Full length article

Effects of voluntary memberships and volunteering on alcohol and tobacco use across the life course: Findings from the German Socio-Economic Panel

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ABSTRACT

Background: It is unclear whether specific components of individual social capital promote or protect against substance use and whether such effects vary across the life course. In this study, we investigated the effects of voluntary memberships and volunteering on alcohol and tobacco consumption in age comparison.
Methods: Preregistration is accessible at https://osf.io/qhkrn/. We used data from the German Socio-Economic Panel (1984–2015), where alcohol consumption was assessed in 2006, 2008, and 2010 and smoking was assessed at least biennially since 1998. We divided participants into three age groups (14–29, 40–50, and 65–75 years of age at baseline). To disentangle intraindividual change over time and interindividual differences (potential selection effects), we employed multilevel analysis.
Results: At the within level, voluntary memberships at one occasion predicted higher alcohol consumption a year later in middle-aged and older adults, but memberships had no significant longitudinal effects on smoking. Several positive effects of volunteering on alcohol and tobacco use one year later were found in males. No significant differences in the longitudinal effects between age groups or between nonpolitical and political volunteering emerged. At the between level, voluntary memberships and volunteering were usually associated with more alcohol consumption at low and moderate levels but with less smoking.
Discussion: Over time, voluntary memberships and volunteering in Germany appear to promote, rather than to protect against, alcohol and tobacco use. On average, more engaged individuals drink more (at moderate levels) and smoke less, which may be due to selection effects.

1. Introduction

Social participation and in particular social capital (i.e., at the collective level, social cohesion, trust, and reciprocity; at the individual level, embeddedness in social groups and access to group resources; Coleman, 1988; Putnam, 1993) can affect substance use both positively and negatively via various pathways, including social support, influence, and engagement (Berkman et al., 2000; Umberson et al., 2010) and social contagion (Skog, 1985; Villalonga-Olives and Kawachi, 2017). For instance, social networks that encourage a healthy lifestyle (social influence), create supportive environments that buffer against stress (social support), and offer meaningful identities and activities (social engagement) will probably reduce the prevalence of risky substance use in their members (Berkman et al., 2000; Umberson et al., 2010; Youniss et al., 1999). However, belonging to a group whose members engage in risky substance use may lead to the opposite

outcome (social contagion; Berkman et al., 2000; Skog, 1985; Villalonga-Olives and Kawachi, 2017).

Voluntary memberships and volunteering are aspects of structural social capital, which refers to formal and informal social networks (Ferlander, 2007). It has been widely assumed – and apparently supported by evidence from cross-sectional and longitudinal research – that volunteering protects against substance abuse in adolescents and young adults (Piliavin and Siegl, 2015). Studies document lower risks of alcohol abuse, tobacco smoking, and marijuana use in young volunteers as compared to nonvolunteers (Ballard et al., 2018; Pavlova et al., 2014; Theall et al., 2009; Weitzman and Chen, 2005; Youniss et al., 1999). In contrast, findings for voluntary memberships have been mixed, with some research reporting protective effects (Bartkowski and Xu, 2007; Winstanley et al., 2008) and other studies finding promotive effects on alcohol abuse (Pavlova et al., 2014; Seid et al., 2016; Theall et al., 2009; Weitzman and Chen, 2005). A study from Japan found not

only voluntary memberships to be associated with smoking but also volunteering to be associated with increased drinking in boys (Takakura, 2015).

This research has focused on youth, assuming that young people are at greatest risk for developing unhealthy substance use habits because of their susceptibility to peer pressure (Villalonga-Olives and Kawachi, 2017). Drinking and smoking habits are initiated and consolidated in adolescence and young adulthood, beyond which these health behaviors become increasingly resistant to external influence (Umberson et al., 2010). Although some studies found significant associations between social capital and alcohol and tobacco use in adult samples with a wide age range (Giordano and Lindström, 2011; Seid et al., 2016), age differences in these effects were not tested. However, alcohol and tobacco use in middle and older age draw the increasing attention of researchers. While risky substance use tends to decrease with age (Knott et al., 2017; Yong et al., 2012), health risks associated with it may become amplified in older age (Beach et al., 2015; World Health Organization, 2014). Moreover, many older adults experience normative life events (retirement and widowhood) that may produce considerable stress and remove key sources of social control that regulate health behaviors. Under these circumstances, structural social capital may be relevant in facilitating or preventing substance use, which often occurs in the context of coping with stress (Umberson et al., 2010). Plenty of studies have testified to the positive effects of volunteering on physical and mental health in old age (Piliavin and Siegl, 2015), but its effects on substance use have hardly been addressed. Nevertheless, Santini et al. (2017) found broad indices of social integration, which included volunteering and voluntary memberships, to predict a lower risk of problem drinking in older Irish adults over two years.

