

BMJ Open Millennials: sickness presenteeism and its correlates: a cross-sectional online survey

Daniela Lohaus, Florian Röser

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ABSTRACT

Objective Sickness presenteeism (SP) is a well-documented phenomenon in the current workforce. However, little is known about the SP of future employees (Millennials). We investigated rate and propensity of presenteeism and health-related and work-related correlates in university students to obtain information about the relevance of SP in the future workforce. Sickness presenteeism (SP) refers to going to work while ill.¹

Design and setting We administered a cross-sectional online survey in August 2018 involving self-assessments of health-related and work-related behaviour. As planned, we analysed rates, instances and propensities of presenteeism and absenteeism. The target population was Millennial university students.

Results 749 German university students, average age 24.7±3.6 years, 49.5% women, mean academic progress 4.5±2.7 semesters, <1% without work experience, 15.4±10.3 mean weekly working hours. Presenteeism rates in the complete sample were 64% at school and 60.4% at work. For the subsample of participants who reported sickness, presenteeism rates were 87.9% at school and 87% at work. Presenteeism propensity among them was 0.67±0.34 at school and 0.68±0.35 at work. SP at school and at work was significantly correlated with subjective health ($r=0.29$, $p=0.000$ and $r=0.25$, $p=0.000$) and locus of control ($r=-0.20$, $p=0.000$ and $r=-0.26$, $p=0.000$). Age and sex adjusted multiple regression analysis showed that subjective health explained 9.7% of the variance in SP at school ($B=0.049$, $p=0.000$) and 8.1% of the variance in SP at work ($B=0.037$, $p=0.000$).

Conclusions The SP rates of the future workforce were in line with previous research on older employees, whereas the presenteeism propensities we found here were higher. Across all analyses, subjective health proved to be associated with presenteeism. Thus, the relevance of SP will remain constant or might even increase with regard to the future workforce. Programmes offering health education should be implemented to sensitise this generation as early as possible.

INTRODUCTION

Sickness presenteeism (SP) refers to going to work while ill.¹ The study of SP has gained in importance during the past two decades due to its association with sickness absenteeism, productivity, health and attitudes.² Although the vast majority of empirical studies of the

Strengths and limitations of this study

- One of the first studies to investigate sickness presenteeism among individuals constituting the future workforce (Millennials).
- Analyses distinguish between individuals with health problems and those without.
- The study focuses not only on the presenteeism rate but also on presenteeism propensity.
- The cross-sectional data do not allow for causal conclusions.
- Data are based on self-assessments.

phenomenon are cross-sectional surveys,³ important consequences of presenteeism for the organisation and the individual have been established in longitudinal research. Studies have reported negative effects for individual health.^{4–12} Other negative effects of SP for the individual are productivity loss¹³ and a decline in work attitudes.^{14–15} Considering consequences for the employing organisation, there is empirical evidence for uncovered costs caused by productivity loss.¹⁶ SP has been reported independently of a variety of sociodemographic variables^{1–17–23} and for various kinds of professional groups.^{17–19–24–29} SP is a global phenomenon. Its prevalence has been documented in many countries in Europe,^{17–25–29–30} the USA,³¹ Canada,^{32–33} Asia³⁴ and the Middle East.³⁵ The presenteeism rates reported for study samples vary from 30% to >90%.

Due to the wide range of negative effects of SP for individuals and organisations as well as the global ubiquity of SP, the study of SP seems advisable. However, although SP rates are well documented for the current workforce, the majority of which belong to the generations of Baby Boomers and Generation X,^{36–37} empirical evidence concerning the SP behaviour of the future generation of workers is scarce.^{38–40} Matsushita and colleagues³⁹ developed an instrument to measure presenteeism among students, but they did not



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Business Psychology,
Hochschule Darmstadt
University of Applied Sciences,
Darmstadt, Germany

Correspondence to

Dr Daniela Lohaus;
daniela.lohaus@h-da.de

report on presenteeism behaviour. Johansen³⁸ analysed motives for the presenteeism of students in secondary school. To our knowledge, the study by Kötter *et al*⁴⁰ is the only one to date to investigate the presenteeism behaviour of students. They did not find any differences in prevalence rates between medical students and science, technology, engineering and mathematics students and reported higher levels of presenteeism for female than for male students. However, the prevalence rate they reported could not be compared with other studies because their way of measuring and aggregating presenteeism behaviour was uncommon. Current university students are predominantly classified as Millennials,^{36 41} who are said to have different attitudes towards work than older generations. In particular, Millennials have greater entrepreneurial interests,⁴² and they hold a 'work-to-live' attitude with a higher priority on work–life balance^{41 43} than previous generations. Especially, this latter trend suggests that presenteeism among Millennials should be lower than among older generations. In general, interests and work values are relatively stable³⁷ and are associated with behaviour. Thus, knowledge about the SP-related behaviours of current students should be useful for evaluating the significance and consequences of such behaviours for individuals, organisations^{44–52} and society in the future.^{53–57} Specifically, we wanted to know how common presenteeism is among students belonging to the generation of Millennials and whether they favour presenteeism over absenteeism when they are sick. We were particularly interested in the question of whether they differ in their behaviour with regard to study and work times and whether their behaviour is associated with other health-related variables. To investigate this, we conducted an online survey.

When studying presenteeism, two methodological issues need to be borne in mind: previous studies have usually not differentiated between individuals suffering from health events—who are thus able to show SP—and individuals without health problems—who per definition cannot show SP behaviour.⁵⁸ Therefore, these studies have provided information about the prevalence of SP in the workforce but not about the prevalence among sick employees. In addition, it is necessary to distinguish between SP rates and SP propensity.⁵⁹ SP rates are measures of the frequency of attending work while ill. They depend on the number of health events and are an indicator of health status or vulnerability to illness.⁶⁰ SP propensity is the percentage of days worked while ill over the total number of days that the person was sick,³² and it reflects an individual's probability of opting for sickness presence rather than sickness absence in the case of illness.⁶⁰ Thus, it offers additional information with regard to the decision-making process of the individual. Both aspects were considered in the current study.

