Linguistic influences on health status among 6958 persons, aged 30 and over, living in Finland

Elena Toffol, Timo Partonen, Seppo Koskinen

Abstract

A language may not only influence our way of thinking, but also the way in which we perceive, interpret and test reality around us. This might have implications in everyday life, including health-related behaviours. Given that in the mainland of Finland a fully-integrated minority of Swedish-speaking individuals live and work in the same context as the Finnish-speaking majority, the aim of our study was to explore whether there are any differences in health-related issues between members of the two linguistic groups, and whether these differences are explained by the linguistic background. This study was part of the nationwide population-based Health 2000 Study, which was carried out in Finland from 2000 to 2001. A large amount of information was available, including background and health-related information, living habits, use of time and leisure activities, eating habits, participation in group activities, problems experienced during childhood, quality of life, seasonal variations in mood and behaviour, waist and hip circumference, height, weight and body mass index, as well as assessments of the metabolic syndrome and interview-based diagnoses for mental disorders. The Finnish-speaking participants had lower social activity, a higher score on the General Health Questionnaire (GHQ-12), more hypochondria, more nervousness, more anxiety, and alcohol abuse more frequently than the Swedish-speaking participants ones. In multivariate analyses, after controlling for socio-demographic variables, no association was found between the metabolic syndrome and the linguistic group, but in contrast, belonging to the Finnish-speaking group was directly associated with a diagnosis of alcohol abuse (OR = 3.341, 95% CI = 1.039 to 10.746, $p < 0.05$) and inversely associated with a diagnosis of agoraphobia (OR = 0.209, 95% CI = 0.060 to 0.733, $p < 0.05$). Analysis of the effects of language and linguistic-related cognitive schemes on behaviours and subsequent mental health deserves further exploration.

Background

According to linguistic relativity theory (a matter of some debate) there is a reciprocal bond between language and thought. Specifically, it claims that the language we speak influences the way we think about and interpret reality [1]. In other words, languages interpret experiences we have, and these interpretations influence thought and subsequent behaviour. However, the importance of the linguistic relativity concept goes far beyond academic debate. If a language were to influence not only the way of thinking we have, but also the way in which we perceive, interpret and test reality around us in a specific manner, it might have implications in our everyday life, such as habits, and thereby also in health-related behaviours. In this respect, the structural level which concerns how speaking natural languages or mother tongues influences thinking and behaviour is very relevant for public health. From this point of view, the health status of individuals speaking Finnish (of the Ural-Altaic language group) versus those speaking Swedish (of the Indo-European language group) as their mother tongue provides a rationale for study.

Regarding this, Frode J. Strømnes identified specific characteristics that distinguish the Finnish and the Swedish languages [2-4]. These characteristics may bear behavioural implications, as evidenced for example by the higher rates of occupational accidents among Finnish-speaking than Swedish-speaking workers [5,6], and by the longer life expectancy among the Swedish-speaking minority in Finland [7]. According to studies by Strømnes, the Swedish language has a more dynamic approach, i.e. it focuses more on movement in space, whereas the Finnish language focuses more on static relations. As a consequence of this different organization of the language, thought and interpretation in working and everyday life situations are different. Because of this difference in cognitive scheme, Finnish-speaking individuals may focus more on static and personal elements, rather than on the production process and its temporal organization, and it may lead to more frequent cessations in production and haste to catch up with the schedule and eventual work-related accidents. Other health hazards are therefore possible, but to date unknown. Furthermore, it was observed that the excess mortality in the Finnish-speaking compared with the Swedish-speaking individuals is mostly attributable to alcohol and other external causes (including suicide) rather than to somatic diseases [7].

Given the conditions encountered in Finnish society where a completely integrated minority of Swedish-speaking individuals live and work in the same context as the Finnish-speaking majority, our aim herein was to explore whether there are any differences in health-related issues between individuals of the two linguistic groups which could be explained by linguistic background. Here, we focused on two different health dimensions: the somatic (specifically the metabolic syndrome) and psychological. On the one hand, we hypothesize that a static and person-centred mental scheme may encourage lifestyle and behaviours which are more centred on the individual's health, such as having a healthy diet, exercising and not smoking. To the contrary, a more dynamic mental scheme with a more co-operative approach may promote behaviours that are regarded as more social in nature, being less centred on the individual's health. Therefore, Finnish-speaking individuals are not expected to have a higher risk of the metabolic syndrome in comparison with Swedish-speaking individuals. On the other hand, as the social capital and its cognitive components in particular contribute to psychological health [8], it is plausible that a static mental scheme affects relationships more and eventually daily activities and behaviours in a way that negatively impacts on the individual's mental status, thus predisposing Finnish-speaking individuals to risk of distress.