The present study is the first to investigate and compare the effects of voluntary memberships and volunteering on alcohol and tobacco use in young, middle-aged, and older adults. We used large-scale data from the German Socio-Economic Panel (SOEP; Schupp et al., 2017) and conducted multilevel analyses with observations nested within participants (Wang and Maxwell, 2015). This design allowed for separating the associations between individual propensities to participate in voluntary organizations and to consume alcohol and tobacco (between level) from the over-time associations between civic engagement and substance use (within level).

We pre-registered this study's hypotheses and methods at the Open Science Framework (https://osf.io/qhkrn/). All our hypotheses referred to the within level. We expected voluntary memberships to predict higher alcohol use, especially at moderate levels. Drawing on prior research (Pavlova et al., 2014; Takakura, 2015; Theall et al., 2009; Villalonga-Olives and Kawachi, 2017; Weitzman and Chen, 2005), we reasoned that voluntary memberships would primarily bring more social interaction, which is often accompanied by low and moderate alcohol consumption. As smoking is no longer socially approved in Germany, we did not expect to find significant associations between memberships and smoking. In contrast, we hypothesized volunteering to predict lower alcohol use and less smoking. Volunteering is a meaningful activity that involves commitments and requires coordination with others (Piliavin and Siegl, 2015; Wilson, 2012). As such, it may invoke the mechanisms of social control, engagement, and support, which protect against substance use (Berkman et al., 2000; Umberson et al., 2010). Moreover, we explored the differences between political volunteering (i.e., aiming at policy change) and nonpolitical volunteering (i.e., direct helping activities). Virtually the only study that considered this distinction found that adolescent political protest predicted more risky health behaviors in young adulthood (Ballard et al., 2018). However, this effect might be due to a greater risk proneness of politically active individuals (Ballard et al., 2018). As no further evidence was available, we expected to find no differences in the effects of political and nonpolitical volunteering on substance use over time. Finally, to acknowledge the widespread assumptions that youth are an at-risk group for substance abuse and that their health

behaviors are most malleable (Umberson et al., 2010; Villalonga-Olives and Kawachi, 2017), we expected all hypothesized effects, positive or negative, to be larger in younger than in middle-aged and older adults.

2. Methods

2.1. Sample and procedure

The SOEP (Schupp et al., 2017) is an ongoing national yearly survey of adults (16 +) residing in private households that was launched in 1984 in West Germany. Interviews are face-to-face and, in the last years, computer-assisted. In this study, we used four subsamples that are representative of the general population: the original West German sample A, the East German sample C (started in 1990), and refreshment samples E (1998) and F (2000). These four subsamples included 37,566 participants surveyed at least once from 1984 to 2015.

We divided participants into contrasting age groups (14–29, 40–50, and 65–75) based on their age in the year when a given outcome was assessed for the first time (1998 for smoking and 2006 for alcohol use). All age groups included about 51% females, except for the older group in 1998 with 54.5% females. Younger and middle-aged groups reported about 12 years of education on average, whereas the older group reported about 11 years of education (see online appendix S1).

2.2. Measures

2.2.1. Volunteering

At least biennially, participants reported on their leisure activities, including nonpolitical volunteering ("Volunteer work in clubs, associations or social services") and political volunteering ("Involvement in a citizens' initiative, political party, local government"). At some waves, a 5-point rating scale was used (1 = never; 2 = less often; 3 = at least once per month; 4 = at least once per week; 5 = daily), whereas a 4-point scale (1 = never; 2 = less often; 3 = at least once a month; 4 = at least once a week) was administered at other waves. We merged the categories "at least once per week" and "daily" (endorsed by very few participants) of the 5-point scale to obtain a uniform 4-point scale. In supplementary analyses, we found no effect of the rating scale on the results.

2.2.2. Voluntary memberships

With varying intervals between measurement occasions, participants reported on their memberships in a trade union, professional body, works or staff council at the workplace, environmental protection group, and club or similar organization. Not all types of memberships were assessed at every occasion. For 10-measurement occasions that provided information on at least two types of membership, we created a binary variable of membership in any organization (yes/no).