METHODS

Study design and population

Based on Krejcie and Morgan's⁶¹ specifications for the calculation of a representative sample, we calculated a required sample size of 384 by taking into account a CI of two SDs, the degree of accuracy of 0.05 and a total population of 2.9 million students in Germany.⁶² During the 2018 summer term, we asked 15 random German institutions of higher education if they would allow us to send our survey to their students. Of these, four institutions agreed to forward the survey. In the email that we sent to the students, we asked participants to forward the survey to other potentially interested persons, which led to a further distribution of the survey and thus in total, students from nine German institutions of higher education took part in the online survey. Participants were informed that the survey was anonymous and voluntary and that they could withdraw their participation at any time. Of the 1291 individuals who began taking the online survey, 791 provided complete data.

Measures of presenteeism and absenteeism

Because many students do not only study full time but are also employed in paid part-time jobs to contribute to their living, we collected data on presenteeism and absenteeism separately for school and work. To measure SP frequency, students were asked how often during the past 12 months they went to classes when the state of their health would have justified staying home.^{1 9 63} The same question was posed for going to work. Whereas fixed response categories such as 'never', 'once', '2 to 5 times' and 'more than 5 times' have been used in other studies,^{1 30 63 64} we used an open-question format. The reason for this was that the former is seen as too crude for such a low base rate behaviour and might convey information about what is perceived as normal and might thus bias the answers.⁶⁵

Sickness absence (SA) was also measured with two items asking students to indicate how often during the past 12 months they stayed home due to sickness instead of going to classes/work.

Health-related and personality-related factors

As potential correlates of SP, we collected subjective measures of individual health, locus of control, professional self-efficacy and extent of paid work. Because in Germany health-related issues and objective health status are very sensitive topics, we decided to use a subjective measure of individual health, which is known to be a robust predictor of several health outcomes, such as functional ability, healthcare utilisation and morbidity.⁶⁶ Locus of control is 'a fundamental individual difference variable that reflects individuals' beliefs about the degree of control they have over events in their lives' (Galvin *et al*, p. 820).⁶⁷ People with an internal locus of control are convinced that their fate depends on their decisions, efforts and behaviours. Individuals with an external locus of control believe that their lives are controlled by external forces such as powerful others, chance or

luck. The construct is often applied in the area of health psychology.^{68–73} Self-efficacy is one's belief in one's competence to perform intended actions. Efficacy beliefs influence the self-regulation of motivation through goal challenges and outcome expectations and the types of activities people choose.⁷⁴ Self-efficacy and locus of control (especially, health locus of control) are seen as personal health resources that determine health-related behaviour.⁷³ Both concepts have repeatedly been used in studies of the health-related behaviours of students.^{73 75–78} In addition, we thought the extent of paid work would be a relevant correlate because it is an indicator of workload, which is known to be related to presenteeism.³

With regard to students' health status, we used two variables based on a sequence of subjective assessments. Subjective health status was calculated as the mean of two items ('How do you rate your general susceptibility to disease?'; 'How do you rate your health in comparison with your age group?'). The scale was a slider ranging from 0 ('very low'; 'very bad') to 100 ('very high'; 'very good'). We used the 4-item short scale by Kovaleva *et al*⁷⁹ to measure locus of control (eg, 'When I really try, I will succeed') and three items from the short scale of occupational self-efficacy⁸⁰ (eg, 'I am not sure I have all the abilities necessary for my job'). Both locus of control and occupational self-efficacy are stable characteristics that are relevant to presenteeism.^{65 81 82} Response categories for the seven items ranged from 1 ('does not apply at all') to 5 ('fully applies').

Employment and demographic variables

Participants stated whether they had worked before they started their university programme, and they were asked if and how many hours they worked while attending school and during semester breaks. The survey asked for demographic information on gender, age, study major, pursued degree and name of university. Employment and demographic variables were measured with one item each.

Data analysis

The number of health events was calculated as the sum of the SP and SA frequencies.^{33 60} We computed presenteeism propensity as SP frequency divided by the number of health events for university and work settings separately. Hence, SA propensity was 1-SP propensity.⁶⁰ Descriptive statistics (means, percentages and SDs) were initially used to tabulate results. Because the variables were not normally distributed, we used nonparametric tests (ie, the Wilcoxon test for dependent samples and the Mann-Whitney U test for independent samples) to analyse group differences and Spearman's rho correlation coefficient to describe associations between variables. Bivariate correlations were calculated between participants' sickness, presenteeism rate, presenteeism propensity, subjective health, locus of control, occupational self-efficacy and number of hours spent working per week. Age and sex adjusted multiple linear regressions using ordinary least

squares were computed to test the influence of the independent variables subjective health and locus of control (selection method: Enter; consider both variables) on the dependent variables presenteeism at school and at work. We used adjusted R^2 for variance explained and report regression coefficients and standard errors. For all analyses, two-sided p values <0.05 were considered statistically significant. We performed all analyses with IBM SPSS (V.24, Armonk, New York, USA). Only participants from the target population who completed the survey were included in the analyses. However, it was not compulsory to provide an answer to each question because some of the questions did not apply to all participants (eg, those referring to working while studying). Thus, analyses of subgroups differed in sample sizes. Participants who had missing data on one of the investigated variables were excluded from the respective analysis.

Ethics approval and informed consent of participants

Before beginning the study, participants were informed that their participation was voluntary and that they could withdraw their participation at any time while working on the questionnaire. They were informed that no personalised data would be collected, that their data would be used for scientific purposes only and that it would be stored and analyzed anonymously so that it would not be possible to establish any connection between them and their answers.

Patient and public involvement

Neither subjects nor public were involved in the study.

RESULTS

A total of 791 questionnaires were completed. In accordance with the goal of the study, the analyses were restricted to participants belonging to the generation of interest, the Millennials, which include people who were born in 1981 or later.^{36 41} Further, cases of long-term absence or presence were excluded from the analyses because these were likely to have been caused by different modalities.⁶⁰ As was done in other studies, we defined 60 days as the threshold.^{60 83} More than 99% of respondents reported fewer than 60 days of SA or sickness presence. Thus, the final sample comprised 749 participants (49.5% women) between the ages of 19 and 37 years with an average age of 24.7 ± 3.6 years. Their mean academic progress was 4.5 ± 2.7 semesters. Less than 1% of participants had no work experience, and the mean number of hours spent working per week was 15.4 ± 10.3 . For a summary of the demographic variables, see [table 1](#).

