problems. However, there is also public awareness about
mainly on problem-drinking and consequent health pro-
body mass. Older adults also associated with ageing, a high prevalence of diseases and
of alcohol as a consequence of the physiological changes
year in 2007. and 77% of males had consumed alcohol in the preceding
on multiple drugs. Older adults also associated with ageing, a high prevalence of diseases and
of alcohol as a consequence of the physiological changes
yrs > 64 years olds). The number of the potential respondents was 1973 when those in perma-
nent institutional care (n = 92), deceased (n = 16), with native language other than Finnish/Swedish (n = 31) or
with unknown address (n = 14) were excluded. Altogether 1,395 individuals returned the questionnaire (response rate
71.6%). The local ethics committee approved the study
protocol.

A structured questionnaire was piloted prior to the
postal survey on 17 elderly individuals to ensure that the
questions were easy to understand. The question items con-
cerning demographics and health-related variables were
retrieved from our previous epidemiological studies [16–
18]. The questionnaire consisted of demographic and
health-related variables. In addition, respondents were
asked to list any medical diagnoses received from their
doctors. Some categorisations were made for health-related
factors and current use of medications. Charlson comorbid-
ity index was constructed from medical diagnoses. It is a
weighted index taking into account the number and severity
of comorbid conditions [19]. To analyse the number of reg-
ularly prescribed drugs, participants were inquired to list
their prescribed drugs.

Alcohol consumption was charted with several questions
developed from the clinical guidelines for alcohol use in
older adults [20] and the AUDIT (alcohol use disorders
identification test) [21]. Quantity and frequency were ascer-
tained by asking: ‘How often do you have a drink containing
alcohol, including beer, cider, wine, or liquor; spirits?’, and
‘On a typical day when you drink, how many drinks do
you have?’ (1 drink = can or bottle (330 ml) of beer, 12 cl
of wine, 4 cl of liquor; spirits (one shot-glass), or 8 cl of
sherry or madeira or aperitif. Alcohol-related problems
were inquired: (i) ‘Have you forgotten to take your medi-
cation when you have used alcohol (never/sometimes/
often)?’; (ii) ‘Has any of your relatives or friends been

Alcohol use of older adults: drinking
alcohol for medicinal purposes

SIR—Of Finnish adults aged 65–84 years, 54% of females
and 77% of males had consumed alcohol in the preceding
year in 2007. Older adults are sensitive to the effects
of alcohol as a consequence of the physiological changes
associated with ageing, a high prevalence of diseases and
the concomitant use of multiple drugs. Older adults also
experience higher blood alcohol concentrations for a given
amount of alcohol than younger adults due to changes in
body mass.

Research on older people’s use of alcohol has focused
mainly on problem-drinking and consequent health
problems. However, there is also public awareness about
the possible health promoting effects of moderate alcohol
consumption demonstrated in epidemiological studies [7–
13]. Alcohol has been used throughout history for medi-
cal purposes; since antiquity, wine has been believed to
stimulate appetite and digestion [14].

Very few studies are available on how older people per-
ceive the health effects of alcohol, and how they use
alcohol for medicinal purposes [15]. The aim of this study
was to investigate the medicinal use of alcohol by individ-
uals aged 65 years and older. We investigated (i) the preva-
ience of alcohol consumption as self-medication, (ii)
associated factors and (iii) the reasons for which alcohol is
used to self-medicate.

Methods

In May 2007, a postal questionnaire was sent to com-
geratized random sample of 2,100 older persons (≥265
years) from the Espoo Population Register, and re-sent
after 3 months to non-respondents. Espoo is a city with
240,000 inhabitants (10% >64 years olds). The number of
of the potential respondents was 1973 when those in perma-
nent institutional care (n = 92), deceased (n = 16), with native language other than Finnish/Swedish (n = 31) or
with unknown address (n = 14) were excluded. Altogether 1,395 individuals returned the questionnaire (response rate
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Research letters

concerned about your drinking or suggested that you should cut down your drinking (never/yes, but not during the last year/yes, during the last year)?"' and (iii) 'Have you been concerned about your own drinking (yes/no)?'.

Alcohol consumption for medicinal purposes was determined by the question 'Do you use alcohol for medicinal purposes (yes/no), if so, for what conditions?' Thus, the question regarding the purposes of medicinal use of alcohol was open-ended. Respondents could give more than one condition. From the open-ended responses, we constructed eight most common conditions for consuming alcohol for medicinal purposes.

