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Health habits of patients with schizophrenia

■ **Abstract** *Background* The aim of the study was to analyze the physical activity, dietary, drinking, and smoking habits of schizophrenia patients (SP). *Methods* Data from 194 schizophrenia outpatients collected using sections of the German National Health Interview and Examination Survey were compared with data from the German general population (GP). In addition to univariate data analyses, a multivariate regression analysis was performed. *Results* Schizophrenia patients have a supper snack more frequently, consume instant meals and calorie-reduced food more frequently, and eat healthy groceries more rarely. Though they drink less alcohol, a greater proportion currently smokes, smoking on average 4 cigarettes more per day. On workdays they spend less time with strenuous activities, and in leisure time a greater proportion is involved in no sports. Regression analysis revealed that schizophrenia by itself or in interaction with demographic variables influences physical activity as well as alcohol, nicotine, and healthy grocery consumption. Health habits were particularly disadvantageously affected by schizophrenia in connection with unemployment. *Conclusions* Schizophrenia patients are an appropriate target group for public health interventions. They need information about a healthy diet and motivation to prepare their own meals, to quit smoking, and to exercise.

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Introduction

People with schizophrenia have a higher risk of medical illness, especially for obesity, hyperlipidemia, diabetes, coronary heart disease, and stroke, than the general population (GP) does [16, 18, 26, 30, 38, 44–46]. An increased overall cancer risk was also observed, which was mainly attributable to lung cancer [27]. Furthermore, people with schizophrenia or affective disorders have significantly higher rates of treatment not only for diabetes, cardiovascular diseases and malignant neoplasms, but also for respiratory and gastrointestinal disorders [17]. Additionally, the standardized mortality ratio for natural causes such as cardiovascular disease and diabetes is significantly higher in schizophrenia patients (SP) than in the GP [7, 9, 36].

Despite these alarming facts, we do not yet know enough about causes for higher somatic morbidity and mortality of SP. Only the association of antipsychotic drugs with obesity and diabetes has been thoroughly investigated [3, 11, 45, 51]. However, weight gain in patients with schizophrenia was mentioned even before the first use of antipsychotic drugs [49], and not all patients taking antipsychotic drugs gain weight at the same rate [2]. The increased incidence of type 2 diabetes results not only from the effect of medication but is also independently associated with the schizophrenic illness itself [39, 43].

Consequently, lifestyle seems important apart from accompanying effects of pharmacotherapy for somatic comorbidity in patients with schizophrenia. This aspect, however, has recieved little previous examination [11].

The best extant documentation shows more smokers among SP than among the GP [14–16, 24, 30, 38].

Regarding the consumption of non-alcoholic beverages, hardly any information is available; the results are contradictory regarding alcohol consumption. On the one hand, several studies show that alcohol abuse is present among many patients with schizophrenia [5, 32–34]. On the other hand, examinations of outpatients point to a lower alcohol consumption among SP than among the GP [8]. This discrepancy could be due to the fact that SP with alcohol related problems are under-represented in outpatient samples, because substance use disorders are associated with a greater use of inpatient services [34], non-compliance, incarceration, homelessness and early deaths from accidents, suicide, and homicide [32].

Only very few and rather contradictory results concerning dietary habits of SP are available. Some authors have observed that people with schizophrenia make poorer dietary choices, eating a diet higher in fat and lower in fiber than the GP [8, 30, 31]. Other authors report that SP eat more food than the GP, while the relative percentages of calories derived from fat, protein, and carbohydrates do not differ [48]. However, the studies mentioned have some limitations. McCreadie et al. compared only severely disabled patients with the GP [30, 31]. Brown et al. could not compare their findings with a population sample, but only with 35- to 64-year-old persons visiting general practices; they did not indicate the extent to which both groups could be compared regarding age and gender distribution [8]. In the sample by Strassnig et al. barely half of the subjects had schizophrenia, and the results only cover food intake in the course of one day [48].

There is even less data regarding physical activity of SP. The only source is the previously mentioned study by Brown et al. and a recently published paper by Daumit et al. [12]. Brown et al. did not have control samples, but assumed on the basis of a population study that SP engage in less sports than the GP [8]. The results by Daumit et al. are related to the diagnostic inhomogeneous group of severely mentally ill individuals and are restricted to physical activities in leisure time. The authors also show that severely mentally ill individuals are physically less active than the GP.

In this study we present the first broad analysis of SP's health habits and compare the results to GP data surveyed parallel to it. We explore the dietary choices, the drinking habits, including alcohol consumption, as well as the nicotine consumption and physical activity of SP in order to test the following hypotheses:

- Schizophrenia patients eat a diet higher in fat and lower in fiber.
- The proportion of current smokers among SP is significantly higher than in the GP.
- Alcohol consumption among SP is higher than in the GP.
- Physical activity in leisure time as well as in daily life is less frequent among SP than among the GP.