Sickness

The descriptive results for the number of days of sickness in the past 12 months can be found in [table 2](#) and the correlations with other factors in [table 3](#). It turned out that participants who worked while attending school reported a significantly larger number of days of sickness during

Table 1 Descriptive data of study participants. Number of incidents and percentages

	All study participants			Considered participants*		
	n	Mean±SD	%	n	Mean±SD	%
Total number (N)	1773		100	749		100
Mean age (years)		24.87±4.70			25.70±3.61	
Female	672		37.9	371		49.5
Mean age (years)		24.68±5.30			24.25±3.51	
Male	703		39.6	368		49.1
Mean age (years)		25.21±4.37			25.17±3.64	
Desired degree and current semester						
Bachelor	1087		61.3	580		77.4
1	87		8.0	19		3.3
2	300		27.6	161		27.8
3	33		3.0	20		3.4
4	249		22.9	129		22.2
5	37		3.4	22		3.8
Six or more	363		33.4	225		38.8
Master	305		17.2	166		22.2
1	38		12.5	18		10.8
2	73		23.9	38		22.9
3	37		12.1	20		12.0
Four or more	149		48.9	90		54.2
Course of study						
Computer science	193		10.9	109		14.6
Technology	223		12.6	120		16.0
Engineer	132		7.4	75		10.0
Architecture	70		3.9	37		4.9
Business administration	166		9.4	87		11.6
Psychology	140		7.9	64		8.5
Social work/Education	79		4.5	49		6.5
Legal studies	15		0.8	10		1.3
Design	8		0.5	2		0.3
Journalism	17		1.0	12		1.6
Mathematics/Chemistry	23		1.3	18		2.4
Communication	41		2.3	17		2.3
Media	51		2.9	27		3.6
Other study programmes	37		2.1	18		2.4
Not specified	578		32.6	104		13.9

*Participants included in the analyses were those who completed the questionnaire and belonged to the generation of Millennials.

school time than during work time. Further, the correlation between days of sickness during school time and days of sickness during work time was significant ($Rho=0.60$, $p=0.000$). Furthermore, days of sickness during school time and during work time were both significantly correlated with subjective health, locus of control, occupational self-efficacy and for work time, also with number of hours spent working per week. With regard to gender, women reported significantly more days of sickness during school time and

during work time than men. 27.2% of the participants did not report any health event during the last 12 months during school time. Concerning work days, 30.3% reported no health events.

SP frequencies and rates

Referring to the complete sample, as is typical for the reporting of SP rates,^{1 9 23 30} the descriptive values are reported in table 4 (left side). For the further exploration

Table 2 Means for days of sickness in the complete sample

Average days of sickness	School time		Work time		Analysis of means
	n	Mean±SD	n	Mean±SD	
During school time	749	4.49±6.54	671	4.31±6.51	*
During work time	671	4.31±6.51	671	3.56±6.65	School time versus work time for working students: Z=3.586, p=0.000
Female	371	4.99±6.82	326	4.29±6.29	Female versus male for school time: Z=-3.571, p=0.000 work time: Z=-3.249, p=0.001
Male	368	3.96±6.27	336	2.90±4.93	

Note. Z: Wilcoxon test for dependent samples and Mann-Whitney U test for independent samples.

*Since not all subjects work during their studies, an inferential statistical comparison is forbidden.

of SP behaviour and its correlates, the analyses were restricted to participants who reported at least one incident of sickness. The reason for this is that only individuals who reported some kind of illness during the past 12 months were able to show presenteeism (see table 4, right side). As results show, 72.8% of the sample were left for analyses regarding SP at school (n=545) and 68.6% with regard to work (n=468). Therefore, after excluding 'healthy' participants, the SP rates rose to 87.9% during school time and 87% during work time.

The difference between SP incidents and SA incidents during school time was significant. When experiencing illness during school time, 39.6% always chose to go to classes, whereas 12.1% never did. With regard to work, the pattern was quite similar: SP incidents during work time differed significantly from SA incidents. 41.9% always chose to go to work in spite of illness, and 13% never did.

Correlates of SP

With regard to SP at school, we found a significant correlation with SP at work (Rho=0.49, p=0.000). Further correlations for SP during school and work time are listed in table 5.

In order to further investigate the two most important correlates, we computed multiple linear regressions using ordinary least-square method and variables selection method 'Enter' (consideration of both variables). First,

Table 3 Correlations for days of sickness in the complete sample

Correlations	School time		Work time	
	Rho*	P value	Rho*	P value
Subjective health	0.37	0.000	0.33	0.000
Locus of control	-0.19	0.000	-0.12	0.005
Occupational self-efficacy	-0.14	0.000	-0.05	0.207
Number of working hours	-0.003	0.425	0.26	0.000

*Spearman's Rho for correlations of not normally distributed variables.

we checked for whether the assumptions for the application of the method were fulfilled.⁸⁴ Data were collected through independent random sampling. Inspection of scatterplots of the independent variables against the dependent and unstandardised predicted values against studentized residuals indicated that the assumption of linearity between independent and dependent variables was met. In addition, the assumptions with respect to homoscedasticity and multicollinearity were met. Outliers were identified in two ways. First, all subjects with values above or below three SDs of studentized deleted residuals were eliminated from the analyses. Second, on the basis of the leverage index, all subjects with values above the critical value (ie, $2 * p/n$)⁸⁵ were excluded from the analyses. Thus, 419 subjects were left for the analysis of presenteeism at school and 323 subjects for the analysis of presenteeism at work (table 6).

Analyses revealed significant models. Subjective health explained 9.7% of the variance of presenteeism frequencies for school time and 8.1% for work time, indicating that presenteeism frequencies were higher for participants with good subjective health in comparison with those with poor subjective health. In both models, the effect of locus of control was not significant.