Results

When asked about their mother tongue, 6554 (92.5%) of the 7415 individuals who participated in any stage of the data collection reported being Finnish-speaking and 404 (5.7%) Swedish-speaking. Furthermore, 127 participants (1.8%) were of other speaking minorities, and 330 did not provide this information. The socio-demographic composition of the two main groups and their anthropometric characteristics are presented in Table 1. Compared with the Finnish-speaking respondents, a higher proportion of the Swedish-speaking participants were women, married or widowed, not full-time employed and had university level education. Furthermore, the average age in the Swedish-speaking group was higher, and their average commuting time was shorter than in the Finnish-speaking group. The Finnish-speaking participants had a lower social activity score, a higher Whiteley index, a higher GHQ-12 score, more symptoms (nervousness and anxiety, melancholy and depression, fatigue and tiredness, exhaustion, sweating of the palms and fast heartbeat) and alcohol abuse more frequently than the Swedish-speaking participants (Table 2). In multivariate analyses, no association was found between the metabolic syndrome and the linguistic group after controlling for socio-demographic variables, regardless of the criteria for metabolic syndrome (Table 3).

Belonging to the Finnish-speaking group, after controlling for socio-demographic factors, was positively associated with a diagnosis of alcohol abuse (without the hierarchy criteria), but negatively associated with a diagnosis of agoraphobia (Table 4). This association between the linguistic group and alcohol abuse remained significant after controlling one by one for additional confounding factors that were potentially related to the linguistic group (the odds ratios of having alcohol abuse for the Finnish vs. the Swedish linguistic group) as follows: social activity score (OR = 3.306, 95% CI = 1.026 to 10.652, $p < 0.05$), seasonal variations in social activities (OR = 3.847, 95% CI = 1.190 to 12.432, $p < 0.05$) and appetite (OR = 3.307, 95% CI = 1.022 to 10.696, $p < 0.05$), frequency of outdoor activities (OR = 3.528, 95% CI = 1.093 to 11.381, $p < 0.05$), frequency of eating chocolate or filled biscuits (OR = 3.331, 95% CI = 1.035 to 10.720, $p < 0.05$), not eating a warm meal dinner (OR = 3.460, 95% CI = 1.074 to 1.150, $p < 0.05$) and retrieving medical information (from books and journals: OR = 3.281, 95% CI = 1.019 to 10.568, $p < 0.05$; from television, radio, internet or compact discs: OR = 3.249, 95% CI = 1.009 to 10.460, $p < 0.05$). However, the association lost its significance after controlling one by one for the following confounders: symptoms (nervousness or anxiety, melancholy or depression, tiredness, exhaustion, sweating of the palms or fast heartbeat), the Whiteley index, seasonal variation in energy, the GHQ-12 score, adverse childhood conditions, not eating a warm meal breakfast, commuting time and use of internet-based health services.

The negative association between linguistic group and agoraphobia remained significant after controlling one by one for several confounding factors (Table 5). However, the association lost its significance after controlling one by one for the Whiteley index, adverse childhood conditions and commuting time (these data are not shown).

Table 1. Socio-demographic and anthropometric characteristics of the Finnish and the Swedish linguistic groups.