Methods

Sample

Patients with a diagnosis of schizophrenia were recruited in Plauen and Leipzig, Eastern Germany. Plauen is a small town with 70,070 inhabitants, while Leipzig is a city with 497,531 inhabitants [6]. Both regions were chosen in order to represent rural as well as urban regions in the schizophrenia sample. The researchers asked outpatient facilities in both catchment areas to inform all their patients about the study who were between 18 and 79 years old and had been diagnosed as suffering from schizophrenia according to ICD-10 F20 [53]. Patients were informed about the study and were asked to fill in a questionnaire. They were told that participation in the study could be denied without explanation. Patients willing to take part in the study could contact the researcher themselves or could provide their addresses and phone-numbers for future contact by the researchers. Following their preferences, patients were examined in there own homes or in their outpatient facility. If patients refused to take part in the study, the outpatient facilities were asked to collect basic socio-demographic data to assess how participants differ from non-participants. Recruitment occurred consecutively with the goal of interviewing 100 subjects in each catchment area.

The study did not include patients with cognitive problems who were unable to fill in the questionnaire; patients who were, according to their doctor's evaluation, not stress-resistant enough to accomplish the examination because of acute disease symptoms were also not included in the study.

A total of 375 patients were asked to participate in the study. About 203 (54%) agreed to an examination. Incomplete information excluded the questionnaires of 9 participants from the study. The examined sample consequently contains 194 subjects (Plauen: $N = 95$, Leipzig: $N = 99$).

Data collection occurred during a period from April 2004 to May 2005. All participants gave their informed consent, and the study was approved by the local research ethics committee. All subjects received a self-administered questionnaire and could be assisted by the researchers if they were not able to complete the questionnaire independently.

Data from SP were compared with data from the German GP collected within the German National Health Interview and Examination Survey 1998 (GNHIE-Survey 98) [50]. In this descriptive cross-sectional study 7124 persons between 18 and 79 years and living in rural or urban regions were examined concerning their health habits. The GNHIE subjects were selected through a randomized stratified sampling procedure to acquire a representative sample of the German civilian non-institutionalized population. The health habits of the GNHIE subjects were examined using a self-administered questionnaire. Since our sample of SP was recruited in Eastern Germany, we did not consult the data of the all-German GNHIE sample as a comparison group, but only the data of the 2419 inhabitants of Eastern Germany.

Assessment

The patients' socio-demographic data and their health habits were assessed using the eating, drinking, smoking and physical activities sections of the GNHIES 98 [50]. The GNHIES sections were chosen because they allowed comparison of SP' health habits with the GP.

As in the GNHIES, the dietary habits of the previous year were explored, and data was collected on how often particular food was ingested, with 19 different food groups being assessed. The coding

occurred on a 7-point Likert-scale from 0 (never) to 6 (several times daily). To obtain a clear summary of the individual results, food consumed by the subjects was classified in food recommended for rare, moderate and large consumption (according to the core recommendations in international food guidelines [37]), and in calorie-reduced food and instant meals. In addition, data on the particular meals subjects usually ate on workdays was collected.

Concerning drinking habits, subjects were asked how often they had consumed popular alcoholic and non-alcoholic drinks within the last year. Altogether, 12 types of beverages were recorded. The coding was again on a 7-point Likert-scale from 0 (never) to 6 (several times daily). Furthermore, for alcoholic beverages the average consumption was compiled in liters or centiliters for different types of alcoholic drinks. This amount consumed was converted into grams of alcohol on the basis of the average alcoholic content of particular alcoholic drinks using the conversion values given by Möller et al. as a basis [35]. The average daily drinking amount was calculated from the average drinking amount and the drinking frequency within the last 12 months. In addition, subjects were asked if alcohol consumption had recently changed.

Smoking habits were assessed via a threefold distinction: those who never smoked, subjects who had quit smoking, and those still smoking. In the two latter groups data for the onset of smoking was collected. For subjects who stopped smoking over 1 year ago, their age at the time of quitting was also recorded. For current daily smokers the average cigarette consumption was recorded. Also for the consumption of pipes and cigars data was recorded. However, this is not mentioned here, since only very few subjects of the whole sample were cigar ($n = 13$) or pipe smokers ($n = 10$).

Concerning physical activity, we examined two aspects: the amount of time the subjects spent in the last three months on average with particular activities on one day, categorized by the level of physical strain, and the frequency and length of time the subjects spent with sports in their leisure time.