Presenteeism propensity

Presenteeism propensity, which reflects an individual's probability of opting for presenteeism instead of absenteeism when suffering a health event, was 0.67 ± 0.34 at school and 0.68 ± 0.35 at work. Presenteeism propensity at school was significantly associated with presenteeism propensity at work (Rho=0.52, p=0.000). Of course, there were significant correlations between SP frequency and presenteeism propensity; however, because the formula for presenteeism propensity contains SP frequency, it would not be productive to report them.

The probability of going to classes when sick was significantly higher than the probability of staying home (Z(544)=-10.042, p=0.000). With regard to work time, the pattern was quite similar: the probability of going to work while ill was significantly higher than the probability of staying home (Z(467)=-9.444, p=0.000). There were no

Table 4 SP rates and frequencies for participants without and with incidents of sickness

	At least one incident of sickness						Analysis of means	
	Complete sample		Mean incidents SA±SD		Mean incidents SP±SD		Z*	P value
	n	SP rates	Mean incidents SA±SD	Mean incidents SP±SD	n	SP rates	Mean incidents SA±SD	Z*
School time	749	64%	2.94±5.00	1.52±2.99	545	87.9%	2.09±3.34	-9.582
Work time	682	60.4%	2.36±4.32	1.19±2.38	468	87%	1.69±2.70	-9.254

*Wilcoxon test for dependent variables.

SA, sickness absence; SP, sickness presenteeism.

gender differences in presenteeism propensity during school or work time.

DISCUSSION

The aim of the survey was to obtain information about the presenteeism behaviour of studying Millennials who constitute the future workforce. While more than one-fourth of participants reported no incidents of sickness during the past year, those who reported at least some kind of illness reported a larger number of days of sickness during school time than during work time. SP rates for the complete sample were 64.4% at school and 60% at work and for those participants reporting at least one health event, 87.9% at school and 87% at work. Thus, the SP rates of the future workforce were in line with previous research on older employees. Presenteeism propensities were 0.67 for school and 0.68 for work and were thus higher than reported in other studies. SP at school and SP at work were highly associated. Further, SP was positively correlated with good subjective health and an external locus of control and negatively correlated with occupational self-efficacy. Across all analyses, including multiple linear regressions, subjective health was the variable with the strongest association with SP. Results of the study show that the relevance of SP will remain constant or might even increase with regard to the future workforce.

In this survey, SP rates for the complete sample were on an average level in comparison to a recent research among German employees that has reported great variability in rates ranging from 35%⁸⁶ to >90%.⁸⁷ The levels found here were in the same range as studies that were conducted with employees in the Netherlands,²⁸ Scandinavia⁸⁷ and other European countries.²³ The proportion of participants who reported no health event during the past year was higher than in other studies.⁶⁰ This higher rate might be due to the fact that the sample we investigated was younger than the usual workforce samples and the fact that age was positively related to health issues.^{88–90} In our analyses, we followed Navarro *et al*'s⁵⁸ recommendation to separately identify the SP prevalence for the subsample of individuals who reported some kind of illness and were thus able to show SP. Hence, the rates increased by more than 35%–40%. This increase was lower than in the study by Navarro *et al*,⁵⁸ who reported SP rates of 23% for the complete sample and a rate that was more than doubled for those with health problems (53%). However, in our survey, SP levels were much higher. The distinction between SP rates for the complete sample and the subsample of those who experienced health problems provides answers to two separate questions. The first (the whole sample) indicates the economic significance of the problem, whereas the second (the subsample) can provide human resource management and corporate health management with relevant information as to how many employees need support and what kinds of measures might be helpful.^{90 91} Therefore, both methods of calculation are useful; however, in terms of health

Table 5 Correlates of sickness presenteeism among the participants with incidents of sickness

	Correlations					
	SP during school time			SP during work time		
	n	Rho*	P value	n	Rho*	P value
SA during school time	545	0.14	0.001			
SA during work time				468	0.11	0.022
Subjective health	466	0.29	0.000	394	0.25	0.000
Locus of control	470	-0.15	0.001	398	-0.17	0.001
Occupational self-efficacy	469	-0.15	0.001	398	-0.12	0.013
Number of working hours	545	0.01	0.763	468	0.13	0.004

*Spearman's Rho for correlations of not normally distributed variables. SA, sickness absence; SP, sickness presenteeism.

interventions, it is more appropriate to consider the part of the workforce reporting some kind of illness.^{58 90 91}

The presenteeism propensities for school and work were identical, which means that participants' decision making did not differ between the two settings. Propensities showed that on average, in two out of three cases, participants who were sick chose to attend class or go to work and thus showed significantly more SP than SA. To date, only a few studies have explored presenteeism propensities.^{32 60} A Canadian study reported a propensity of 0.50 for employees,³² and an Austrian study reported a propensity of 0.59, also for employees.⁶⁰ The propensities found in the current study for students appeared to be slightly higher (0.67 and 0.68). This finding seems to contradict the focus on work-life balance that has been reported for the generation of Millennials.^{41 43 92 93} The high levels of presenteeism propensity might be explained by students who might be worried that they will not be able to keep up if they miss too many classes.⁹⁴ With regard to their jobs, the high level might be due to their work conditions, that is, most of them are probably paid on an hourly basis with the consequence that they will not earn anything if

they call in sick. A more detailed view of the data revealed that the proportion of participants who always decided for SP when they were sick was more than three times higher than those who always chose SA. Millennials' attributes and expectations offer further potential explanations for their high attendance rates.⁹⁵ Millennials favour close relationships at work⁹⁶ and prefer team work inter alia in order to avoid risks.⁹⁴ Furthermore, they are interested in the acquisition of skills.⁹⁷ Thus, their decision to embrace presenteeism might reflect their desire not to let down team members (either at school or at work) and to expand their competencies.⁸⁷ Future studies should investigate whether this high propensity is due to differences in 'jobs' (ie, studying full time and working part time versus working full time) or due to different generations. We suggest that a survey be administered to full-time employees who belong to the generation of Millennials.

The high correlation between SP at school and SP at work indicates that both kinds of behaviour are determined by individuals' health status, which is reflected in the number of days they were sick and the positive correlation with their subjective assessment of their health.