Data were presented with statistical variables including frequencies and percentages. The Chi-square test was used to compare categorical variables and the Mann–Whitney test to compare continuous, non-normally distributed variables. Logistic regression analysis was used to determine whether diagnoses or medical problems were independently associated with alcohol use for medicinal purposes. Confidence intervals were calculated as described [22].

Results

Of the total sample (n = 1,395), 241 persons (17.3%) responded that they used alcohol as a medicine (Table 1). The medicinal consumption of alcohol was more common in the oldest age group. Both genders used this self-medication equally. Marital status did not differ between those who used alcohol as a medicine and those who did not. High income was associated with a lower frequency of using alcohol for medicinal purposes.

The frequency of alcohol consumption was higher among those using alcohol for medicinal purposes than

Table 1. Sociodemographic and health-related factors and use of alcohol as a medicine

<table>
<thead>
<tr>
<th></th>
<th>Uses alcohol for medicinal purposes, % (n = 241)</th>
<th>Does not use alcohol for medicinal purposes, % (n = 1,153)</th>
<th>P-value</th>
<th>Difference between means or proportions (95% confidence intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>61.4</td>
<td>63.0</td>
<td>0.649</td>
<td>−1.6 (−8.3 to 5.2)</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–70 years</td>
<td>13.3</td>
<td>21.3</td>
<td>≤0.001*</td>
<td>−8.0 (−13.0 to −3.2)</td>
</tr>
<tr>
<td>71–80 years</td>
<td>34.4</td>
<td>39.7</td>
<td>−5.3</td>
<td>(−11.9 to 1.4)</td>
</tr>
<tr>
<td>81–90 years</td>
<td>33.2</td>
<td>30.4</td>
<td>1.8</td>
<td>(−3.8 to 9.3)</td>
</tr>
<tr>
<td>≥91 years</td>
<td>19.1</td>
<td>8.5</td>
<td>10.6</td>
<td>(5.4 to 15.8)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or common-law relation</td>
<td>49.2</td>
<td>53.0</td>
<td>0.722*</td>
<td>−3.8 (−10.8 to 3.1)</td>
</tr>
<tr>
<td>Widowed</td>
<td>37.8</td>
<td>34.3</td>
<td>3.5</td>
<td>(−3.2 to 10.3)</td>
</tr>
<tr>
<td>Single, unmarried or divorced</td>
<td>13.0</td>
<td>12.7</td>
<td>0.3</td>
<td>(−4.4 to 5.0)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;7 years</td>
<td>31.5</td>
<td>29.7</td>
<td>0.842*</td>
<td>1.8 (−4.6 to 8.3)</td>
</tr>
<tr>
<td>7–12 years</td>
<td>47.7</td>
<td>49.4</td>
<td>−1.7</td>
<td>(−8.6 to 5.3)</td>
</tr>
<tr>
<td>&gt;12 years</td>
<td>20.7</td>
<td>20.9</td>
<td>−0.2</td>
<td>(−5.8 to 5.5)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>25.0</td>
<td>36.5</td>
<td>0.003*</td>
<td>−11.5 (−17.7 to −5.4)</td>
</tr>
<tr>
<td>Moderate</td>
<td>70.8</td>
<td>60.0</td>
<td>10.9</td>
<td>(4.5 to 17.3)</td>
</tr>
<tr>
<td>Low</td>
<td>4.2</td>
<td>3.5</td>
<td>0.6</td>
<td>(−2.1 to 3.4)</td>
</tr>
<tr>
<td>Self-reported health status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unhealthy or quite unhealthy</td>
<td>31.2</td>
<td>22.9</td>
<td>0.008*</td>
<td>8.3 (1.9 to 14.7)</td>
</tr>
<tr>
<td>Mean Charlson comorbidity index (SD)</td>
<td>1.10 (1.2)</td>
<td>0.90 (1.2)</td>
<td>0.008*</td>
<td>0.2 (0.04 to 0.36)</td>
</tr>
<tr>
<td>Mean number of medication (SD)</td>
<td>4.4 (3.3)</td>
<td>3.8 (3.2)</td>
<td>0.002*</td>
<td>0.7 (0.2 to 1.1)</td>
</tr>
<tr>
<td>Frequency of using alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than or equal to once a month, or not at all</td>
<td>28.2</td>
<td>55.8</td>
<td>&lt;0.001*</td>
<td>−27.6 (−34.1 to −21.1)</td>
</tr>
<tr>
<td>More than once a month but ≤3 times/week</td>
<td>48.3</td>
<td>37.1</td>
<td>11.1</td>
<td>(4.1 to 18.2)</td>
</tr>
<tr>
<td>More than three times a week</td>
<td>23.5</td>
<td>7.0</td>
<td>16.5</td>
<td>(10.8 to 22.1)</td>
</tr>
<tr>
<td>Amount of alcohol used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than or equal to one portion</td>
<td>70.1</td>
<td>66.4</td>
<td>0.73</td>
<td>1.8 (−2.8 to 10.5)</td>
</tr>
<tr>
<td>Two portions</td>
<td>19.5</td>
<td>21.8</td>
<td>−2.3</td>
<td>(−8.1 to 3.4)</td>
</tr>
<tr>
<td>Three to four portions</td>
<td>8.7</td>
<td>10.2</td>
<td>−1.5</td>
<td>(−5.6 to 2.6)</td>
</tr>
<tr>
<td>Greater than or equal to five portions</td>
<td>1.7</td>
<td>1.7</td>
<td>0.0</td>
<td>(−1.8 to 1.8)</td>
</tr>
<tr>
<td>Has forgotten to take medications because of alcohol use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>5.9</td>
<td>2.9</td>
<td>0.003*</td>
<td>3.0 (−0.2 to 6.2)</td>
</tr>
<tr>
<td>Often</td>
<td>0.0</td>
<td>0.4</td>
<td>0.4</td>
<td>(−0.4 to 1.3)</td>
</tr>
<tr>
<td>Relatives or friends have been worried about respondent's alcohol use during the last year</td>
<td>8.8</td>
<td>4.1</td>
<td>0.003*</td>
<td>4.7 (0.9 to 8.6)</td>
</tr>
<tr>
<td>Respondent has been concerned about his/her own drinking</td>
<td></td>
<td></td>
<td>0.47*</td>
<td>−1.1 (−3.7 to 1.6)</td>
</tr>
</tbody>
</table>