■ Statistical analysis

Differences between groups were tested by Pearson's χ^2, Mann–Whitney–U or t-test, as appropriate. T-test was used for mean comparisons of variables, which were normally distributed. For non-normally distributed variables the Mann–Whitney–U-test was used as non-paremtetric test. Because former studies suggested that gender might moderate the health habits [20], we also performed gender specific data analyses. However, to foster clarity we report results of these analyses only when there are significant differences among these groups that did not surface in the entire sample group.

Finally we performed a multivariate regression analysis with four dependent variables. By means of this form of analysis the correlation of the dependent variables is taken into account. Since two of the criteria are dichotomous a probit model was chosen to explain the probability. For each of the four examined domains of health habits one dependent variable was chosen which had been demonstrating significant differences between SP and the GP in our descriptive data analysis. Besides schizophrenia, parameters known to predict health habits in the GP were chosen as independent variables. Additionally, we tested for interaction effects between these parameters and schizophrenia that would influence health habits. Because the SP's sample was very small compared with the GP's sample, we calculated 10%-confidence intervals.

Calculations were carried out using SPSS (version 12.0), STATA (version 8.2) and Mplus (version 4.1).

Results

■ Analysis of possible selection effects

We could collect socio-demographic data from the 172 patients who refused to participate in our study. In order to identify possible selection effects, we compared these data with the corresponding data of the 194 SP participating in the study. We found no significant differences between participants and non-participants concerning gender distribution, marital status, educational level, and the percentage of patients living in sheltered accommodation. However, the group of non-participants was older (participants mean 44.7 years, SD 13.6; non-participants mean 51.5, SD 11.1; $P < 0.001$) and had a longer duration of schizophrenic illness (participants mean 16 years, SD 12; non-participants mean 23, SD 10; $P < 0.001$). Furthermore, the percentage of currently unemployed people was higher in the group of non-participants (participants 77%, non-participants 88%; $P = 0.012$). This difference is probably due to the higher age and the longer duration of illness among non-participants, which results in the fact that a larger proportion of non-participants has already lost its workplace or is receiving a disability pension.

About 60% of the participants had been using atypical antipsychotics. Fifty-seven percent of them had been receiving this medication for more than 1 year. The neuroleptic medication of non-participants could not be recorded.

As reason for refusing to participate in the study, 57% of patients indicated skepticism of surveys in general, 26% stated they did not feel like participating, 9% refused because of a specific aversion to the topic of the study, and an additional 9% did not participate in the study due to lack of time.

■ Socio-demographic data of schizophrenia patients and the general population

Literature shows a relationship between a health-promoting lifestyle and several socio-demographic factors. The most important lifestyle modifying factors are gender, age and education [20, 23]. Regarding these three factors, there were no significant differences between the GP and SP in our sample.

But among SP was a higher percentage of single (SP 52%, GP 21%; $P < 0.001$) and currently unemployed subjects (SP 77%, GP 41%; $P < 0.001$). These socio-demographic characteristics can influence the lifestyle, but they are also closely connected with schizophrenia. On the one hand, singleness and unemployment increase the risk of schizophrenia, and on the other hand they are often the outcome of a schizophrenic illness [1]. Therefore, in descriptive data analysis we executed no statistical control of the mentioned socio-demographic variables linked to schizophrenia. However, their influence was tested together with other variables in a multivariate regression analysis.

■ Diet

Table 1 shows the kind of meals subjects usually ate on workdays. It reveals that significantly fewer pa-

Table 1 Eating habits and dietary choices of schizophrenia patients and the general population

	Schizophrenia patients	General population	P value
Eating habits			
Meals the subjects usually have on workdays			
Subjects who have breakfast, %	82	96	<0.001
Subjects who have second breakfast, %	17	29	0.001
Subjects who have lunch, %	92	88	0.086
Subjects who have afternoon snack, %	47	50	0.475
Subjects who have dinner, %	97	98	0.474
Subjects who have supper snack, %	24	8	<0.001
Number of meals per day, mean (SD)	3.6 (1.0)	3.7 (0.8)	0.113
Subjects who eat irregularly, %	13	14	0.610
Dietary choices[#]			
Food recommended for rare consumption,[a] mean (SD)	2.0 (0.9)	1.9 (0.9)	0.880
Food recommended for moderate consumption,[b] mean (SD)	3.4 (0.6)	3.4 (0.6)	0.121
Food recommended for large consumption,[c] mean (SD)	3.2 (0.8)	3.3 (0.7)	0.016
Reduced-calorie food,[d] mean (SD)	3.1 (1.8)	2.1 (1.2)	<0.001
Instant meals,[e] mean (SD)	1.2 (1.5)	0.9 (1.3)	0.049