Table 6 Age and sex adjusted multiple linear regression models in sample of the participants with incidents of sickness

Variables	School time		Work time	
	B (95% CI)	SE	B (95% CI)	SE
Subjective health	0.049 (0.033 to 0.066)	0.008	0.037 (0.021 to 0.054)	0.009
Locus of control	-0.580 (-1.326 to 0.165)	0.379	-0.375 (-1.155 to 0.405)	0.396
Sex	0.593 (-0.146 to 1.331)	0.376	-0.526 (-1.270 to 0.217)	0.378
Age	0.065 (-0.051 to 0.180)	0.059	0.074 (-0.042 to 0.191)	0.059
R ²	0.105		0.093	
Adjusted R ²	0.097		0.081	
F value	F(4,414)=12.203, p=0.000		F(4,318)=8.137, p=0.000	

Models include the variables Subjective Health and Locus of Control. Analyses are adjusted for sex (female=0, male=1) and age.

Ordinary least-square method. Variables selection method: Enter (consideration of all variables). Linearity, multicollinearity and homoscedasticity are given.

Durbin-Watson ratio: 2.054 (school time), 2.160 (work time).

B represents regression coefficient.

Miraglia and Johns³ found that individuals with poorer general health exhibited more presenteeism because the sheer number of health events was higher, a finding that was supported by the data in the current study. In addition, the positive correlation between SP and SA also found here has been well established,^{1 6 17 21 63 65} although it seemed particularly high in this study.

In our correlational analyses, SP was positively associated with good subjective health and an external locus of control and negatively correlated with occupational self-efficacy. The correlation between SP and subjective health status has been well established.⁶⁵ In addition, the age and sex adjusted multiple linear regressions with the two most important correlates (ie, subjective health and locus of control) revealed that subjective health is a significant predictor for SP in both contexts. This means the better participants perceive their health the more SP they report. This has to be taken into consideration in future measures to manage SP. There is only one earlier study we know of that investigated the relationship between health locus of control and presenteeism among employees in all age groups, and it found lower SP for people with an internal health locus of control.⁹⁸ Although we measured general locus of control, we found the same pattern: that is, a higher SP rate for individuals with an external locus of control. Research has shown that university students score higher on internal locus of control than on external locus of control⁷⁸ and that an internal locus of control and a high level of self-efficacy⁹⁹ are associated with academic achievement.⁷⁵ Thus, students with an external locus of control might worry that they will miss too much if they do not attend classes when they are ill. Self-efficacy has been postulated to be associated with SP.^{2 81} A study involving a sample of Chinese full-time workers established a positive correlation between SP and self-efficacy and found that self-efficacy could buffer the negative effect of SP on health.⁸² By contrast, in our study, participants with low occupational self-efficacy showed higher levels of SP. The difference in findings may have occurred because Lu *et al*⁸² measured general self-efficacy, whereas we used occupational self-efficacy. In addition, research has shown that Millennials are high in self-efficacy,^{93 95} and thus, they might be convinced that they can manage to make up any work they miss when they miss school or work when they are sick. By contrast, participants with low occupational self-efficacy are not sure whether they have the necessary competencies to meet expectations and thus opt for SP in order to work as much as possible and meet their work and study goals. In the future, it would be interesting to investigate these contradictory results.

Strengths and weaknesses

Pertaining to the goal of the study to investigate SP among the generation of Millennials, a strength of the survey is that it provided information about the SP behaviour of the future workforce, a group that has rarely been investigated with regard to SP. In addition, to our knowledge, the study is one of the first to explore SP among students

who belong to the generation of Millennials. Further, since many of the participants were not just studying but were also working part time, this study allowed us to assess SP behaviour in university and work settings at the same time and to compare them. However, it is obvious that the sample was restricted to students and thus does not allow generalisations about manifestations of SP behaviour among full-time employees in these birth cohorts. Additional advantages of the study are that we calculated propensities and made a distinction between individuals with and without health problems. In most studies to date, participants have been asked to quantify the number of times they have engaged in SP but not the number of times they have engaged in SA or the total number of health events they have experienced. Thus, the prevalence of SP could be reported only for the complete sample. Shortcomings of the survey pertain mostly to methodological issues: because we applied a cross-sectional design, we were not able to identify the direction of the influence between subjective health and SP. Another weakness is that all measures were self-reports, and thus, their reliability might suffer from common method bias and over-reporting due to social desirability.⁶⁵ Due to missing data and the non-applicability of questions, some of the analyses were restricted to a much smaller number of participants than the total sample size. In addition, as in many other studies,³ participants were asked to recall incidents of sickness presence and absence over a 1-year period, and therefore, the data might be biased by false recollection.¹⁰⁰ However, because the self-reported measure of days of sickness¹⁰⁰ and the subjective measure of health status¹⁰¹ demonstrated a high level of correspondence with objective data, we used the self-report method as a practicable way to obtain the relevant data.

CONCLUSION

The study's results are in accordance with the recent findings that the prevalence of SP is continuously rising,¹⁰² which means the issue will remain an important one. Further, they indicate that especially subjective health is associated with presenteeism behaviour of Millennials. SP and the associated risks are not restricted to the current workforce but are prevalent among those who are currently enrolled in a university. One should think about implementing health education concerning SP for students who represent the future workforce and soon-to-be managers in order to sensitise them to the management of SP before they join the full-time workforce. A future study should be conducted in order to compare the results of this survey of Millennials attending a university with full-time working Millennials. Further, presenteeism propensity is important for gaining insights into individuals' decisions to engage in presenteeism or absenteeism when ill. With regard to methodology, future studies should make a distinction in prevalence rates between the complete workforce and those with health

problems because these two rates provide answers to different questions.