	Finnish n (%)	Swedish n (%)
Gender*		
women	3609 (55.1)	242 (59.9)
men	2945 (44.9)	162 (40.1)
Marital status*		
married	3632 (55.4)	239 (59.2)
cohabiting	690 (10.5)	26 (6.4)
separated/divorced	659 (10.1)	37 (9.2)
widowed	774 (11.8)	62 (15.3)
single	798 (12.2)	40 (9.9)
Education level*		
basic	2755 (42.1)	181 (44.8)
vocational	2050 (31.4)	102 (25.2)
university	1732 (26.5)	121 (30.0)
Profession*		
full-time employed	3184 (48.6)	175 (43.3)
part-time employed	269 (4.1)	23 (5.7)
student, retired, unemployed	3067 (46.8)	206 (51.0)
other	34 (0.5)	0
	Finnish mean (SD)	**Swedish mean (SD)**
Age (years)**	54.0 (15.9)	58.4 (17.2)
Weight (kg)	76.0 (15.6)	74.5 (15.0)
Height (cm)	168.0 (9.9)	167.3 (10.0)
Body mass index	26.9 (4.7)	26.5 (4.3)
Waist circumference (cm)	92.6 (13.3)	91.6 (12.7)
Hip circumference (cm)	101.6 (9.5)	101.1 (9.4)
Work hours per week	39.1 (8.5)	38.9 (10.0)
Commuting time (min per day)*	37.6 (35.3)	30.0 (23.8)

Mann-Whitney or chi-square tests being significant at *$p < 0.05$, **$p < 0.001$

Table 2. Health status of the Finnish and the Swedish linguistic groups.

	Finnish n (%)	Swedish n (%)
Metabolic syndrome		
WHO	1523 (25.4)	90 (25.1)
EGIR	1273 (25.8)	76 (22.7)
NCEP-ATPIII	1956 (31.9)	115 (31.0)
AACE	2256 (40.5)	136 (39.7)
IDF	2623 (43.0)	162 (43.8)
Any M-CIDI diagnosis	1550 (29.8)	48 (24.6)
Alcohol abuse	102 (2.0)	1 (0.5)
Alcohol abuse (no hierarchy criteria)**	292 (5.6)	3 (1.5)
Alcohol dependence	419 (8.1)	11 (5.7)
Any alcohol disorder	521 (10.0)	12 (6.2)
Major depressive disorder	268 (5.2)	5 (2.6)
Dysthymia	127 (2.4)	3 (1.5)
Panic disorder	101 (1.9)	5 (2.6)
Social phobia	50 (1.0)	2 (1.0)
Agoraphobia	24 (0.5)	3 (1.5)
Generalized anxiety disorder	65 (1.3)	2 (1.0)
	Finnish mean (SD)	**Swedish mean (SD)**
SCL-90 somatization score	1.67 (0.60)	1.64 (0.62)
Social activity score**	2.16 (0.80)	2.30 (0.78)
Whiteley index***	13.7 (4.1)	12.4 (4.3)
GSS	5.02 (3.08)	4.96 (2.85)
GHQ-12 score*	1.9 (2.9)	1.6 (2.6)
15D score	0.91 (0.1)	0.91 (0.1)
Other symptoms score		
swelling of the feet	1.58 (0.95)	1.59 (1.00)
sleeping disorders/insomnia	2.14 (1.13)	2.05 (1.16)
nervousness/anxiety***	1.95 (0.96)	1.76 (0.93)
melancholy/depression***	1.79 (0.96)	1.59 (0.87)
non-energetic/tired*	2.15 (1.05)	2.03 (1.03)
poor concentration/memory	1.96 (1.03)	1.86 (0.97)
exhaustion***	2.04 (1.01)	1.80 (0.96)
irritability	1.93 (0.90)	1.91 (0.91)
sweaty palms**	1.25 (0.59)	1.19 (0.60)
fast heartbeat*	1.61 (0.88)	1.51 (0.84)

AACE: American Association of Clinical Endocrinologists
EGIR: European Group for the Study of Insulin Resistance
GSS: global seasonality score
GHQ-12: 12 item General Health Questionnaire
IDF: International Diabetes Federation
M-CIDI: Munich-Composite International Diagnostic Interview
NCEP-ATPIII: US Adult Treatment Panel III of the National Cholesterol Education Program
SCL-90: Symptom Checklist 90
WHO: World Health Organization

Mann-Whitney or chi-square tests being significant at *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 3. Associations of the linguistic group with metabolic syndrome as assessed with the five sets of criteria.[a]

	Mother tongue Finnish vs. Swedish		
	OR	**95% CI**	**p-value**
WHO	1.083	0.839 to 1.399	0.541
EGIR	1.067	0.813 to 1.401	0.640
NCEP-ATPIII	1.189	0.937 to 1.509	0.154
AACE	1.136	0.900 to 1.434	0.282
IDF	1.108	0.885 to 1.387	0.373

AACE: American Association of Clinical Endocrinologists
CI: confidence interval
EGIR: European Group for the Study of Insulin Resistance
IDF: International Diabetes Federation
NCEP-ATPIII: US Adult Treatment Panel III of the National Cholesterol Education Program
OR: odds ratio
WHO: World Health Organization

[a] Controlled for age, gender, marital status, education level and profession.