Pearson's χ^2 test (meals the subjects usually have, subjects who eat irregularly), Mann–Whitney–U-test (number of meals per day, dietary choices)
[#]Note: Items scaled from 0 (never) to 6 (several times a day).
[a]Fried potatoes/french fries; cake/biscuits/sweets/chocolate; potato crisps/cracker/peanuts; fast food (bratwurst/hamburger/kebab/pizza) (4 items)
[b]Fromage frais/yoghourt/cream cheese; fish; cheese/butter; bread made from rye and wheat flour/white bread and rolls; eggs; meat/sausage (6 items)
[c]Fresh fruit; raw salad/vegetables; wholegrain bread/wholegrain rolls; oat flakes and muesli; boiled vegetables; noodles/rice (6 items)
[d]Reduced-calorie butter/margerine; other reduced-calorie food (2 items)
[e]Instant meals (1 item)

tients with schizophrenia had breakfast ($P < 0.001$) and second breakfast ($P = 0.001$), compared with the GP. Concerning lunch, afternoon snack and dinner, there were no significant differences. However, compared with the GP, more SP had a supper snack ($P < 0.001$). Regarding the number of meals subjects usually had on workdays, there were no significant differences between the GP and SP. 13% of the individuals with schizophrenia reported eating irregularly. In this they did not differ from the GP, with 14% of subjects reporting irregular eating habits.

Furthermore, Table 1 shows that patients with schizophrenia, compared with the GP, less frequently eat food recommended for large consumption ($P = 0.016$) and more frequently eat reduced-calorie food ($P < 0.001$) and instant meals ($P = 0.049$). Men with a schizophrenic illness also chose food recommended for moderate consumption more rarely than men in the GP ($P = 0.012$).

■ Drinking

Table 2 shows how often subjects consumed particular beverages. SP more often consumed mineral or tap water ($P < 0.001$), sportsman drinks ($P = 0.044$), as well as alcohol-free or alcohol-reduced beer ($P < 0.001$), and also coffee ($P = 0.020$). The differences are also highly significant regarding the consumption of alcoholic drinks (regular beer, wine/sparkling wine, and high proof alcoholic drinks), whereat SP report about a clearly less frequent consumption than the GP ($P < 0.001$).

Regarding the amount of alcohol consumed per day, SP also differ from the GP. The GP consumes 9.7 grams (SD 19.4) of pure alcohol on average per

day, while SP consume only 8.3 grams (SD 21.6, $P < 0.001$). The observed difference is caused by the drinking habits of male SP ($P < 0.001$), while female SP do not differ significantly from the GP ($P = 0.184$).

About 32% of SP claimed to drink no alcohol, compared with 17% in the GP ($P < 0.001$). However, the proportion of people with a hazardous alcohol consumption also tended to be slightly higher in subjects with schizophrenia (SP 7%, SG 6%, $P = 0.530$). This was the case for males and females, but in both genders the difference was not significant.

About 43% of SP and only 31% of the GP stated they had had a higher alcohol consumption in the past ($P = 0.001$).

■ Smoking

As Table 3 shows, among SP the proportion of subjects who were always non-smokers is significantly lower than among the GP (34% vs. 46%, $P = 0.002$). The proportion of those subjects who successfully quit smoking is also smaller among SP than among the GP ($P = 0.028$). Moreover, it is remarkable that SP succeed stopping smoking only at a higher age than the GP (42.7 years vs. 36.6 years, $P = 0.014$).

Looking at the proportion of those subjects who have been trying to quit smoking for <1 year, and the proportion of subjects who only occasionally smoke, no differences exist between SP and the GP.

Correspondingly, the proportion of subjects who currently smoke daily is significantly higher among SP than among the GP ($P < 0.001$). Regarding the cigarette consumption of current daily smokers, clear differences also exist between schizophrenia subjects (20 cigarettes per day) and the GP (16 cigarettes per

Table 2 Drinking habits of schizophrenia patients and the general population[#]

