20% lower risk of presenting one of the defined medical risk factors than participants in the reference population who did not use a bicycle for transport on a regular basis (Table 3, Model 1). This correlation persisted even when sporting activity was held constant (Table 3, Model 2).

In the gender-specific analysis, a significant correlation between cycling for transport and the presence of medical risk factors was evident only for men when the variables of age, education, and sporting activity were controlled for. Men who used a bicycle for everyday transport were less likely to present any of the risk factors investigated here than men who did not say they used a bicycle for transport on a regular basis. For the women, no correlation between cycling for transport and presence of medical risk factors was evident when the covariates were controlled for (Table 3, Model 3).
### Table 2  Relation Between Bicycle Use in Everyday Life and Subjective Health, Controlled for Age, Gender, Education, and Sporting Activity (Logistic Regression)

<table>
<thead>
<tr>
<th>Model</th>
<th>Overall</th>
<th>Male, 3</th>
<th>Female, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycling</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Odds ratio</td>
<td>1.257</td>
<td>1.170</td>
<td>0.847</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.031–1.532*</td>
<td>0.954–1.436</td>
<td>0.630–1.139</td>
</tr>
<tr>
<td>Constant</td>
<td>2.148***</td>
<td>2.005***</td>
<td>2.506***</td>
</tr>
<tr>
<td>(R^2)</td>
<td>.039</td>
<td>.045</td>
<td>.048</td>
</tr>
<tr>
<td>(n)</td>
<td>1,909</td>
<td>1,909</td>
<td>811</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval; \(R^2\) = explained variance. Dependent variable: Subjective health; based on the question “How would you rate your general health? Is it very good (1), good (2), middling (3), poor (4) or very poor (5)?” Coding: 1 = categories 1 and 2; 0 = categories 3–5. Model 1 was controlled for age, gender, and education; Model 2 was controlled for age, gender, education, and sporting activity; and Model 3 was controlled for age, education, and sporting activity.

\(\text{a}D\)ichotomous variable. Coding: 1 = bicycle used in everyday routine, 0 = bicycle not used.

*= p ≤ .05. **= p ≤ .01. ***= p ≤ .001.

### Table 3  Relation Between Bicycle Use in Everyday Life and the Presence of Medical Risk Factors, Controlled for Age, Gender, Education, and Sporting Activity (Logistic Regression)

<table>
<thead>
<tr>
<th>Model</th>
<th>Overall</th>
<th>Male, 3</th>
<th>Female, 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycling</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Odds ratio</td>
<td>0.794</td>
<td>0.815</td>
<td>0.623</td>
</tr>
<tr>
<td>95% CI</td>
<td>0.652–0.967*</td>
<td>0.665–0.998*</td>
<td>0.455–0.852**</td>
</tr>
<tr>
<td>Constant</td>
<td>−2.471***</td>
<td>−2.416***</td>
<td>−2.870***</td>
</tr>
<tr>
<td>(R^2)</td>
<td>.108</td>
<td>.108</td>
<td>.094</td>
</tr>
<tr>
<td>(n)</td>
<td>1,913</td>
<td>1,913</td>
<td>793</td>
</tr>
</tbody>
</table>

Note. CI = confidence interval; \(R^2\) = explained variance. Dependent variable: Medical risk factors; Coding: 1 = one or more risk factors, 0 = no risk factor; hypertension, disorders of lipid metabolism, diabetes, overweight. Model 1 was controlled for age, gender, and education; Model 2 was controlled for age, gender, education, and sporting activity; and Model 3 was controlled for age, education, and sporting activity.

\(\text{a}D\)ichotomous variable. Coding: 1 = bicycle is used in everyday routine, 0 = bicycle is not used.

