Psychiatry Research 282 (2019) 112622

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

The stability and latent profiles of mental health problems among Dutch young adults in the past decade: A comparison of three cohorts from a national sample

Peter G. van der Velden[a,b,*], Marcel Das[a,b], Ruud Muffels[c,b]

[a] CentERdata, Tilburg, the Netherlands
[b] Tilburg University's Network on Health and Labour (NETLAB), Tilburg, the Netherlands
[c] Tilburg School of Social and Behavioral Sciences, and Tranzo (Scientific center for care and welfare), Tilburg University, Tilburg, the Netherlands

ARTICLE INFO

Keywords:
Young adults
Depression and anxiety symptoms
Fatigue
Medicine use
Mental health services utilization
General health
Latent profiles

ABSTRACT

The aim of the study reported here was to assess whether the prevalence of mental health problems (MHP) among Dutch 19–24 year old adults increased in the past decade and/or whether the distribution of latent profiles of mental health problems changed over the years. For this purpose, data was extracted from the LISS panel, based on a representative national sample of the Dutch population. We focused on three exclusive groups who were 19–24 years old in 2007 (n = 383), 2012 (n = 351) or 2017 (n = 362). Multivariate logistic regression analyses showed that the 2012 and 2017 group did not have more MHP according to seven mental health-related indicators including mental health services utilization. Latent profile analysis identified 4 classes of MHP profiles, labeled "healthy" (82.2%), "at risk" (9.6%), "clinical" (4.2%) and "treatment" (3.9%). The 2007, 2012 and 2017 cohorts were equally distributed across these four classes. However, females had systematically more health problems than males and more often belonged to the "at risk", "clinical" and "treatment" class. In sum, our findings do not support concerns about an increase in MHP or that problems have become more complex among Dutch young adults over the past decade.

1. Introduction

In the past years, concerns have been raised in newspapers and academic journals about an 'epidemic' of mental health problems among young adults and especially students (Costell et al., 2006a,b; Hunt and Eisenberg, 2010; Huygen, 2016; Krisberg, 2016; Twenge et al., 2018). In addition, reports were and are published describing an increase in the use of counseling centers by students (CCMH, 2017; Dinther, 2018; Twenge et al., 2018). Given the burden of mental health problems and disorders, the ongoing changes in modern societies (Bor et al., 2014), and the fact that common mental disorders are being first reported before the age of 24 (Patton et al., 2014), the question whether young adults nowadays are indeed more at risk of mental health problems is highly relevant (cf. Auerbach et al., 2016).

In short, the following patterns with respect to a possible increase were observed in the past decades. About 10 years ago, Patel et al. (2007) stated that, given the mixed findings, it was unclear whether the rates of mental disorders among young adults had increased during the past few decades before their study (cf. Costello et al., 2006a, b). In addition, analyses of yearly Surveys on Drug Use and Health in the US for 2005 to 2014 (Mojtabai et al., 2016) among young adults (18–25 years old) showed a slight upward trend in the prevalence of 12-month major depressive episodes, from 8.8% to 9.6% among a limited group of the 18–20 year old adults. With respect to the differences between student and non-students, analyses of WHO World Mental Health Surveys conducted in 21 countries revealed that 20.3% of college students aged 18–22 suffered 12-month mental disorders according to the DSM-IV, but also showed that the prevalence of mental disorders was not higher than among attriters and non-students of the same age (Auerbach et al., 2016).

Meanwhile, a meta-analysis performed by Curran and Hill (2017) revealed another important trend in the past four decades in Western countries with respect to levels of self-oriented perfectionism, other-oriented perfectionism and especially socially prescribed perfectionism among college students: these have increased linearly over the past 30 years. A recent meta-analysis by Limburg et al. (2017) showed that forms of perfectionism are associated with various forms of psychopathology, suggesting a possible increase in mental health problems

* Corresponding author at: CentERdata, PO Box 90153, 5000 LE Tilburg, the Netherlands.
E-mail addresses: pg.vandervelden@tilburguniversity.edu, pg.vandervelden@kpnmail.nl (P.G. van der Velden).

https://doi.org/10.1016/j.psychres.2019.112622
Received 22 January 2019; Received in revised form 15 October 2019; Accepted 15 October 2019
Available online 16 October 2019
0165-1781/

and especially among students.