2.2.3. Alcohol consumption

In 2006, 2008, and 2010, participants reported how often they consumed beer, wine or champagne, spirits, and mixed drinks (for each beverage: regularly, occasionally, seldom, or never). Following Ziebarth and Grabka (2008), we defined four groups: abstainers (who never drink), rare drinkers (who consume at least one beverage seldom), moderate drinkers (who consume at least one beverage occasionally), and regular drinkers (who consume at least one beverage regularly). We tested the validity of this variable against a set of more precise measures of alcohol consumption that were administered only once in 2016. Across age groups, our grouping variable from 2010 correlated .41–.60 with the self-reported frequency of alcohol consumption in 2016 (in days per month), .30–.49 with the average ethanol consumption in 2016 (on the days when alcohol was consumed), and .14–.16 with heavy alcohol use in 2016. Across age groups, 0.0% of abstainers, 0.1% of rare drinkers, 1.6% of moderate drinkers and 6.7% of regular drinkers in 2010 could be classified as heavy alcohol users in 2016. Thus,

Table 1
Descriptive Statistics for the Key Study Variables.

Variables	M (SD)	%	n persons	n observations	M (SD)	%	n persons	n observations	M (SD)	%	n persons	n observations
For alcohol use	Age 14–29 (2006)				Age 40–50 (2006)				Age 65–75 (2006)			
Nonpolitical volunteering (1–4)	1.57 (0.98)	–	5,564	24,878	1.58 (0.98)	–	7,006	56,061	1.57 (0.99)	–	4,697	39,148
Political volunteering (1–4)	1.10 (0.37)	–	5,564	24,876	1.15 (0.46)	–	7,004	56,001	1.17 (0.51)	–	4,695	39,055
Membership	–	26.5	5,181	14,906	–	35.3	6,865	30,766	–	32.2	4,686	21,734
Alcohol consumption			3,763	7,864			3,731	9,509			2,602	6,274
Abstainers	–	10.4			–	8.7			–	16.9		
Rare drinkers	–	28.0			–	28.4			–	29.7		
Moderate drinkers	–	48.4			–	43.2			–	35.5		
Regular drinkers	–	13.1			–	19.6			–	17.9		
For smoking	Age 14–29 (1998)				Age 40–50 (1998)				Age 65–75 (1998)			
Nonpolitical volunteering (1–4)	1.53 (0.94)	–	7,210	43,321	1.61 (1.00)	–	5,660	47,600	1.43 (0.89)	–	3,189	24,026
Political volunteering (1–4)	1.10 (0.37)	–	7,211	43,306	1.19 (0.53)	–	5,654	47,511	1.14 (0.48)	–	3,190	24,000
Membership	–	26.9	6,846	24,813	–	37.8	5,605	26,246	–	25.0	3,173	13,051
Smoker	–	36.6	6,463	31,708	–	33.5	4,544	27,537	–	9.9	2,336	12,512
Smoking intensity			3,087	10,518			1,917	8,282			343	1,069
Light smokers	–	24.3			–	18.1			–	32.7		
Moderate smokers	–	41.8			–	36.1			–	43.6		
Heavy smokers	–	33.9			–	45.9			–	23.6		

Note: Summary statistics across persons and observations are shown. n = number of valid cases. Dash = not applicable.

our grouping variable appeared to represent the frequency of drinking well, but it was not suitable to capture high-risk drinking patterns, even though it had some predictive value for the latter.

2.2.4. Smoking

Starting in 1998 and at least biennially, all respondents answered the question "Do you currently smoke, whether cigarettes, a pipe, or cigars?" followed by a question for smokers only: "How many cigarettes, pipes, or cigars do you smoke per day? Please give the daily average of the previous week." We used current smoking status (yes/no) and smoking intensity (1 = light smokers with 1–9 cigarettes per day; 2 = moderate smokers with 10–19 cigarettes per day; 3 = heavy smokers with 20+ cigarettes per day; Chiolero et al., 2006). To account for the higher amount of tobacco contained in pipers and cigars, we counted one pipe as equivalent to 2.5 cigarettes and one cigar as equivalent to 4 cigarettes (NHS Scotland, 2014). We also ran alternative analyses of smoking intensity for cigarettes only.

2.2.5. Control variables

The first set of control variables included sociodemographic indicators: region of origin (East/West Germany), sex, age, years of education, employment status (employed, unemployed according to the ILO criteria, or out of the labor market), equalized disposable household income in euro (logged), occupational prestige, cohabiting with a partner/spouse (yes/no), and children under 16 in the household (yes/no). The second set included satisfaction with health and emotional well-being. The third set included other leisure activities: self-reported frequencies of church attendance, informal helping, going out, socializing, doing sports, and artistic activities.

2.3. Statistical analyses

We conducted two-level probit regression analyses in MPlus 7.4 (Muthén and Muthén, 2012) as all outcomes were binary or ordered categorical variables. In Model 1, we included three central predictors at both levels and age at the within level to control for any systematic effects of growing older on the predictors and the outcomes (Wang and Maxwell, 2015). Models 2–4 added control variables on within, between, or both levels (see online appendix S2), depending on the extent of their variation over time. All continuous within-level indicators were centered on individual means across all observations to remove the

between-level variance (Wang and Maxwell, 2015). The individual means were entered as continuous between-level indicators and were grand-mean centered. Voluntary membership at the between level indicated whether a participant ever, within the observation period, reported being a member of any organization (yes/no).