Table 4. Associations of the linguistic group with mental disorders as assessed with the M-CIDI interview for diagnosis.[a]

	Mother tongue Finnish vs. Swedish		
	OR	**95% CI**	**p-value**
Alcohol abuse	3.332	0.455 to 24.382	0.236
Alcohol abuse *(no hierarchy)*	*3.341*	*1.039 to 10.746*	*0.043*
Alcohol dependence	1.293	0.683 to 2.449	0.431
Any alcohol disorder	1.507	0.812 to 2.798	0.194
Major depressive disorder	2.210	0.895 to 5.459	0.086
Dysthymia	1.423	0.443 to 4.567	0.553
Panic disorder	0.719	0.287 to 1.804	0.482
Social phobia	0.806	0.191 to 3.397	0.769
Agoraphobia	*0.209*	*0.060 to 0.733*	*0.014*
Generalized anxiety disorder	1.106	0.267 to 4.586	0.890
Any M-CIDI diagnosis	1.232	0.881 to 1.724	0.223

CI: confidence interval
M-CIDI: Munich-Composite International Diagnostic Interview
OR: odds ratio

[a] Controlled for age, gender, marital status, education level and profession.
Statistically significant items are marked with italics.

Table 5. Associations of the linguistic group with agoraphobia diagnosis after controlling for alternative confounding factors.[a]

Additional alternative controlling variable	Finnish vs Swedish OR of agoraphobia diagnosis (95% CI)	p-value
SCL-90 symptoms		
SCL-90 soreness of muscles	0.191 (0.053 to 0.687)	0.011
SCL-90 hot or cold spells	0.211 (0.059 to 0.758)	0.017
SCL-90 numbness/tingling	0.214 (0.060 to 0.763)	0.017
Other symptoms		
Nervousness/anxiety	0.236 (0.060 to 0.935)	0.040
Melancholy/depression	0.193 (0.050 to 0.741)	0.017
Non-energetic/tired	0.267 (0.070 to 1.023)	0.054
Exhaustion	0.240 (0.065 to 0.890)	0.033
Sweaty palms	0.217 (0.059 to 0.793)	0.021
Fast heartbeat	0.181 (0.051 to 0.644)	0.008
Social activities total score	0.215 (0.061 to 0.762)	0.017
Seasonal variations		
Social activities	0.225 (0.063 to 0.803)	0.022
Appetite	0.214 (0.060 to 0.758)	0.017
Energy	0.206 (0.058 to 0.735)	0.015
Outdoor activity (every day to 1-2 times per week vs 1-2/month or less)	0.224 (0.063 to 0.790)	0.020
GHQ-12 total score	0.188 (0.050 to 0.706)	0.013
Eating chocolate or filled biscuits	0.214 (0.061 to 0.752)	0.016
Eating breakfast (nothing, only drink or cold meal vs. warm meal)	0.202 (0.057 to 0.715)	0.013
Eating dinner (nothing, only drink or cold meal vs. warm meal)	0.198 (0.056 to 0.697)	0.012
Retrieving medical information		
Books and journals	0.222 (0.063 to 0.783)	0.019
TV, radio, internet, CDs	0.221 (0.062 to 0.779)	0.019
Internet-based health services		
Family doctor services	0.145 (0.038 to 0.550)	0.005
Other physician services	0.130 (0.033 to 0.511)	0.003

CI: confidence interval
GHQ-12: 12 item General Health Questionnaire
OR: odds ratio
SCL-90: Symptom Checklist 90

[a] Each model is additionally controlled for age, gender, marital status, education level and profession.

Discussion

Our results suggest potential linguistic influences on mental health status, with no significant impact on the general health status. Specifically the Finnish-speaking group had higher odds of alcohol abuse, but lower odds of agoraphobia. The linguistic group seemed not to be associated with any indicator of metabolic syndrome.