	Schizophrenia patients	General population	P value
Mineral or tap water, mean (SD)	5.1 (1.4)	4.5 (1.9)	<0.001
Fruit and vegetable juice, mean (SD)	3.2 (1.9)	3.2 (1.9)	0.975
Milk, mean (SD)	3.3 (2.0)	3.2 (1.9)	0.386
Black tea, mean (SD)	1.5 (1.8)	1.6 (1.9)	0.613
Coffee, mean (SD)	4.9 (1.8)	4.7 (1.8)	0.020
Sportsman drinks, mean (SD)	0.3 (0.9)	0.2 (0.7)	0.044
Reduced-calorie drinks, mean (SD)	1.9 (2.0)	2.0 (2.0)	0.748
Lemonade, cola, tonic, mean (SD)	2.2 (2.1)	2.4 (2.2)	0.148
Alcohol free or reduced beer, mean (SD)	0.4 (0.8)	0.2 (0.6)	<0.001
Regular beer, mean (SD)	1.4 (1.8)	1.9 (1.9)	<0.001
Wine, sparkling wine, mean (SD)	1.0 (1.2)	1.5 (1.3)	<0.001
High-proof alcoholic drinks, mean (SD)	0.5 (1.1)	0.8 (1.2)	<0.001

Mann–Whitney–U-test (all variables in Table 2)
[#]Note: Items scaled from 0 (never) to 6 (several times a day)

Table 3 Smoking habits of schizophrenia patients and the general population

	Schizophrenia patients	General population	P value
Current status regarding smoking habits			
Always non-smoker, %	34	46	0.002
Daily smoker, %	46	27	<0.001
Occasional smoker, %	6	7	0.407
Non-smoker for >1 year, %	12	19	0.028
Non-smoker for <1 year, %	2	1	0.183
Current and past smokers:			
Age at starting smoking in years, mean (SD)	18.5 (5.9)	18.6 (5.1)	0.380
Non-smokers for >1 year:			
Age at quitting smoking in years, mean (SD)	42.7 (12.4)	36.6 (12.0)	0.014
Current daily smokers:			
Cigarettes per day, mean (SD)	19.5 (10.6)	15.8 (7.9)	0.002

Pearson's χ^2 test (current status regarding smoking habits), Mann–Whitney–U-test (age at starting/quitting smoking, cigarettes per day)

day, $P = 0.002$). Only the age at which current and former smokers started consuming tobacco shows no difference among SP and the GP ($P = 0.380$).

■ Physical activity

On workdays schizophrenia subjects spend 9.4 h on average sleeping and 12.7 h with sedentary physical activities (Table 4). In contrast, the GP spends significantly less time with those activities not physically strenuous (sleeping $P < 0.001$, sedentary activities $P = 0.004$). On weekends similar differences can be observed (sleeping $P < 0.001$, sedentary activities $P = 0.001$). Accordingly, the GP spends significantly more time with moderately strenuous ($P < 0.001$) and strenuous activities ($P < 0.001$) on workdays as well as on weekends.

About 46.6% of SP indicated they participate in no sports in their leisure time, while in the GP only 33.5% reported this ($P < 0.001$). In contrast, for schizophrenia and GP subjects engaging in leisure time sports, no significant differences exist regarding the time spent.

■ Predictors of health habits

As the multivariate regression analysis shows (Table 5), schizophrenia predicts the subjects' health habits in all examined domains either by itself or in interaction with demographic variables.

Thus, unemployed SP (77% of all examined SP) eat healthy groceries less frequently than unemployed subjects in the GP. Also concerning physical activity, unemployed SP live unhealthier than unemployed

people in the GP. In the GP the probability to participate in no sports already increases if a subject is unemployed. This probability, however, increases much more if a person is unemployed and suffering from schizophrenia.

With regard to nicotine consumption, the regression analysis shows a general but not significant trend towards an increased probability to be a smoker for SP. In subjects with a high educational level, the probability to be a smoker increases significantly if these subjects have a schizophrenic disease. Additionally, the probability to be a smoker is significantly lower in females with schizophrenia than in males with schizophrenia.

Furthermore, multivariate regression analysis confirms that SP drink significantly less alcohol than the GP. However, the interaction effect between schizophrenia and gender indicates that the lower alcohol consumption is primarily attributable to males with schizophrenia. While schizophrenic males drink 12.9 g alcohol per day less than males in the GP, schizophrenic females drink only 3.8 g (12.9–9.1) alcohol per day less than females in the GP. Schizophrenic females consume alcohol more health-consciously than females in the GP, but do not seem to follow medical recommendations as strictly as schizophrenic males.