To test for differences between the effects of same predictors across age groups, we conducted analyses in each age group separately and used the method of overlapping confidence intervals with a correction suggested in (Knol et al., 2011) to test age differences in regression coefficients for significance at $p < .01$. To explore the differences between the effects of different predictors (nonpolitical and political volunteering), we z-standardized their within- and between-level indicators prior to dividing the participants into age groups. We tested the differences between the regression coefficients for significance at $p < .01$ using a z-test.

We used Bayesian estimation as ML estimation for categorical outcomes was computationally infeasible with our sample size (Muthén and Asparouhov, 2012). Bayesian estimation does not provide conventional p-values, but it does provide credibility intervals (Muthén and Asparouhov, 2012). The Bayes estimator is a full information estimator that uses all available data, including cases with partly missing data. To facilitate estimation of missing values, we included data from all waves when predictor and control variables were assessed (i.e., starting from 1985), even if no data on the outcomes were yet available. Additionally, we used missing data covariates: income and satisfaction with health from the previous wave at the within level and years of education at the between level (if not already in the model). As effect sizes, we report differences in the probability to report a given outcome (see online appendix S6 for formulae).

3. Results

Table 1 shows descriptive statistics on central predictors and outcomes in the subsamples that we used in the analyses of alcohol consumption and smoking, respectively.

3.1. Within-level effects

3.1.1. Alcohol consumption

As shown in Table 2, there was little change in the pattern of alcohol consumption with age, except for that young adults increased and older

Table 2
Effects of Voluntary Memberships and Volunteering on Alcohol Consumption.

Predictors	Rare drinkers vs. abstainers $_t$				Moderate vs. rare drinkers $_t$				Regular vs. moderate drinkers $_t$			
	Model 1[a]	Model 2[a]	Model 3[a]	Model 4[a]	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Age 14–29 (2006)												
Within												
Membership $_{t-1}$	− 0.003	− 0.003	0.038	− 0.060	0.121	0.098	0.163[*]	0.101	0.168	0.130	0.169	0.188
Nonpolitical volunteering $_{t-1}$	0.120	0.102	0.108	0.123	0.047	0.037	0.039	0.028	− 0.040	− 0.040	− 0.030	− 0.028
Political volunteering $_{t-1}$	− 0.072	− 0.057	− 0.053	− 0.029	− 0.035	− 0.028	− 0.036	− 0.038	− 0.072	− 0.080	− 0.090	− 0.065
Age $_t$	0.054[**]	0.053[**]	0.055[**]	0.053[**]	− 0.008	− 0.010	− 0.010	− 0.008	0.007	0.010	0.004	0.007
Between												
Ever member	0.228[*]	0.081	0.229	0.203	0.213[**]	0.132[*]	0.205[**]	0.223[**]	0.211[*]	0.039	0.227[**]	0.238[*]
Nonpolitical volunteering	0.103	0.090	0.113	0.108[*]	0.091[*]	0.062	0.090[**]	0.086[**]	0.032	− 0.003	0.030	0.029
Political volunteering	0.006	− 0.005	0.001	0.018	0.023	0.014	0.026	0.041	0.045	0.006	0.050	0.047
Age 40–50 (2006)												
Within												
Membership $_{t-1}$	0.388[*]	0.387[*]	0.408[*]	0.418[*]	0.132	0.120	0.151[*]	0.144[*]	0.119	0.100	0.106	0.079
Nonpolitical volunteering $_{t-1}$	− 0.077	− 0.076	− 0.079	− 0.092	− 0.006	0.010	− 0.017	− 0.025	− 0.012	0.011	− 0.002	− 0.002
Political volunteering $_{t-1}$	− 0.066	− 0.070	− 0.084	− 0.095	0.025	0.028	0.024	0.021	0.068	0.072	0.067	0.072
Age $_t$	− 0.023	− 0.014	− 0.017	− 0.026	− 0.001	0.008	0.000	0.003	0.015	0.020	0.013	0.012
Between												
Ever member	0.756[**]	0.490[*]	0.781[**]	0.729[**]	0.129	0.027	0.114	0.156	0.187	0.023	0.169	0.213
Nonpolitical volunteering	0.196[*]	0.136	0.147	0.194[*]	0.087[*]	0.062	0.082[*]	0.092[*]	− 0.004	− 0.037	0.006	0.005
Political volunteering	0.240[*]	0.134	0.250[*]	0.200[*]	0.079[*]	0.064	0.085[*]	0.081	− 0.099[*]	− 0.147[**]	− 0.104[*]	− 0.110[*]
Age 65–75 (2006)												
Within												
Membership $_{t-1}$	0.130	0.137	0.235[*]	0.155	0.192[**]	0.196[*]	0.212[*]	0.200[*]	0.097	0.069	0.128	0.137
Nonpolitical volunteering $_{t-1}$	0.069	0.068	0.065	0.039	0.035	0.017	0.011	0.001	− 0.108	− 0.101	− 0.101	− 0.112
Political volunteering $_{t-1}$	0.101	0.114	0.109	0.071	− 0.071	− 0.063	− 0.061	− 0.089[*]	0.085	0.087	0.084	0.094
Age $_t$	− 0.062[**]	− 0.049[**]	− 0.049[**]	− 0.057[**]	0.001	0.008	0.008	0.001	− 0.018	− 0.019	− 0.019	− 0.025
Between												
Ever member	0.357[**]	0.121	0.296[**]	0.357[**]	0.183[*]	0.104	0.153	0.179	0.114	− 0.180	0.081	0.096
Nonpolitical volunteering	0.085	0.082	0.014	0.076	0.114[*]	0.063	0.074	0.110[*]	0.126	0.082	0.090	0.112
Political volunteering	0.272[**]	0.208[*]	0.280[**]	0.265[**]	0.061	0.008	0.065	0.072	0.069	− 0.085	0.060	0.061