Earlier studies have reported a better health status, and a longer life expectancy [9,10], in the Swedish-speaking minority as compared with the Finnish-speaking majority starting already at school age [11]. Generally speaking, there is a tight bond between culture and language: language itself being expression and part of a cultural identity. Thus, the separate influence of language cannot be easily disentangled. Therefore, it is not possible to fully rule out that the differences between the two linguistic groups, or the associations with mental disorders, are a consequence of some broader cultural differences, such as help-seeking thresholds. However, the associations remained significant after controlling for the socio-demographic variables. It is also of note that the Finnish-speaking and the Swedish-speaking groups are close within a society where only minor cultural differences (mostly linguistic) exist. In addition, the data analysed here were collected in a population-based health examination study which covered all the mainland of Finland in a representative way, and therefore the differences we found are not biased by a selection of specific geographical areas.

Intriguingly, the significant associations we found were those regarding mental health and psychological well-being, not those concerning somatic health and metabolic syndrome. This might suggest that these differences are an expression of a more direct linguistic influence. Indeed, we hypothesize here that culture in general (including the socio-economic status, as in Sipilä and Martikainen [7]) and infrastructure primarily impact on daily lifestyle, and that therefore they may predispose to somatic disorders, such as the metabolic syndrome, that are notoriously related to modern lifestyles such as unhealthy dietary habits and sedentary physical activities. On the other hand, according to linguistic relativity theory, it could be speculated that the natural language, i.e. the mother tongue, influences thought, perception and interpretation, and these could intuitively be reflected in psychological status and mental disorders.

Interestingly, the Finnish linguistic group was more prone to alcohol abuse, but less prone to agoraphobia. Even though various cultural elements may explain these findings, a more direct linguistic influence cannot be ruled out. As said, according to studies by Strømnes [2-4], the Finnish language follows a more static approach and is more person centred, while the Swedish language is more focused on dynamic and temporal entities. When evaluating safety in their working place, Finnish-speaking workers stressed more on the importance of their own responsibility in safety, while Swedish-speaking workers had a more co-operative approach [12]. In this context, alcohol abuse could be seen as a disorder of the individual, i.e. a person centred disorder that depends on the individual's thoughts and actions. On the other hand, agoraphobia is a disorder which impairs dynamic or co-operative dimensions of the individual's life, as it is characterized by an inability to engage with situations which normally require movement and interaction with others. It is therefore possible that those who are, because of their natural mental schemes more concerned about dynamic and relational aspects are also more sensitive and vulnerable to impairment in these functions. Even though the social capital was found to explain part of the differences in self-rated and psychological health between Finnish-speaking and Swedish-speaking Finns [8,13], the associations in our study remained significant after controlling for indicators of social activities and participation, suggesting that it could be the mental scheme associated with the language spoken that partly mediates the association between linguistic group and mental health.

Limitations

A major limitation of this study is that other factors, including various cultural components, may otherwise explain the associations between the linguistic group and specific conditions. In other words, there may be other possible mechanisms whereby language is related to health. However, we were able to control our models of associations between language and mental health for a range of diverse variables, which we found to differ between the two groups, and which thereby were potentially related to the cultural influence, such as eating habits, social and outdoor activities and use of media.

Conclusions

Our study indicates that the influence of language on behaviours and subsequent mental health should be carefully analysed. Further research is needed to better explain the nature of this relationship.

Methods

Design of the study

This study was part of a nationwide health interview and examination survey, the Health 2000 Study, which was carried out in Finland, a north-eastern European country with about 5 million inhabitants, from September 2000 to June 2001. The survey was coordinated by the National Public Health Institute and implemented in collaboration with the Ministry of Social Affairs and Health. The two-stage stratified cluster sampling design was planned by Statistics Finland. The sampling frame comprised adults living in mainland Finland. This frame was divided into five geographical strata according to the five university hospital districts, or catchment areas, each containing roughly one million inhabitants. All the methods have been reported in detail elsewhere [14].