The aim of the present study is therefore to examine to what extent three population-based cohorts of young adults who were 19–24 years old in 2007, 2012 or 2017, differ in terms of mental health problems. In addition, since little is known about the extent to which the distribution of profiles or latent classes of mental health problems differ between cohorts of young adults, it is also important to assess possible differences in the distribution of these profiles or latent class distribution. After all, the absence of cohort differences in prevalence rates of distinct mental health problems does not necessarily rule out the possibility that certain profiles (for instance latent classes of young adults who suffer from many distinct mental health problems) are more prevalent today than in the past (or vice versa). The second aim of the present study is therefore to examine which profiles or latent classes of mental health problems can be distinguished and to what extent the 2007, 2012 and 2017 cohorts show a similar or different distribution of latent classes.

To the best of our knowledge, previous studies on this topic did not examine the prevalence of mental health problems in combination with the latent profiles of mental health problems among different cohorts of young adults. Such a combined research strategy does have clear benefits, however: if there is no significant increase in mental problems among different cohorts of young adults and if the distribution of latent profiles of classes does not differ significantly between different cohorts, then we can conclude with more certainty that we lack evidence for the concern that mental health problems among cohorts of young adults are increasing.

Our null-hypothesis is that mental health-related problems among young adults did not increase in the past decade and that latent profiles of mental health problems are equally distributed among cohorts of young adults in 2007, 2012 and 2017.

2. Materials and methods

2.1. Participants

For the present study we used data from the LISS panel, administered by CentERdata (Tilburg University, The Netherlands). The LISS panel is the central element of a project titled Measurement and Experimentation in the Social Sciences, funded by the Netherlands Organization for Scientific Research. The panel is based on a large representative sample drawn from the Dutch population register by Statistics Netherlands (Scherpenzeel and Das, 2011).

Panel members who do not have a computer and/or internet access are provided with the necessary equipment at home, and all members receive an incentive of 15 euros per hour for their participation. Each year so-called (identical) core studies are conducted focusing on topics such as health, leisure and personality, starting in 2007. These questionnaires were approved by a panel of internal and external reviewers of CentERdata and each respondent gave their informed consent. For the present study we first extracted data from the health studies conducted in November-December 2007 (T1, $N^{selected} = 8478$, $response^{completers} = 78.1\%$), 2012 (T2: $N^{selected} = 6769$, $response^{completers} = 84.7\%$) and 2017 (T3: $N^{selected} = 7487$, $response^{completers} = 79.2\%$). We next selected respondents who were 19–24 years old at T1, T2 or T3. The age lower limit of 19 was chosen because at that age most adolescents have finished secondary school, pre- intermediate professional or pre-higher professional education (T1, $N^{selected\ 19\text{-}24} = 597$, $response^{completers} = 69.4\%$), 2012 (T2: $N^{selected\ 19\text{-}24} = 571$, $response^{completers} = 73.4\%$) and 2017 (T3: $N^{selected\ 19\text{-}24} = 630$, $response^{completers} = 63.3\%$). Respondents who belonged to two groups were excluded. The three exclusive cohorts consisted of 383 (T1), 351 (T2) and 362 (T3) respondents.

The published LISS panel data, which are freely available (Open Access) for scientific researchers provided they meet a number of conditions, offer the opportunity to replicate particular studies conducted before. More details of the panel data and of the previously conducted studies can be found on www.lissdata.nl (in English).

2.2. Measures

We used seven different measures assessing mental health-related problems. Mental health problems (MHP), i.e. anxiety and depression symptoms, were examined using the Mental Health Index or Inventory (5-item sub scale of the MOS 36-item short-form health survey; Means-Christensen et al., 2005; Ware and Sherbourne, 1992; Rumpf et al., 2001). Respondents were asked to rate their mental health during the past month on 6-point Likert scales, such as '*This past month I felt very anxious*' and '*I felt depressed and gloomy*' (5 = *never* to 0 = *continuously*). After recoding the positive formulated third and fifth item, the total scores were computed and multiplied by four (all Cronbach's $\alpha > 0.85$). Lower scores reflect more MHP. A cut-off of ≤ 44 (Driessen, 2011) was used to identify respondents with moderate to severe MHP.