Note: Cells represent unstandardized probit regression coefficients. Model 1 = without control variables. Model 2 = adjusted for employment status, income, cohabiting with partner, and having children under 16 in the household at the within level and for region of residence, sex, average years of education, average occupational prestige, and average income at the between level. Model 3 = adjusted for satisfaction with health and emotional well-being at both levels. Model 4 = adjusted for church attendance, informal helping, going out, socializing, doing sports, and artistic activities at the within level.

[a] For middle-aged adults, this model was estimated on a reduced sample that only included observations from 1990 onwards because of convergence problems in the full sample that included earlier observations. Note that in all models, using observations prior to 2005 served only the purpose of a more precise estimation of missing values.

 * $p < .05$.

 ** $p < .01$.

adults decreased in the probability to drink rarely (vs. not at all). Furthermore, in young adults, most associations between voluntary memberships and alcohol consumption were not statistically significant. In middle-aged adults, being a member of a voluntary organization on a given occasion significantly predicted a 7.3% [95% CI: 1.2–12.8%] greater probability of rare drinking (vs. not drinking at all) and a 5.8% [95% CI: 0.4–11.0%] greater probability of moderate (vs. rare) drinking on the next occasion. The former effect held in all models, whereas the latter effect was significant only when health and well-being or leisure activities were controlled for. In older adults, membership significantly predicted a 9.3% [95% CI: 2.2–18.0%] greater probability of moderate (vs. rare) drinking on the next occasion across all models.

As the regression coefficients of membership were mostly in a positive direction for all levels of alcohol consumption, we ran additional models in which we treated alcohol consumption as an ordinal variable. These analyses yielded similar findings: In middle-aged and older adults, membership significantly predicted higher alcohol consumption a year later in most models, whereas in young adults, significantly positive effects of membership did emerge, but only without control variables.

Occasion-specific frequency of volunteering had virtually no statistically significant effects on alcohol consumption in the next year, regardless of age group, type of volunteering (political or nonpolitical),

and the level of alcohol consumption. In the absence of significant effects of volunteering within age groups, we tested neither age differences nor the differences between political and nonpolitical volunteering for significance.

3.1.2. Smoking

Table 3 displays the results of multilevel regression analyses for smoking status and smoking intensity as outcomes. Within age groups, the probability of being a smoker and smoking intensity generally decreased over time. Across age groups, we found no consistently significant effects of occasion-specific membership in voluntary organizations and volunteering on smoking in the next year. (An unexpectedly positive effect of nonpolitical volunteering on smoking intensity in middle-aged participants was not significant in all models, see Table 3.) For this reason, we did not test for age differences or for differences between political and nonpolitical volunteering. In alternative analyses for cigarettes only, there were no significant effects on smoking intensity either (see online Appendix S5).

3.2. Between-level associations

3.2.1. Alcohol consumption

At the between level, indicators of participation were generally associated with more alcohol consumption, especially at low and

Table 3
Effects of Voluntary Memberships and Volunteering on Smoking.