Since equal allocation across strata was used, 16 clusters were selected from each stratum, and to improve precision the strata were further divided into two substrata. First, all the 15 biggest (by the number of inhabitants) towns, or in fact their health centres, were selected, and the sample size for each health centre was proportional to its proportion of the population. Second, the remaining 65 health centres were selected using a design of systematic probabilities proportional to size. The population count of people aged 18 or over (excluding the 15 largest towns) was used as a measure of size, and the sample sizes (ranging from 50 to 100) were equal within each university hospital region, the total number of persons drawn from a university hospital region being proportional to the corresponding population size. In the first stage of sampling, 80 health centre districts (clusters) were selected out of the total of 249 districts in mainland Finland. The second stage involved sampling individual persons from those districts. Thus, the 80 health centres were the primary sampling units, and the ultimate sampling units were persons who were identified by

systematic random sampling that was drawn using data provided by the Population Register Centre. Its population information system contains the official information for the whole country on the individuals residing permanently in Finland.

Sample

All the persons aged 30 and over (n=8028) who were identified as participants to be invited were contacted in person. Interviewers attended training sessions on the specific themes that were to be covered in the computer-assisted interviews. Of the final sample of 7979 persons, 6986 (88%) were interviewed at home or institution face-to-face and 6354 (80%) attended the health status examination in a local health centre or equal setting, while 416 took part in the health status examination at home or in an institution. Overall, 84% participated either in the health status examination proper or in the examination at home.

During the interviews, the background (including the mother tongue) and health-related information and data on living habits were collected. The participants were handed a questionnaire to give information on a range of symptoms and mental health with the 12-item General Health Questionnaire (GHQ-12) for example.

During the health status examination, the waist circumference (in centimetres) was measured on the naked waist at the end of light expiration while the examinee was standing, and this measurement was taken halfway between the iliac crest and the lowest rib. The hip circumference (in centimetres) was measured at the broadest point of the pelvis. The height (in centimetres) and weight (in kilograms) were also measured, and the body mass index was calculated (as the weight in kilograms divided by the square of the height in metres). To the end, a nurse checked that the first questionnaire had been filled in and the participants were handed out another questionnaire which was to be filled in at home and thereafter mailed back. This second questionnaire retrieved data on the seasonal variations in mood and behaviour, and the quality of life for example.

Self-report items

As part of the assessment, the participants filled in items concerning their use of time and leisure activities, eating habits, participation in group activities, problems experienced during childhood, retrieving information on health and illness, seasonal variation in mood and behaviour, a range of symptoms and quality of life.

Time and frequency of participation in different leisure activities (on a 5-point scale, ranging from "less frequently than once a year or never", to "every day or during most of the days") were inquired with a list of 16 items including club or society activities, theatre movies, religious activities and other. Computer use was assessed with three additional questions, and three further questions were aimed at evaluating the retrieval of information concerning health and illness.

Assessment of eating habits included the frequency on a 5-point scale, ranging from never to 3 times a day or more often, of consumption of sweets and sweetened drinks, and in addition, the type of meals normally eaten during weekdays.

Participation in group activities and courses was part of the health promotion assessment. The list of group activities and courses consisted of 11 items. It included weight-watching, smoking-cessation and mental well-being groups.

Assessment of problems experienced during childhood consisted of 11 items regarding the individual's living environment before 16 years of age, including serious illnesses, drinking or mental problems of the parents, financial or unemployment difficulties in the family and bullying.

The 6 items of seasonal variation in mood and behaviour were taken and adapted from the Seasonal Pattern Assessment Questionnaire. Two modifications were made to the original scoring as follows. Each item (sleep length, social activity, mood, weight, appetite and energy level) was scored from 0 to 3 (none, slight, moderate or marked change), and not from 0 to 4 (none, slight, moderate, marked or extremely marked change), with the sum or global seasonality score (GSS) ranging from 0 to 18.

The 12-item GHQ evaluates whether the individual complains of a recent symptom or behaviour. It is a valid screening tool for and a measure of psychological symptoms and mental health at population level in a range of settings and cultures, especially feelings of anxiety and depression. It was scored on a Likert-like scale (less than usual, no more than usual, rather more than usual or much more than usual), yielding a sum score ranging from 0 to 36. According to the analysis of data derived from the Health 2000 Study, the threshold value of 4 was taken to indicate ill health (the scores of 0 to 4 assigned as low, and those of 5 to 36 as high).