* Differences between the groups were tested with Chi-square test or Fisher exact test.

b Differences between the groups were tested with Mann–Whitney U test.
among others. However, the typical amount of alcohol consumed did not differ between the groups. Those using alcohol for medicinal purposes had more often forgotten to take their daily medications than those not using alcohol as a medicine. In addition, their relatives or friends had more often been concerned about their drinking during the last year than those not using alcohol as a medicine (Table 1).

Those considering themselves unhealthy or very unhealthy used alcohol more often for medicinal purposes than those considering themselves healthy or very healthy. Those who used alcohol for medicinal purposes had a higher Charlson comorbidity index and higher mean number of regularly used drugs (Table 1). Using alcohol for medicinal purposes was associated with prior myocardial infarction, asthma, rheumatoid arthritis/osteoarthritis, dementia and depression. Those using alcohol to self-medicate had fallen during the last 6 months or suffered from a fracture in adulthood more often than the others (Table 2). However, in logistic regression analysis adjusted for age and income, only depression remained statistically significantly associated with using alcohol for medicinal purposes (OR: 1.6 (95% CI: 1.1–2.4)).

The most common conditions for which participants responded using alcohol as a medicine were cardiovascular diseases (34.4%), sleep disturbances (22.1%), common cold (19.9%) and indigestion (14.0%). It was also used for relaxation (6.8%), stimulation (6.3%), pain (3.2%) and general prevention of illnesses (3.6%). Other reasons (8.6%) included doctor’s prescription, vertigo, faintness, hangover and red wine for anaemia.