Predictors	Smoker $_t$				Smoking intensity $_t$ [a]			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Age 14–29 (1998)								
Within								
Membership $_{t-1}$	0.046	0.057	0.034	0.043	0.020	−0.013	0.029	0.030
Nonpolitical volunteering $_{t-1}$	0.030	0.022	0.025	0.024	0.016	0.018	0.021	0.020
Political volunteering $_{t-1}$	−0.005	−0.012	−0.007	−0.010	0.017	0.017	0.014	0.019
Age $_t$	−0.039**	−0.035**	−0.039**	−0.038**	−0.001	−0.002	−0.002	−0.002
Between								
Ever member	−0.408**	−0.040	−0.416**	−0.408**	−0.056	0.058	−0.110	−0.062
Nonpolitical volunteering	−0.368**	−0.358**	−0.364**	−0.358**	−0.173**	−0.181**	−0.170**	−0.176**
Political volunteering	0.085	0.087	0.091	0.081	−0.088	−0.091	−0.092	−0.085
Age 40–50 (1998)								
Within								
Membership $_{t-1}$	−0.077	−0.060	−0.067	−0.065	−0.094	−0.097	−0.088	−0.097
Nonpolitical volunteering $_{t-1}$	−0.049	−0.043	−0.048	−0.031	0.072*	0.083*	0.068	0.068
Political volunteering $_{t-1}$	0.039	0.046	0.044	0.047	−0.048	−0.051	−0.045	−0.054
Age $_t$	−0.076**	−0.079**	−0.073**	−0.076**	−0.044**	−0.051**	−0.043**	−0.043**
Between								
Ever member	−0.140	−0.049	−0.199	−0.174	−0.223*	0.002	−0.160	−0.113
Nonpolitical volunteering	−0.584**	−0.595**	−0.553**	−0.549**	−0.029	−0.135	−0.032	−0.056
Political volunteering	0.024	0.083	0.022	0.027	0.032	0.091	0.028	0.025
Age 65–75 (1998)								
Within								
Membership $_{t-1}$	−0.070	−0.032	−0.033	−0.022	−0.029	−0.059	−0.032	−0.013
Nonpolitical volunteering $_{t-1}$	−0.112*	−0.114	−0.124	−0.106	0.042	0.005	0.003	0.065
Political volunteering $_{t-1}$	0.056	0.059	0.056	0.042	−0.087	−0.084	−0.078	−0.066
Age $_t$	−0.053**	−0.071**	−0.056**	−0.057**	−0.081**	−0.091**	−0.065**	−0.098**
Between								
Ever member	−0.401*	−0.578*	−0.358	−0.362*	0.109	−0.084	0.062	−0.023
Nonpolitical volunteering	0.046	−0.066	0.067	0.040	0.012	0.014	0.009	0.032
Political volunteering	0.258**	0.223*	0.324**	0.231*	−0.206	−0.263	−0.181	−0.178

Note: Cells represent unstandardized probit regression coefficients. Model 1 = without control variables. Model 2 = adjusted for employment status, income, cohabiting with partner, and having children under 16 in the household at the within level and for region of residence, sex, average years of education, average occupational prestige, and average income at the between level. Model 3 = adjusted for satisfaction with health and emotional well-being at both levels. Model 4 = adjusted for church attendance, informal helping, going out, socializing, doing sports, and artistic activities at the within level.

[a] In those who at least once reported to smoke.
* $p < .05$.
** $p < .01$.

moderate levels, in all age groups (see Table 2). Specifically, younger participants who had ever been a member of a voluntary organization during the observation period reported significantly higher alcohol consumption across measurement occasions than nonmembers did; the differences between members and nonmembers in the probability to drink more ranged from 6.1% [95% CI: 0.2–11.0%] to 20.9% [95% CI: 4.5–40.8%]. Their middle-aged and older counterparts were significantly more likely than nonmembers to report rare drinking (vs. not drinking at all; a 13.5% [95% CI: 8.8–18.8%] and 9.0% [95% CI: 2.9–15.0%] difference in the probability to drink rarely in middle-aged and older adults, respectively). Furthermore, a higher average frequency of nonpolitical volunteering was associated with higher alcohol consumption at low and especially moderate levels across age groups. A higher average frequency of political volunteering was associated with more alcohol consumption at low and moderate levels in middle-aged adults and with low alcohol consumption (vs. none at all) in older adults. Effect sizes ranged from a 3.4% [95% CI: 0.4–6.6%] to 8.3% [95% CI: 3.2–12.1%] difference in the probability to belong to a higher category of alcohol consumption for 1SD difference in the frequency of nonpolitical or political volunteering. All these positive associations were partly or fully accounted for by sociodemographic control variables. Finally, and in contrast to the prevailing direction of effects, middle-aged individuals with higher average levels of political volunteering (e.g., +1SD) were significantly less likely (-10.2% probability [95% CI: 0.3–18.9%]) to drink regularly (vs. moderately) across measurement occasions. This negative association held in the presence

of control variables.