Use of mental health services (MHS) was assessed by one item '*How often did you use the following health services over the past 12 months*?, with answer categories varying from family physician to alternative healer. For the present study we focus on the use of a psychiatrist, psychologist, or psychotherapist *(0 = no, 1 = yes)* in the past 12 months.

In the survey on health, respondents were offered a list of 10 problems people may suffer from, varying from heart complaints to sleeping problems. For the present study we focused on the item '*Do you regularly suffer from fatigue*' (0 = *no*, 1 = *yes*).

Health-related disabilities were assessed with the question 'To what extent did your physical health or emotional problems hinder your work over the past month, for instance in your job, the housekeeping, or in school? Which was developed for the core study on health (van Heck and Vingerhoets, 2001). The question is comparable with questions of the MOS-36 (Ware and Sherbourne, 1992) and the European Health Interview Surveys (SILC-EU; Eurostat, 2016). The question had a 5-point Likert scale (1 = not at all to 5 = very much). For the present study scores were recoded into low (1,2,3) and high (4,5).

We extracted data on the use of medicines for anxiety and depression by means of the question '*Are you currently taking medicine at least once a week for: anxiety or depression*' (0 = *no*, 1 = *yes*).

We also assessed general health with two standardized questions: 'How would you describe your health, generally speaking?' (1 = poor to 5 = excellent; Simon et al., 2005), and 'Can you indicate whether your health is poorer or better, compared to last year?' (1 = considerably poorer to 5 = considerably better). The reason we included these measures is because Simon et al. (2005) showed that general health is not limited to physical health problems only, but also includes mental health-related problems. For the present study we recoded both scores into in low (1,2,3) and high (4,5).

All items were administered at T1, T2 and T3 as well as questions about age (in years), highest education level, work/education status (student yes/no) and sex. For the present study the highest education level (apart from having received a diploma) was recoded into (1) "college" level (including primary school, intermediate secondary education, junior high school, higher secondary education/preparatory university education, senior high school, not (yet) started any education, other); (2) intermediate vocational education (junior college); and (3) higher education (including higher vocational education, university).

2.3. Statistical analyses

Multivariate logistic regression analyses were conducted with the seven health measures as dependent variables, and with group-year membership (1 = 2007, 2 = 2012, 3 = 2017), student status (student 1 = *no*, 2 = yes), highest education level (1 = *College*, 2 = *intermediate vocational;* 3 = *higher education*), sex (1 = *males*, 2 = *female*), and the

Table 1
Demographic characteristics of the 2007, 2012 and 2017 cohorts.

	Group 2007 M (sd)/ n (%)	Group 2012 M (sd)/ n (%)	Group 2017 M (sd)/ n (%)	F/χ2	Df	p
Age (years)	21.1 (1.59)	21.3 (1.48)	21. 3 (1.63)	3.93	2	0.020
Sex						
-Male	175 (45.7)	150 (42.7)	137 (37.8)	4.77	2	0.092
-Female	208 (54.3)	201 (57.3)	225 (62.2)			
Highest education level						
-Elementary	82 (21.4)	82 (23.4)	43 (11.9)	47.0	4	< 0.001
-Inter. vocational	118 (30.8)	83 (23.6)	63 (17.4)			
-Higher education	183 (47.8)	186 (53.0)	256 (70.7)			
Student						
-No	179 (46.7)	122 (34.8)	98 (27.1)	31.69	2	< 0.001
-Yes	204 (53.3)	229 (65.2)	264 (72.9)			

Education: Elementory (including primary school, intermediate secondary education, junior high school, higher secondary education/preparatory university education, senior high school, not (yet) started any education, other), intermediate vocational (junior college) and higher education (including higher vocational education, university).

Table 2
Results of multivariate logistic regression with health problems as dependent variables.