The 13-item Symptom Checklist 90 (SCL-90) somatization subscale measures the level of distress due to perceived body dysfunctions on a 5-point Likert scale, asking to what extent (not at all, quite little, to some extent, quite much, very much) the

respondent was bothered by the listed symptoms during the previous 4 weeks. The final score is calculated as the mean on the answered questions, ranging from 0 to 4. The 13-item SCL-90 was followed by a list of 10 other symptoms frequently included in other surveys (swelling of the feet, sleeping disorders/insomnia, nervousness/anxiety, melancholy/depression, feeling non-energetic/tired, poor concentration/memory, overexertion/exhaustion, irritability, sweaty palms, fast heartbeat), being scored on a 5-point Likert scale.

The hypochondria level, or attitudes regarding health, was assessed with the 7-item Whiteley index, a self-rating scale which yields a sum score ranging from 7 to 35.

The health-related quality of life in terms of functional capacity, activities of daily living and related problems was measured with the 15D questionnaire. The 15D score is a single index number calculated on each item 5-point score after application of appropriate weights, and it ranges from 0 to 1 [15,16].

Assessment of the metabolic syndrome

Metabolic syndrome was assessed using five sets of criteria: the World Health Organization (WHO) criteria, the European Group for the Study of Insulin Resistance (EGIR) criteria, the US Adult Treatment Panel III of the National Cholesterol Education Program (NCEP-ATPIII) criteria, the American Association of Clinical Endocrinologists (AACE) criteria and the International Diabetes Federation (IDF) criteria.

Assessment of alcohol use, anxiety and depressive disorders

The diagnostic mental health interview was performed at the end of the comprehensive health examination. The computerized version of the CIDI (M-CIDI, Munich-Composite International Diagnostic Interview) was used. The program uses algorithms to meet the DSM-IV criteria and allows the estimation of DSM-IV diagnoses for major disorders. The translation of the M-CIDI into Finnish was made pairwise by psychiatric professionals and revised by others. The official Finnish translation of the DSM-IV classification was used as a basis for formulating the interview. The process included consensus meetings, third expert opinions, an authorized translator's review and testing with both informed test subjects and unselected real subjects. Interviews were performed to determine the 12-month prevalence rates of alcohol abuse and dependence, other substance dependence and abuse, generalized anxiety disorder, panic disorder with or without agoraphobia, social phobia, major depressive episodes and disorder, and dysthymia. Comorbid cases were defined as persons having suffered from more than one category disorders within the past 12 months.

Ethics

The National Public Health Institute coordinated and implemented the study project in collaboration with the Ministry of Social Affairs and Health. It provided written informed consent to each participant, giving a full description of the protocol before signing. The procedures were according to the ethical standards of the responsible committee on human experimentation and with the Declaration of Helsinki, its amendments and revision. The study protocol was accepted by the Ethical Committee for Research in Epidemiology and Public Health at the Hospital District of Helsinki and Uusimaa (HUS).

Data analysis

To start with, the following variables were tested as a screen to find out differences between the two linguistic groups: working time (hours per week), commuting time (minutes per day), social activities, outdoor activities, eating habits, participation in group activities, problems experienced during childhood, retrieving diverse information on health and illness, the GSS, the GHQ-12 score, somatization and other symptoms, the Whiteley index, the 15D score, weight, and the body mass index, as well as the waist and hip circumferences.

To elucidate the independent effect of the linguistic group on the presence of the metabolic syndrome and on the diagnosis of alcohol use, anxiety or depressive disorders, multivariate logistic regression models were calculated, each being controlled for the age, gender, marital status, education level, and profession. These models were analysed further with controlling one by one for additional confounding factors that were potentially related to the linguistic group on the basis of the screen.

Conflict of Interest

The authors declare that they have no conflict of interest.

Authors' contributions

ET performed the statistical analysis and participated in drafting the manuscript. TP participated in the design of the study and in drafting the manuscript. SK contributed to conception and design of the study and critically revised the manuscript. All authors read and approved the final manuscript.

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Elena Toffol, MD, PhD
Department of Health, National Institute for Health and Welfare, Helsinki, Finland

Timo Partonen, MD, PhD
Department of Health, National Institute for Health and Welfare, Helsinki, Finland

Seppo Koskinen, MD, PhD
Department of Health, National Institute for Health and Welfare, Helsinki, Finland

Correspondence:
elena.toffol@thl.fi