3.2.2. Smoking

Between-level indicators of participation were generally associated with less smoking, particularly in younger and middle-aged adults (see Table 3). In comparison to nonmembers, participants who had ever been a member of a voluntary organization during the observation period had a 13.2% [95% CI: 8.1–18.2%] lower probability to smoke (younger adults), a 7.5% [95% CI: 0.1–14.1%] lower probability to be a heavy smoker (middle-aged adults), or a 18.2% [95% CI: 0.4–32.6%] lower probability to smoke (older adults). These associations were accounted for by sociodemographic or health and well-being control variables. Furthermore, across models, a higher average frequency of nonpolitical volunteering (e.g., +1SD) was associated with a 8.5% [95% CI: 3.4–13.8%] to 14.4% [95% CI: 10.3–18.2%] lower probability to be a smoker or to be a heavy smoker in younger and middle-aged adults. In contrast, in older adults, a 1SD higher average frequency of political volunteering was significantly associated with a 13.5% [95% CI: 2.9–23.5%] greater probability to be a smoker. This effect also held across all models.

3.3. Post-hoc analyses of sex differences

As few within-level effects of volunteering on substance use emerged, we explored whether sex differences could account for this lack of significant effects. It is widely known that males are more prone

to substance use than females are (Chiolero et al., 2006), a pattern that was replicated in our data (see online appendix S3). We ran every model for males and females separately (see online appendix S4) and found, unexpectedly, several significant positive effects, which were primarily observed in male participants.

Specifically, a 1*SD* higher occasion-specific frequency of non-political volunteering significantly ($p < .05$) predicted a 4.2% [95% CI: 0.4–8.6%] higher probability of rare drinking (vs. not drinking at all) in the next year in younger males, but this effect was not significant in younger females: 0.7% [95% CI: -1.8–4.0%]. In middle-aged males, a 1*SD* higher political volunteering significantly ($p < .05$) predicted a 4.5% [95% CI: 0.1–9.2%] higher probability of regular (vs. moderate) drinking. In middle-aged females, this effect was not significant: 1.1% [95% CI: -5.8–8.2%]. Notably, in older females, a 1*SD* higher political volunteering significantly ($p < .05$) predicted a 3.5% [95% CI: 0.2–6.5%] *higher* probability of rare drinking (vs. not drinking at all) and a 4.9% [95% CI: 0.1%–9.5%] *lower* probability of drinking moderately (vs. rarely; $p < .05$) in the next year. These effects were not found in older males (for rare vs. no drinking, the models did not converge because of data sparseness; for moderate vs. rare drinking: -0.4% [95% CI: -4.0–3.6%]). None of the significant effects reported above remained so in all four models (i.e., with various sets of control variables).

Furthermore, across all models, a higher occasion-specific frequency of nonpolitical volunteering (e.g., +1*SD*) predicted a 1.4% [95% CI: 0.3–2.7%] higher probability to smoke in the next year in younger males ($p < .05$) but not in younger females (-0.4% [95% CI: -1.9–1.0%]). Mirroring the weaker effect found in the entire sample (see Section 3.1.2), nonpolitical volunteering significantly and across all models predicted higher smoking intensity in middle-aged males ($p < .05$). Specifically, a 1*SD* higher frequency of nonpolitical volunteering resulted in a 2.7% [95% CI: 0.8–4.4%] difference in the probability to be a heavy smoker in middle-aged males. In middle-aged females, this effect was not significant: -0.2% [95% CI: -2.8–2.6%]. Alternative analyses for cigarettes only (see online Appendix S5) yielded significant and positive effects of nonpolitical volunteering on smoking intensity not only in middle-aged but also in older males.

4. Discussion

In this study, we conducted multilevel analyses of large-scale panel data from Germany to find out whether voluntary memberships and volunteering predicted more or less alcohol and tobacco use over time and whether these effects varied across young, middle-aged, and older adults. At the within level (intraindividual change), we found voluntary memberships to predict more alcohol consumption at moderate levels and to have no statistically significant effects on smoking over time. Both results were in line with our expectations. In contrast, our hypotheses that volunteering would protect individuals against substance use were not supported by the data. Moreover, post-hoc analyses separately by sex showed that nonpolitical or political volunteering sometimes predicted significantly higher alcohol consumption in males: rare (vs. no) drinking in young males and regular (vs. moderate) drinking in middle-aged males. Nonpolitical volunteering also significantly predicted more smoking in males across age groups (in older adults, this effect held only for cigarettes but not for combined smoking units). Effect sizes were small, varying from 1% to 9% difference in the probability to report the corresponding outcome in the next year. In females, few statistically significant effects of volunteering on substance use emerged. Some, but not all of the positive effects of voluntary memberships and volunteering on alcohol and tobacco use seemed to be accounted for by other time-variant factors, such as sociodemographic indicators, health and well-being, and other leisure activities. As we expected, there were no significant differences between the effects of political and nonpolitical volunteering. However, we did expect to find stronger effects in younger adults, but no significant age

differences emerged.