Additionally, our regression analysis confirms demographic predictors of health behavior already well known from literature. Thus, the analysis reveals that women eat healthy groceries more frequently than men, drink less alcohol, and smoke less frequently. But the probability to participate in no sports in leisure time is in women also higher than in men. Furthermore, the educational level is a strong predictor of health-promoting behavior. People with a higher educational level eat healthy food more frequently and have lower probabilities to smoke or to participate in no sports in their leisure time. The third

Table 4 Physical activity of schizophrenia patients and the general population

	Schizophrenia patients	General population	P value
Physical activity on a workday (24 h) in hours			
Sleeping/resting, mean (SD)	9.4 (1.9)	7.7 (1.4)	<0.001
Sedentary and facile activities[a], mean (SD)	12.7 (2.5)	11.7 (3.6)	0.004
Moderately strenuous activities[b], mean (SD)	1.5 (1.7)	2.9 (2.6)	<0.001
Strenuous activities[c], mean (SD)	0.3 (1.0)	1.7 (2.5)	<0.001
Physical activity on a weekend day (24 h) in hours			
Sleeping/resting, mean (SD)	10.0 (2.1)	8.7 (1.5)	<0.001
Sedentary and facile activities[a], mean (SD)	12.5 (2.7)	11.7 (3.0)	0.001
Moderately strenuous activities[b], mean (SD)	1.2 (1.6)	2.5 (2.1)	<0.001
Strenuous activities[c], mean (SD)	0.3 (1.0)	1.1 (1.8)	<0.001
Subjects who participate in no sports in their leisure time, %	46.6	33.5	<0.001
Hours of sports per year among subjects who participate in sports in their leisure time, mean (SD)	67.7 (64.1)	64.1 (63.1)	0.554

Pearson's χ^2 test (subjets who paricipate in no sports), Mann–Whitney–U-test (physical activity on workday/weekend, hours of sports)

Note: [a]e.g. office work, driving, watching TV, eating, reading, cooking, going for a walk, shopping, tidying up, body care, sales activity
[b]e.g. jogging, renovating, cleaning, biking, swimming
[c]e.g. carrying loads, heavy gardening, chopping wood, competitive sport, ball games

predictor of health habits is a subject's age. Older people have a lower probability to smoke, but have also a higher probability to participate in no sports. As already mentioned, physical activity is also influenced by unemployment, which significantly increases a subject's probability to participate in no sports.

The share of explained variance is highest in physical activity (0.21) and smoking behavior (0.18), and lower in alcohol consumption (0.13) and consumption of healthy groceries (0.08).

Discussion

In accordance with results of previous studies [8, 12, 15, 22, 30], our study has shown that SP have a lifestyle unhealthier than the GP in many areas. They eat food recommended for large consumption less frequently, they have meals in the morning more rarely and eat more frequently in the late evening, they consume instant meals more often, and they drink coffee more frequently than the GP. Not only is the proportion of SP who smoke greater, but they also smoke on average 4 cigarettes more per day than the GP. The percentage of those who quit smoking a long time ago is lower among SP, and giving up nicotine consumption succeeded on average 6 years later than in the GP. Recreational activity and normal work- and weekend-days among SP are connected with less physical activity than among the GP.

The results of univariate analyses were confirmed by multivariate regression analysis. In all examined domains, schizophrenia was a significant predictor of health habits by itself or in interaction with demographic variables.

Thus, even while adjusting for demographic variables, a schizophrenic disease predicted lower alcohol consumption compared to the GP. There was also a tendency towards an increased probability to smoke for SP. That this effect did not reach a significant level may result from the low size of the SP' sample compared to the large GP sample. However, the interaction effect between schizophrenia and educational level was significant, showing that in subjects with a high educational level the probability to smoke increased significantly if these subjects had a schizophrenic disease. This means that the health-promoting effect of education loses its influence in schizophrenia. This could be explained by the fact that the increased nicotine consumption in SP serves as a form of self-medication to reduce side effects of antipsychotics, to alleviate negative symptoms, and to ameliorate cognitive deficits associated with schizophrenia [25].

General population surveys have already shown that unemployment increases a subject's probability to avoid sports [47]. Our study confirmed this and additionally revealed that unemployment in combination with schizophrenia effects health behavior in a particularly disadvantageous way. Thus, unemployed SP ate healthy groceries less frequently and had an even higher probability to avoid sports than unemployed subjects in the GP. The present study, however, can not explain why unemployment and schizophrenia interact so disadvantageously. Thus, it is on the one hand possible that SP already tend to have an unhealthier lifestyle than the GP, which is probably only intensified by unfavorable circumstances of unemployment. On the other hand, the loss of employment may be not disadvantageous itself, but could be an indicator for the severity of schizophrenia. Because unemployed SP are as a rule more severely ill than employed patients, disadvantageous health habits could also be caused by a more severe illness. This relationship should be examined in more detail in future studies.