### Table 2. Respondents’ use of alcohol as self-medication and their reported diagnoses and medical problems

<table>
<thead>
<tr>
<th>Diagnoses, conditions and symptoms</th>
<th>Uses alcohol as a medicine (%)</th>
<th>Does not use alcohol as a medicine (%)</th>
<th>P-value</th>
<th>Difference between means or proportions (95% confidence intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>20.0</td>
<td>18.7</td>
<td>0.098</td>
<td>1.3 (~6.3 to 6.6)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>10.8</td>
<td>6.4</td>
<td>0.048</td>
<td>4.4 (~0.7 to 7.9)</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>34.1</td>
<td>29.4</td>
<td>0.217</td>
<td>4.6 (~2.9 to 2.2)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>48.4</td>
<td>49.1</td>
<td>0.863</td>
<td>0.7 (~8.2 to 0.6)</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.9</td>
<td>4.1</td>
<td>0.177</td>
<td>2.2 (~4.7 to 0.3)</td>
</tr>
<tr>
<td>Peptic ulcer</td>
<td>2.6</td>
<td>4.8</td>
<td>0.219</td>
<td>2.3 (~2.7 to 0.2)</td>
</tr>
<tr>
<td>Asthma</td>
<td>23.2</td>
<td>14.8</td>
<td>0.007</td>
<td>8.5 (1.6 to 15.3)</td>
</tr>
<tr>
<td>Rheumatoid arthritis or osteoarthritis</td>
<td>56.3</td>
<td>38.2</td>
<td>~0.001</td>
<td>18.1 (10.4 to 25.9)</td>
</tr>
<tr>
<td>Dementia</td>
<td>16.8</td>
<td>8.5</td>
<td>0.001</td>
<td>8.2 (2.3 to 4.3)</td>
</tr>
<tr>
<td>Depression</td>
<td>24.6</td>
<td>14.7</td>
<td>0.001</td>
<td>9.9 (3.0 to 16.8)</td>
</tr>
<tr>
<td>Cancer</td>
<td>21.0</td>
<td>18.1</td>
<td>0.356</td>
<td>2.9 (~3.5 to 9.3)</td>
</tr>
<tr>
<td>Parkinson's disease</td>
<td>2.2</td>
<td>2.2</td>
<td>0.996</td>
<td>0.0 (~2.4 to 2.4)</td>
</tr>
<tr>
<td>Has fallen during the last 6 months</td>
<td>26.5</td>
<td>18.2</td>
<td>0.004</td>
<td>8.4 (2.2 to 14.6)</td>
</tr>
<tr>
<td>Fracture in adulthood</td>
<td>50.3</td>
<td>37.5</td>
<td>0.002</td>
<td>12.8 (4.7 to 20.9)</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>16.1</td>
<td>14.6</td>
<td>0.561</td>
<td>1.5 (~3.7 to 6.7)</td>
</tr>
</tbody>
</table>

### Discussion

Of the total sample, 17.3% responded that they used alcohol for medicinal purposes. The medicinal consumption of alcohol was more common in the oldest age group and in persons with chronic conditions. Those using alcohol for medicinal purposes consumed it more frequently than others. The most commonly mentioned conditions for which alcohol was used were cardiovascular diseases, sleep disturbances, common cold and indigestion.

Strength of this study is the large, representative sample of the home-dwelling elderly including very old age groups. A high response rate (71.6%) supports the validity of study. Our study also has some limitations. It relies on self-reporting of alcohol consumption and diagnoses. Self-reported alcohol consumption is likely to be underestimated to some extent in drinking surveys [23]. Diagnoses were also assessed through self-report, which assume that individuals are aware of them. The cross-sectional nature of this study limits our ability to fully explore the associations identified.

The most commonly mentioned medical conditions for which alcohol was used were strikingly similar to a previous study [15] in which the material was also collected in Finland. To our knowledge, this is the only previous study reporting medicinal alcohol use at the community level in older adults. In Aira’s study [15] alcohol was used for cardiovascular diseases (38%), sleep disturbances (26%), mental problems (23%) and common cold (10%). Our respondents did not mention mental conditions as a reason to use alcohol even though diagnosis of depression was associated with using alcohol for medicinal purposes. Previous studies have revealed that alcohol may be used to relieve depression and anxiety [23–27]. However, those mentioning alcohol as a relaxant (6.8%) or stimulant (6.3%) may include individuals using alcohol for mental problems. The use of alcohol to treat a common cold (19.9%) or indigestion (14.0%) was more common in our population. Some (3.6%) of our respondents mentioned using alcohol to prevent illnesses. Some studies have investigated the use of alcohol to treat pain in the general population [28] which was rare in our population.