Thus, our study delivered no reliable evidence for that structural social capital might protect individuals of any age from risky substance use. Moreover, albeit small, several significant effects in the opposite direction emerged, which need explanation and further investigation. This especially pertains to volunteering, whose benefits to engaged individuals have been widely recognized (Piliavin and Siegl, 2015). In addition to social contagion within social networks (Skog, 1985; Villalonga-Olives and Kawachi, 2017), the stress and coping pathway may be pertinent to explain the puzzling effects of volunteering on smoking (Umberson et al., 2010). Certain forms of volunteering, such as hospice volunteering or supporting victims of violence, are stressful and evince substantial rates of burnout and turnover (Claxton-Oldfield and Claxton-Oldfield, 2012). Engaging in such activities may invoke stress and coping responses, including coping via substance use, which is more typical of males (Nolen-Hoeksema, 2012). To test this pathway, a more precise differentiation between various volunteer activities or an assessment of their stressfulness is needed, which was not possible with the SOEP data.

Perhaps the most important message of our study is that the association between civic engagement and substance use exists primarily at the level of interindividual differences. Between-level analyses revealed that individuals who reported voluntary memberships or volunteered more usually also reported more alcohol consumption, mostly at low and moderate levels, but less smoking than their less engaged counterparts did. In middle-aged adults, higher average levels of political volunteering were even associated with less regular drinking. Effect sizes were larger than at the within level (a 4–21% difference in the probability to report the corresponding outcome). These effects, most of which applied to both sexes, were partly accounted for by between-level sociodemographic control variables, which included SES. A plausible explanation would be that better-off individuals self-select into voluntary memberships and volunteering (Wilson, 2012) and are also more likely to engage in social (not excessive) drinking but less likely to smoke (Patrick et al., 2012). Hence, prior findings that voluntary memberships and volunteering predicted substance use over time (Ballard et al., 2018; Giordano and Lindström, 2011) may also be attributed to some third variables, such as conscientious personality, which predispose individuals to follow a trajectory of civic engagement and moderate or no substance use.

The major limitations of our study resulted from its use of secondary data. All measures were self-report, which could lead to underreporting substance use and over- or underestimating the frequency of volunteering. The assessment of alcohol consumption was available at only three measurement occasions and did not identify problem drinking in terms of consumption volumes. However, this measure showed some predictive validity for ethanol consumption and heavy alcohol use 6-years later. Moreover, mounting evidence suggests that even low and moderate alcohol consumption is associated with health risks such as certain types of cancer (Bagnardi et al., 2013). Furthermore, volunteering indicators were not very specific with regard to the activities undertaken; the only distinction possible was that between nonpolitical and political volunteering. For voluntary memberships, some differentiation between types of organizations was possible, but it was not consistent across waves; therefore, we preferred a simple indicator of any voluntary membership. Moreover, the rating scales of some instruments varied across waves, but we adjusted for these differences in our statistical analyses. Longitudinal attrition is always a problem with panel data, and we addressed it by using a full information estimator and adding missing value covariates. Finally, the one-year interval between measurement occasions might be too short or too long for the effects of social capital on substance use to be detected. Future research may consider different time scales, from day-to-day associations to cumulative effects over many years.

5. Conclusions

Using data from a representative panel survey of German young, middle-aged, and older adults, we found that individuals who reported voluntary memberships and volunteering differed from their less engaged counterparts in their drinking and smoking habits. Over time, voluntary memberships and volunteering promoted, rather than protected against, alcohol use and, for nonpolitical volunteering, tobacco use, particularly in males. Although these effects were so small that they hardly warrant a public health concern presently, it may be worthwhile to address the substance use risks of specific (e.g., more and less stressful) types of volunteering. Moreover, our findings dispute the common assumption that social capital is only relevant to substance use among young individuals and call for more attention to its role in middle and late adulthood.

Role of funding source

Contributors

Maria Pavlova planned the study, supervised the data analysis, wrote Introduction and Discussion, and supervised writing of other parts of the article. Matthias Lühr prepared and conducted the data analysis and wrote Methods and Results. Maike Luhmann assisted in planning the study, supervised the data analysis, and contributed to writing the article. All authors have read and approved the final version of the article.

Conflict of interest

No conflict declared.

Acknowledgements

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.drugalcdep.2018.10.013.

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