Table 5 Predictors of health habits in a multivariate regression analysis

	Estimates	s.e.	est./s.e.	Standard. reg. coeff.	Lower 90% conf. int.	Upper 90% conf. int.
Food recommended for large consumption (intercept: 3.029)						
Schizophrenic disease (0 = no, 1 = yes)	0.014	0.146	0.095	0.005	−0.227	0.255
Gender (0 = males, 1 = females)	**0.372**	**0.030**	**12.321**	**0.253**	**0.323**	**0.422**
Current unemployment (0 = no, 1 = yes)	0.045	0.036	1.236	0.030	−0.014	0.104
Educational level (0 = low, 1 = high)	**0.165**	**0.032**	**5.144**	**0.109**	**0.112**	**0.218**
Being single (0 = no, 1 = yes)	−0.062	0.043	−1.449	−0.036	−0.133	0.009
Age (centred)	−0.002	0.001	−1.841	−0.052	−0.004	0.000
Schizophrenia × gender	0.014	0.108	0.133	0.004	−0.164	0.192
Schizophrenia × unemployment	**−0.240**	**0.125**	**−1.917**	**−0.076**	**−0.446**	**−0.034**
Schizophrenia × educational level	0.131	0.120	1.094	0.028	−0.067	0.329
Schizophrenia × being single	0.022	0.120	0.184	0.006	−0.176	0.220
Schizophrenia × age	−0.001	0.004	−0.269	−0.006	−0.008	0.006
Gram alcohol per day (intercept: 17.970)						
Schizophrenic disease (0 = no, 1 = yes)	**−12.907**	**6.303**	**−2.048**	**−0.176**	**−23.307**	**−2.507**
Gender (0 = males, 1 = females)	**−14.041**	**1.590**	**−8.831**	**−0.364**	**−16.665**	**−11.418**
Current unemployment (0 = no, 1 = yes)	−1.279	1.060	−1.206	−0.033	−3.028	0.470
Educational level (0 = low, 1 = high)	0.149	0.889	0.168	0.004	−1.318	1.616
Being single (0 = no, 1 = yes)	−2.165	1.324	−1.635	−0.048	−4.350	0.020
Age (centred)	−0.060	0.042	−1.426	−0.049	−0.129	0.009
Schizophrenia × gender	**9.099**	**3.602**	**2.526**	**0.089**	**3.156**	**15.042**
Schizophrenia × unemployment	5.065	5.624	0.901	0.061	−4.215	14.345
Schizophrenia × educational level	5.793	3.664	1.581	0.048	−0.253	11.839
Schizophrenia × being single	5.034	3.945	1.276	0.050	−1.475	11.543
Schizophrenia × age	0.036	0.159	0.227	0.007	−0.226	0.298
Being smoker (0 = no, 1 = yes) (intercept: 0.392)						
Schizophrenic disease (0 = no, 1 = yes)	0.371	0.292	1.271	0.088	−0.111	0.853
Gender (0 = males, 1 = females)	**−0.410**	**0.059**	**−6.962**	**−0.185**	**−0.507**	**−0.313**
Current unemployment (0 = no, 1 = yes)	0.030	0.070	0.427	0.013	−0.086	0.146
Educational level (0 = low, 1 = high)	**−0.185**	**0.062**	**−2.976**	**−0.081**	**−0.287**	**−0.083**
Being single (0 = no, 1 = yes)	−0.065	0.080	−0.811	−0.025	−0.197	0.067
Age (centred)	**−0.025**	**0.003**	**−9.286**	**−0.349**	**−0.030**	**−0.020**
Schizophrenia × gender	**−0.405**	**0.217**	**−1.866**	**−0.069**	**−0.763**	**−0.047**
Schizophrenia × unemployment	0.242	0.250	0.967	0.051	−0.171	0.655
Schizophrenia × educational level	**0.404**	**0.243**	**1.660**	**0.058**	**0.003**	**0.805**
Schizophrenia × being single	0.004	0.253	0.015	0.001	−0.413	0.421
Schizophrenia × age	−0.006	0.010	−0.637	−0.021	−0.023	0.011
Participating in no sports (0 = no, 1 = yes) (intercept: 0.356)						
Schizophrenic disease (0 = no, 1 = yes)	−0.220	0.336	−0.654	−0.051	−0.774	0.334
Gender (0 = males, 1 = females)	**0.133**	**0.058**	**2.307**	**0.059**	**0.037**	**0.229**
Current unemployment (0 = no, 1 = yes)	**0.124**	**0.070**	**1.763**	**0.055**	**0.008**	**0.240**
Educational level (0 = low, 1 = high)	**−0.651**	**0.062**	**−10.533**	**−0.279**	**−0.753**	**−0.549**
Being single (0 = no, 1 = yes)	−0.001	0.088	−0.016	−0.001	−0.146	0.144
Age (centred)	**0.022**	**0.003**	**8.604**	**0.309**	**0.017**	**0.027**
Schizophrenia × gender	0.193	0.211	0.917	0.032	−0.155	0.541
Schizophrenia × unemployment	**0.439**	**0.253**	**1.730**	**0.091**	**0.022**	**0.856**
Schizophrenia × educational level	0.359	0.225	1.596	0.051	−0.012	0.730
Schizophrenia × being single	0.112	0.261	0.431	0.019	−0.319	0.543
Schizophrenia × age	0.010	0.009	1.071	0.032	-0.005	0.025