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REFERENCES

- Aronsson G, Gustafsson K. Sickness presenteeism: prevalence, attendance-pressure factors, and an outline of a model for research. *J Occup Environ Med* 2005;47:958–66.
- Lohaus D, Habermann W. Presenteeism – a review and research directions. *Hum Resour Manag Rev* 2018.
- Miraglia M, Johns G. Going to work ill: a meta-analysis of the correlates of presenteeism and a dual-path model. *J Occup Health Psychol* 2016;21:261–83.
- Gustafsson K, Marklund S. Consequences of sickness presence and sickness absence on health and work ability: a Swedish prospective cohort study. *Int J Occup Med Environ Health* 2011;24:153–65.
- Kivimäki M, Head J, Ferrie JE, et al. Working while ill as a risk factor for serious coronary events: the Whitehall II study. *Am J Public Health* 2005;95:98–102.
- Taloyan M, Aronsson G, Leineweber C, et al. Sickness presenteeism predicts suboptimal self-rated health and sickness absence: a nationally representative study of the Swedish working population. *PLoS One* 2012;7:e44721.
- Lu L, Lin HY, Cooper CL. Unhealthy and present: motives and consequences of the act of presenteeism among Taiwanese employees. *J Occup Health Psychol* 2013;18:406–16.
- Bergström G, Bodin L, Hagberg J, et al. Sickness presenteeism today, sickness absenteeism tomorrow? A prospective study on sickness presenteeism and future sickness absenteeism. *J Occup Environ Med* 2009;51:629–38.
- Hansen CD, Andersen JH. Sick at work--a risk factor for long-term sickness absence at a later date? *Journal of Epidemiology & Community Health* 2009;63:397–402.
- Demerouti E, Le Blanc PM, Bakker AB, et al. Present but sick: a three-wave study on job demands, presenteeism and burnout. *Career Dev Int* 2009;14:50–68.
- Lu L, Cooper C, Yen Lin H. A cross-cultural examination of presenteeism and supervisory support. *Career Dev Int* 2013;18:440–56.
- Conway PM, Høgh A, Rugulies R, et al. Is sickness presenteeism a risk factor for depression? A Danish 2-year follow-up study. *Journal of Occupational and Environmental Medicine* 2014;56:595–603.
- Collins JJ, Baase CM, Sharda CE, et al. The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. *Journal of Occupational and Environmental Medicine* 2005;47:547–57.
- Karanika-Murray M, Pontes HM, Griffiths MD, et al. Sickness presenteeism determines job satisfaction via affective-motivational states. *Soc Sci Med* 2015;139:100–6.
- Ybema JF, Smulders PGW, Bongers PM. Antecedents and consequences of employee absenteeism: a longitudinal perspective on the role of job satisfaction and burnout. *European Journal of Work and Organizational Psychology* 2010;19:102–24.
- Evans-Lacko S, Knapp M. Global patterns of workplace productivity for people with depression: absenteeism and presenteeism costs across eight diverse countries. *Soc Psychiatry Psychiatr Epidemiol* 2016;51:1525–37.
- Aronsson G, Gustafsson K, Dallner M. Sick but yet at work. An empirical study of sickness presenteeism. *J Epidemiol Community Health* 2000;54:502–9.
- Chang Y-T, Su C-T, Chen R-Y, et al. Association between organization culture, health status, and Presenteeism. *J Occup Environ Med* 2015;57:765–71.
- Cho Y-S, Park JB, Lee K-J, et al. The association between Korean workers' presenteeism and psychosocial factors within workplaces. *Ann Occup Environ Med* 2016;28.
- Gosselin E, Lemyre L, Corneil W. Presenteeism and absenteeism: differentiated understanding of related phenomena. *J Occup Health Psychol* 2013;18:75–86.
- Leineweber C, Westerlund H, Hagberg J, et al. Sickness Presenteeism among Swedish police officers. *J Occup Rehabil* 2011;21:17–22.
- Präsentismus PP. Prävalenz und Bestimmungsfaktoren unterlassener Krankmeldungen bei Der Arbeit. *Zeitschrift für Personalforschung* 2010;24:401–8.
- Robertson I, Leach D, Doerner N, et al. Poor health but not absent prevalence, predictors, and outcomes of presenteeism. *J Occup Environ Med* 2012;44:1344–9.
- Gustafsson S, Løvseth L, Schenck-Gustafsson K, et al. What makes physicians go to work while sick: a comparative study of sickness presenteeism in four European countries (HOUPE). *Swiss Med Wkly* 2013;143:w13840.
- Hansen CD, Andersen JH. Going ill to work--what personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? *Soc Sci Med* 2008;67:956–64.
- Thun S, Løvseth LT. A health impairment process of sickness presenteeism in Norwegian physicians: the mediating role of exhaustion. *Health* 2016;08:846–56.
- Vogt J, Badura B, Hollmann D. Krank bei der Arbeit: Präsentismusphänomene. In: Böcken J, Braun B, Landmann J, eds. *Gesundheitsmonitor 2009*. Gütersloh: Bertelsmann Stiftung, 2010.
- Vroome E. Prevalence of sickness absence and 'presenteeism', 2006. Available: <http://eurofound.europa.eu/ewco/2006/07/NL06070191.htm> [Accessed 14 Sep 2017].
- Böckerman P, Laukkanen E. What makes you work while you are sick? Evidence from a survey of workers. *Eur J Public Health* 2010;20:43–6.
- Pohling R, Buruck G, Jungbauer K-L, et al. Work-Related factors of presenteeism: the mediating role of mental and physical health. *J Occup Health Psychol* 2016;21:220–34.
- Burton WN, Conti DJ, Chen CY, et al. The role of health risk factors and disease on worker productivity. *J Occup Environ Med* 1999;41:863–77.
- Biron C, Brun Jean-Pierre, Ivers H, et al. At work but ill: psychosocial work environment and well-being determinants of presenteeism propensity. *J Public Ment Health* 2006;5:26–37.
- Caverley N, Cunningham JB, MacGregor JN. Sickness presenteeism, sickness absenteeism, and health following restructuring in a public service organization. *J Management Studies* 2007;44:304–19.
- Kim J, Suh EE, Ju S, et al. Sickness experiences of Korean registered nurses at work: a qualitative study on presenteeism. *Asian Nurs Res* 2016;10:32–8.
- Al Nuhait M, Al Harbi K, Al Jarboa A, et al. Sickness presenteeism among health care providers in an academic tertiary care center in Riyadh. *J Infect Public Health* 2017;10:711–5.
- Costanza DP, Badger JM, Fraser RL, et al. Generational differences in work-related attitudes: a meta-analysis. *J Bus Psychol* 2012;27:375–94.
- Jin J, Rounds J. Stability and change in work values: a meta-analysis of longitudinal studies. *J Vocat Behav* 2012;80:326–39.
- Johansen V. Motives for sickness presence among students at secondary school: a cross-sectional study in five European countries. *BMJ Open* 2018;8:e019337.
- Matsushita M, Adachi H, Arakida M, et al. Presenteeism in college students: reliability and validity of the Presenteeism scale for students. *Qual Life Res* 2011;20:439–46.
- Kötter T, Obst K, Voltmer E. Präsentismus bei Medizinstudenten: Eine Querschnittstudie. *Präv Gesundheitsf* 2017;12:241–7.
- Cogijn J. Are generational differences in work values fact or fiction? Multi-country evidence and implications. *The International Journal of Human Resource Management* 2012;23:2268–94.