The use of alcohol for medicinal purposes was associated with more frequent use but the amount used on a typical day does not differ between the groups. Thus, it seems that older adults use alcohol for medicinal purposes typically in small quantities. However, use of alcohol for medicinal purposes was associated with forgetting to take medicines, relatives’ worries, as well as falls and fractures. Older people may have misbelives about the medicinal use of alcohol that leads them to regular use of alcohol. Older
Older adults have simultaneously many chronic conditions and take medicines that may have interactions with alcohol. They may be unaware of the risky consequences of using both alcohol and medicines. Our findings emphasise the need for healthcare professionals to educate and monitor older adults concerning alcohol consumption and use of medication.

**Key points**

- Older adults, especially very old age groups, use alcohol as a medicine.
- Older adults used alcohol for cardiovascular diseases, sleep disturbances, common cold and indigestion.
- Older adults have many chronic conditions for which they take medicines that may have interactions with alcohol.

**Acknowledgements**

We thank statistician Hannu Kautiainen for his kind help.

**References**


Effect of resistance training on physical performance and fear of falling in elderly with different levels of physical well-being

SIR—Several factors are involved in the maintenance of activities of daily living (ADL) in older adults. Skeletal muscle mass and strength are important factors for maintaining independence and quality of life in elderly. Several recent cross-sectional studies have shown the associations of muscle strength with physical fitness and disability [1, 2]. Loss of muscle mass (sarcopenia) is prevalent in older adults [3] and represents an impaired state of health with mobility disorders, increased risk of falls and fractures, impaired ability to perform ADL, disabilities and loss of independence [4–6].

Fear of falling is common in older adults. The prevalence varies from 21 to 85%, is higher in women than in men, and increases with age [7]. The risk factors of fear of falling are shown to be physical frailty [8], perception of poor health [9], obesity, cognitive impairment, depression, poor balance [10] and history of at least one fall [7].

Resistance training is an effective intervention to improve the physical function in older adults by increasing strength and physical performance [11]. However, it is still controversial whether resistance training is effective for all levels of elderly people. For example, we reported that decreased muscle power is a reliable predictor of falls only in frail elderly [12].

We hypothesised, therefore, that there is a differential effect of resistance training on physical performance according to the level of physical well-being. The aim of this study was to compare the effects of resistance training on skeletal muscle mass, physical performance and fear of falling in robust and frail elderly.

Methods

Participants

Participants were recruited by an advertisement in a local press. We used the following criteria to screen participants in an initial interview: aged ≥65 years, community dwelling, has visited a primary care physician within the previous 3 years, score of ≥8 by Rapid Dementia Screening Test [13], able to walk independently, willing to participate in group exercise classes for at least 6 months, access to transportation and no regular exercise in the previous 12 months.

We also used the interview to exclude participants based on the following exclusion criteria: severe cardiac, pulmonary, or musculoskeletal disorders, pathologies associated with an increased risk of falls (i.e. Parkinson’s disease or stroke) and use of psychotropic drugs. We obtained written informed consent from each participant in accordance with the guidelines approved by the Kyoto University Graduate School of Medicine and the Declaration of Human Rights, Helsinki, 1975.

Frailty definition

The frailty classification was based on a composite of previous work. The Timed Up and Go (TUG) is a simple test developed to screen basic mobility performance and has been shown to be significantly associated with ADL in frail elderly adults [14]. It has been reported that elderly with a TUG score greater than 13.5 s can have an increased risk of falling [15]. Frailty was defined as a TUG score ≥13.5 s. Based on key components of the screening examination (TUG score greater than 13.5 s), 159 elderly adults were classified as the frail group, whereas 178 elderly adults were classified as the robust group because they had a TUG score of ≤13.5 s.

Resistance training

All participants underwent resistance training sessions twice a week for 50 weeks. All participants performed the seated row, leg press, leg curl and leg extension exercises on resistance-training machines. Training loads were chosen using the 10-repetition maximum (10-RM, the maximal weight that can be lifted 10 times). Participants used the 10-RM for 3 sets of 10 repetitions for each machine exercise. Participants were required to adjust the training weight to ensure failure at the 10-RM. It took approximately 1 h to finish all sessions, with 15-min warm-up at the beginning and 10-min cool-down stretch at the end.

Bioelectrical impedance analysis measurement

A bioelectrical impedance data acquisition system (Physion MD; Physion Co. Ltd, Kyoto, Japan) was used to determine