Grey rows = dependent variables; italic font = interaction effects; bold font = significant effects at 10% probability of error level

Being single—next to unemployment an essential consequence of schizophrenia—had no significant influence on health habits. This was unexpected, because we supposed being single could be discouraging if it comes to preparing meals for oneself or doing exercises, which may interact disadvantageously with negative symptoms of schizophrenia.

Besides the mentioned disadvantageous health habits, there are also ways SP strive towards healthy living. Thus, more frequent consumption of reduced-calorie food could be a sign that patients are trying to avoid or to reverse weight gain. But it also indicates that knowledge gaps regarding basics about a healthy diet and long term successful weight control among SP exist.

Increased consumption of mineral water may also be connected with the avoidance of weight gain, but could also be a consequence of a primary polydipsia, which can be found in up to 25% of SP [13].

Furthermore, the less frequent mean consumption of alcoholic drinks, which was already described in earlier studies [4, 8], and the higher proportion of SP drinking no alcohol at all, argue for efforts toward a health-promoting lifestyle. Obviously, many patients follow medical recommendations and avoid alcohol because of possible interactions with medication. But we also observed a non-significantly higher proportion of SP with hazardous alcohol consumption. This corresponds with results of Rodgers et al., who found a U-shaped pattern of alcohol consumption in patients with depression and anxiety, indicating that mentally ill people have a higher proportion of non-drinkers and also a higher proportion of hazardous drinkers compared to the GP [42]. With regard to this it should also be taken into consideration that SP with alcohol related problems may be under-represented in outpatient samples like our study [32, 34].

In addition to examining SP's health habits, our study also confirmed that health habits generally are modified by age, gender and educational level of subjects—a well-known fact from former examinations of the GP [20]. Comparable to our results, former studies showed that females eat healthy groceries more often, consume less alcohol, and smoke less often [10, 23, 40, 52], but also have a higher probability to participate in no sports in leisure time [47]. Furthermore, a low educational level is known to predict a generally unhealthy lifestyle [41] and less healthy dietary choices [23]. According to these results we found a lower educational level predicting a less healthy diet and a higher probability to be a smoker or to participate in no sports. Our study could also confirm that a higher age is associated with lower nicotine consumption [28] and also with less physical activity [19].

A limitation of our study is that SP who participated were younger, had a shorter duration of illness, and were unemployed at a lower percentage than patients who refused participation. It can be assumed that the absence of employment particularly affects health habits unfavorably. Furthermore, it is possible that patients not wanting to participate are less interested in health questions and thus have an unhealthier lifestyle. Consequently, the findings presented could underestimate the actual dimension of unhealthy living among SP. An underestimation could also result from the fact that the most severely ill patients (patients with cognitive problems and patients not stress-resistant enough to accomplish the examination because of acute disease symptoms) were not included in the study.

Furthermore, our study is based on information given by the subjects themselves, which could limit the validity of the recorded data. Desired response behavior or minimizing existing problems, as with alcohol consumption, for instance, cannot be excluded. These phenomena presumably occur among SP and likewise among subjects from the GP, making a valid representation of differences between both groups nevertheless, possible. However, SP could have felt more compelled to demonstrate health-conscious behavior because they were recruited in outpatient facilities. In contrast, GP subjects probably felt more open to answer honestly because they were recruited using a register of residents and not medical facilities.

Conclusion

Regarding diet, exercise, and nicotine consumption, SP have an unhealthier lifestyle than the GP. Therefore, they are an appropriate target group for public health interventions. On the one hand, SP should be emphatically supported to quit smoking. Since long term success among many patients is hard to achieve, strategies that reduce smoking could be a more feasible but still useful goal [21, 29]. On the other hand, preventive measures should include information about healthy diets and motivation to prepare one's own meals. Cooking and nutrition courses offered by community psychiatric institutions would help recreational activities and social contacts and could, in addition, have positive effects on the lifestyle and the quality of life of affected persons. Sports and physical activity should also be emphasized more than before in community based mental health care. In a best case scenario, corresponding interventions would be integrated into mental health care and already mediated at the beginning of a schizophrenic illness. Thus, a fundamental contribution to primary prevention of somatic diseases among SP could be achieved.

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