42. Bubany ST, Hansen J-IC. Birth cohort change in the vocational interests of female and male college students. *J Vocat Behav* 2011;78:59–67.
43. Lyons S, Kuron L. Generational differences in the workplace: a review of the evidence and directions for future research. *J Organ Behav* 2014;35:S139–S157.
44. Ammendolia C, Côté P, Cancelliere C, et al. Healthy and productive workers: using intervention mapping to design a workplace health promotion and wellness program to improve presenteeism. *BMC Public Health* 2016;16:1–18.
45. Block G, Sternfeld B, Block CH, et al. Development of alive! (a lifestyle intervention via Email), and its effect on health-related quality of life, Presenteeism, and other behavioral outcomes: randomized controlled trial. *J Med Internet Res* 2008;10:e43.
46. Brown HE, Gilson ND, Burton NW, et al. Does physical activity impact on presenteeism and other indicators of workplace well-being? *Sports Medicine* 2011;41:249–62.
47. Bustillos AS, Trigoso OO. Access to health programs at the workplace and the reduction of work Presenteeism. *J Occup Environ Med* 2013;55:1318–22.
48. Cancelliere C, Cassidy JD, Ammendolia C, et al. Are workplace health promotion programs effective at improving presenteeism in workers? *BMC Public Health* 2011;11:395.
49. Coffeng JK, Hendriksen IJM, Duijts SFA, et al. Effectiveness of a combined social and physical environmental intervention on presenteeism, absenteeism, work performance, and work engagement in office employees. *J Occup Environ Med* 2014;56:258–65.
50. Harden SM, You W, Almeida FA, et al. Does successful weight loss in an Internet-based website weight loss program improve employee presenteeism and absenteeism? *Health Educ Behav* 2015;42:769–74.
51. Christensen JR, Overgaard K, Hansen K, et al. Effects on presenteeism and absenteeism from a 1-year workplace randomized controlled trial among health care workers. *J Occup Environ Med* 2013;55:1186–90.
52. Schmid JA, Jarczok MN, Sonntag D, et al. Associations between supportive leadership behavior and the costs of absenteeism and Presenteeism: an epidemiological and economic approach. *J Occup Environ Med* 2017;59:141–7.
53. Fevang E, Markussen S, Røed K. The sick pay trap. *J Labor Econ* 2014;32:305–36.
54. Markussen S, Røed K, Røgeberg OJ, et al. The anatomy of absenteeism. *J Health Econ* 2011;30:277–92.
55. Econtech Pty Ltd. *Econtech economic modelling of the cost of presenteeism in Australia*. Canberra/Sydney: Econtech Pty Ltd, 2007.
56. Colla CH, Dow WH, Dube A, et al. Early effects of the San Francisco paid sick leave policy. *Am J Public Health* 2014;104:2453–60.
57. De Paola M, Scoppa V, Pupo V. Absenteeism in the Italian public sector: the effects of changes in sick leave policy. *J Labor Econ* 2014;32:337–60.
58. Navarro A, Salas-Nicás S, Moncada S, et al. Prevalence, associated factors and reasons for sickness presenteeism: a cross-sectional nationally representative study of salaried workers in Spain, 2016. *BMJ Open* 2018;8:e021212.
59. Gerich J. Sick at work: methodological problems with research on workplace presenteeism. *Health Serv Outcomes Res Method* 2015;15:37–53.
60. Gerich J. Determinants of presenteeism prevalence and propensity: two sides of the same coin? *Arch Environ Occup Health* 2016;71:189–98.
61. Krejcie RV, Morgan DW. Determining sample size for research activities. *Educ Psychol Meas* 1970;30:607–10.
62. Statistisches Bundesamt. (n.d.). Anzahl der Studierenden an Hochschulen in Deutschland in den Wintersemestern von 2002/2003 bis 2018/2019. In Statista - Das Statistik-Portal. Available: <https://de.statista.com/statistik/daten/studie/221/umfrage/anzahl-der-studenten-an-deutschen-hochschulen/> [Accessed 29 Jan 2019].
63. Elstad JI, Vabø M, stress J. Job stress, sickness absence and sickness presenteeism in Nordic elderly care. *Scand J Public Health* 2008;36:467–74.
64. Johansson G, Lundberg I. Adjustment latitude and attendance requirements as determinants of sickness absence or attendance. empirical tests of the illness flexibility model. *Soc Sci Med* 2004;58:1857–68.
65. Johns G. Presenteeism in the workplace: a review and research agenda. *J Organ Behav* 2010;31:519–42.
66. Berglund E, Lytsy P, Westerling R. The influence of locus of control on self-rated health in context of chronic disease: a structural equation modeling approach in a cross sectional study. *BMC Public Health* 2014;14:492.
67. Galvin BM, Randel AE, Collins BJ, et al. Changing the focus of locus (of control): a targeted review of the locus of control literature and agenda for future research. *J Organ Behav* 2018;39:820–33.
68. Biernacka MA, Jakubowska-Winecka A. Health locus of control as a psychological factor in improving treatment results in adolescents with primary hypertension and diabetes. *Health Psychol Rep* 2017;1:20–9.
69. Cheng C, Cheung MW-L, Lo BCY. Relationship of health locus of control with specific health behaviours and global health appraisal: a meta-analysis and effects of moderators. *Health Psychol Rev* 2016;10:460–77.
70. Duckworth KE, Forti AM, Russell GB, et al. The process of advance care planning in hCT candidates and proxies: self-efficacy, locus of control, and anxiety levels. *Am J Hosp Palliat Care* 2014;31:710–6.
71. Ross TP, Ross LT, Short SD, et al. The multidimensional health locus of control scale: psychometric properties and form equivalence. *Psychol Rep* 2015;116:889–913.
72. Rydlewska A, Krzysztofik J, Libergal J, et al. Health locus of control and the sense of self-efficacy in patients with systolic heart failure: a pilot study. *Patient Prefer Adherence* 2013;7:337–43.
73. Zielińska-Więczkowska H. Relationships between health behaviors, self-efficacy, and health locus of control of students at the universities of the third age. *Med Sci Monit* 2016;22:508–15.
74. Bandura A. Social cognitive theory: an Agentic perspective. *Annu Rev Psychol* 2001;52:1–26.
75. Alias M, Akasah ZA, Kesot MJ. Relationships between locus of control, self-efficacy, efforts and academic achievement among engineering students. *MATEC Web of Conferences* 2016;68.
76. Hosseini SN, Mirzaei Alavijeh M, Karami Matin B, et al. Locus of control or self-esteem; which one is the best predictor of academic achievement in Iranian college students. *Iran J Psychiatry Behav Sci* 2016;10:e2602.
77. Moshki M, Ghofranipour F, Hajizadeh E, et al. Validity and reliability of the multidimensional health locus of control scale for college students. *BMC Public Health* 2007;7:295.
78. Sagone E, Caroli MED. Locus of control and academic self-efficacy in university students: the effects of Self-concepts. *Procedia Soc Behav Sci* 2014;114:222–8.
79. Kovaleva A, Beierlein C, Kemper CJ, et al. *Eine Kurzskala Zur Messung von Kontrollüberzeugung: die Skala Internale-Externale-Kontrollüberzeugung-4 (IE-4)*. GESIS-Working papers 2012|19. Köln: GESIS, 2012.
80. Abele AE, Stief M, Andrä MS. Zur ökonomischen Erfassung beruflicher Selbstwirksamkeitserwartungen – Neukonstruktion einer BSW-Skala. *Zeitschrift für Arbeits- und Organisationspsychologie* 2000;3:145–51.
81. Cooper CL, Lu L. Presenteeism as a global phenomenon: unraveling the psychosocial mechanisms from the perspective of social cognitive theory. *Cross Cult Strat Manag* 2016;23:216–31.
82. Lu L, Peng SQ, Lin HY, et al. Presenteeism and health over time among Chinese employees: the moderating role of self-efficacy. *Work & Stress* 2014;28:165–78.
83. Bryngelson A. Long-Term sickness absence and social exclusion. *Scand J Public Health* 2009;37:839–45.
84. Segrin C. Multiple Regression. In: Salkind NJ, ed. *Encyclopedia of research design*. Los Angeles: Sage, 2010: Vol. 2. 844–9.
85. Igo RP. Influential Data Points. In: Salkind NJ, ed. *Encyclopedia of research design*. Los Angeles: Sage, 2010: Vol. 2. 600–2.
86. Schnee M, Burnout VJ. Mobbing und Präsentismus – Zusammenhänge und Präventionsmaßnahmen. In: Böcken J, Braun B, Repschläger U, eds. *Gesundheitsmonitor 2012*. Gütersloh: Bertelsmann Stiftung, 2013: 99–117.
87. Johansen V, Aronsson G, Marklund S. Positive and negative reasons for sickness presenteeism in Norway and Sweden: a cross-sectional survey. *BMJ Open* 2014;4:e004123.
88. Truxillo DM, Cadiz DM, Hammer LB. Supporting the aging workforce: a review and recommendations for workplace intervention research. *Annu Rev Organ Psychol Organ Behav* 2015;2:351–81.
89. THW N, Feldman DC. Employee age and health. *J Vocational Behav* 2013;83:336–45.
90. Kooij DTAM, Jansen PGW, Dijkers JSE, et al. Managing aging workers: a mixed methods study on bundles of HR practices for aging workers. *The International Journal of Human Resource Management* 2014;25:2192–212.
91. Kooij DTAM, Guest DE, Clinton M, et al. How the impact of HR practices on employee well-being and performance changes with age. *Hum Resour Manag J* 2013;23:18–35.