*= p ≤ .05. **= p ≤ .01. ***= p ≤ .001.
Discussion

This study is the first to present representative data on physical activity in relation to health and risk-factor profiles among older adults in southern Germany. Physical activity is associated with a more positive subjective self-rating of general health (Norman, Bellocco, Vaida, & Wolk, 2002). This observation is confirmed in our study on bicycle use in everyday life. Our analysis also shows, however, that, when sporting activity is controlled for, this correlation applies only in the female subset of the sample population. Hence, in elderly women, everyday physical activity markedly enhances subjective health. In the male subset of the sample, a correlation was no longer apparent when sporting activity was controlled for. This is probably partly attributable to the fact that people who use a bicycle for transport are also likely to engage in more sporting activity in general ($r = .205, p \leq .01$). It is also probable that women view daily bicycle use as symbolic of an active lifestyle and a balanced diet, whereas among the male population, any improvement in their self-assessment of general health would be more likely to be perceived as related to the pursuit of classic sports.

In contrast to previous studies (Barengo et al., 2004; Wennberg et al., 2006), this study did not identify any correlation between cycling for transport and cardiovascular diseases. In the age group studied here, this might be because the participants integrated cycling in their everyday life in an effort to counteract existing disease, either on their own initiative or acting on medical advice. Irrespective of the presence or absence of existing disease, however, the current study—in agreement with earlier studies (Dannenberg, Keller, Wilson, & Castelli, 1989; Hu et al., 2003)—identified a particularly meaningful association between everyday mobility and incidence of risk factors. The finding of our study is all the more significant because the negative correlation between bicycle use in everyday life and the occurrence of risk factors is not diminished when sporting activity is controlled for. This indicates that positive effects of physical activity on hypertension, dyslipidemia, diabetes, and obesity—the main risk factors for both the development of cardiovascular disease and an unfavorable prognosis—can be achieved merely by integrating more physical activity into routine everyday life.

Because of the cross-sectional design of the study, the observed associations do not imply causation. It might also be possible that poor health could cause inactivity, and inactivity could cause a low self-rating of health. To address this issue, importance was attached to the subjective assessment of health, which is recognized as a reliable predictor of general health (Fayers & Sprangers, 2002; Ferraro, 1980). Another limitation based on the nature of the study is that the data generated reflect information elicited from the participants themselves. As such, social desirability might be an issue (Lautenschlager & Flaherty, 1990). To avoid having study participants overestimate their activities or unwittingly falsify their medical history, the interviews accentuated the regularity of physical activity and explicitly asked for medically diagnosed diseases and risk factors.

The limitations of self-provided information are offset by the many advantages of the telephone interview. These reside first of all in the representativeness of the data of the overall population in the age group studied. Unlike many other studies on the impact of physical activity on physical diseases and risk factors, this study is not based on one patient cohort only. The use of previously validated
measuring tools (Bellach et al., 1998) produced results that agree with those of other studies to a large extent (Chen & Mao, 2006; Heidrich et al., 2003; Mokdad et al., 2003). Another advantage of the study’s approach is that it enabled the analysis of correlations between health, sports, and everyday activities in a large sample size.

Given the macroeconomic importance of cardiovascular diseases coupled with the reluctance of many middle-aged and elderly people to engage in regular sporting activity, systematic encouragement of everyday physical activity should be a major health care policy goal. Advertising campaigns presenting bicycle use in everyday life as a symbol of a healthy lifestyle might be useful here, in addition to increasing the number of cycling lanes in cities. In view of the huge importance of an explicit recommendation from a primary-care physician in encouraging regular physical activity (Schneider & Becker, 2005), medical advice will play a major role in any effort to increase the percentage of those who use a bicycle for everyday transport, based on the argument that it is good for their health.

Acknowledgments

Living an Active Life—Age and Aging in Baden-Wuerttemberg is a representative general survey of physical and sporting activity in middle-aged and older adults in southern Germany. The survey as a whole centered on the sports and health biography, health behavior, and lifestyle of this age group. The study was supported by the Landesstiftung Baden–Wuerttemberg, with funding in place for the period from September 2005 to August 2007. Project contributors include the authors and Prof. Dr. Klaus-Peter Brinkhoff, University of Stuttgart (Becker et al., 2007).

References


Bicycle Use in Everyday Life in the Over-50 Population