92. Deal JJ, Altman DG, Rogelberg SG. Millennials at work: what we know and what we need to do (if anything). *J Bus Psychol* 2010;25:191–9.
93. Twenge JM. A review of the empirical evidence on generational differences in work attitudes. *J Bus Psychol* 2010;25:201–10.
94. Gursoy D, Maier TA, Chi CG. Generational differences: an examination of work values and generational gaps in the hospitality workforce. *Int J Hosp Manag* 2008;27:448–58.
95. Myers KK, Sadaghiani K. Millennials in the workplace: a communication perspective on millennials' organizational relationships and performance. *J Bus Psychol* 2010;25:225–38.
96. Lockwood NR, Cepero FR, Williams S. The multigenerational workforce: opportunity for competitive success. *Society for Hum Resour Manag* 2009;1:1–10.
97. ESW N, Schweitzer L, Lyons ST, et al. Great expectations: a field study of the Millennial generation. *J Bus Psychol* 2010;25:281–92.
98. Johns G. Attendance dynamics at work: the antecedents and correlates of presenteeism, absenteeism, and productivity loss. *J Occup Health Psychol* 2011;16:483–500.
99. Phulpoto NH, Hussain A, Anjum Z, et al. Locus of control and its impact on self-efficacy of university graduates. *IJCSNS* 2018;18:1–5.
100. Ferrie JE et al. A comparison of self-reported sickness absence with absences recorded in employers' registers: evidence from the Whitehall II study. *Occup Environ Med* 2005;62:74–9.
101. Wu S, Wang R, Zhao Y, et al. The relationship between self-rated health and objective health status: a population-based study. *BMC Public Health* 2013;13:320–8.
102. CIPD. Health and well-being at work, 2018. Available: https://www.cipd.co.uk/Images/health-and-well-being-at-work_tcm18-40863.pdf [Accessed 25 Jul 2018].