		Anxiety and depression symptoms			Regular feel fatigue			Good general health			Problems with study etc. due to health or emotional problems		
	N	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)
Group													
−2007	383	7.6	1		33.1	1		88.5	1		7.1	1	
−2012	351	11.1	1.57	(0.94–2.62)	35.3	1.08	(0.79–1.48)	90.0	1.16	(0.72–1.87)	7.2	1.06	(0.60–1.88)
−2017	362	8.3	1.16	(0.67–2.02)	41.5	1.37	(0.997–1.88)	90.6	1.16	(0.71–1.90)	7.1	1.15	(0.65–2.05)
Sex													
-Male	462	6.5			24.1	1		93.3	1		4.4	1	
-Female	634	10.8	1.73*	(1.10–2.71)	45.5	2.58***	(1.97–3.37)	87.1	0.46**	(0.30–0.72)	9.4	2.28**	(1.34–3.85)
Education level													
-College	207	9.7	1		33.2	1		88.4	1		7.8	1	
-Inter. vocational	264	11.8	1.35	(0.74–2.47)	39.4	1.33	(0.89–1.99)	84.5	0.72	(0.41–1.25)	9.9	1.40	(0.70–2.79)
-Higher education	625	7.5	0.79	(0.43–1.43)	36.5	1.10	(0.76–1.59)	92.3	2.06*	(1.11–3.84)	5.9	0.78	(0.39–1.54)
Student													
-No	399	9.8	1		36.2	1		89.2	1		8.9	1	
-Yes	697	8.5	0.91	(0.57–1.46)	36.8	1.10	(0.81–1.49)	90.0	0.79	(0.49–1.26)	6.3	0.72	(0.42–1.22)
Interaction effect education level*student status													
-College			1			1			1			1	
-Inter. vocational			3.11	(0.93–10.44)		0.99	(0.45–2.22)		0.78			3.50	(0.89–13.9)
-Higher education			1.90	(0.58–6.20)		0.81	(0.39–1.68)		0.37			2.81	(0.73–10.9)

		Health worse than past year			Contact with psychiatrist etc. in past 12 months			Medicine for anxiety or depression			Any problem		
	N	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)	%	Adj. OR	(95% CI)
Group													
−2007	383	15.0	1		13.1	1		2.1			49.1		
−2012	351	15.4	0.99	(0.66–1.49)	9.5	0.70	(0.43–1.12)	1.5	0.65	(0.21–2.02)	50.1	1.03	(0.77–1.39)
−2017	362	16.6	1.05	(0.70–1.58)	10.3	0.72	(0.45–1.15)	1.4	0.60	(0.19–1.91)	53.0	1.11	(0.82–1.50)
Sex													
-Male	462	13.2	1		7.8	1		1.3			40.9		
-Female	634	17.4	1.42*	(1.01–1.99)	13.4	1.92**	(1.27–2.91)	1.9	1.52	(0.57–4.10)	57.9	2.00**	(1.56–2.55)
Highest education level													
-College	207	15.9	1		8.4			1.5			45.4		
-Inter. vocational	262	14.4	0.90	(0.54–1.50)	11.4	1.15	(0.57–2.28)	1.9	1.37	(0.32–5.86)	55.7	1.56*	(1.07–2.27)
-Higher education	625	16.1	0.77	(0.47–1.27)	11.7	1.31	(0.71–2.40)	1.6	1.01	(0.27–3.83)	50.4	1.11	(0.80–1.57)
Student													
-No	399	12.5	1		11.6	1		1.3			49.1		
-Yes	679	17.4	1.40	(0.94–2.09)	10.7	0.72	(0.43–1.21)	1.9	1.80	(0.60–5.47)	51.6	1.17	(0.88–1.55)
Interaction effect education level*student status													
-College			1			1						1	
-Inter. vocational			1.20	(0.43–3.34)		0.64	(0.16–2.52)		n.c			1.24	(0.58–2.64)
-Higher education			2.13	(0.80–5.62)		2.73	(0.82–9.13)		n.c			1.27	(0.64–2.51)

* = $P < 0.05$,
** = $P < 0.01$,
*** = $p < 0.001$.
Adj. OR = Odds ratio adjusted for all other predictors in Table 2.
Education: college level (including primary school, intermediate secondary education, junior high school, higher secondary education/preparatory university education, senior high school, not (yet) started any education, other), intermediate vocational (junior college) and higher education (including higher vocational education, university).
n.c. = not computable because of empty cells causing extreme Adj. OR's. Therefore, the interaction effect was omitted from the analyses on medicine use.

interaction effect student status*education level as predictors (see Table 1). Analyses were performed with IBM SPSS (version 25).

To examine possible differences in the profiles of health problems, latent profile analysis was conducted (LPA; Lazarsfeld and Henry, 1968; Tein et al., 2013) using the total study sample. LPA is particularly appropriate for data on the presence or absence of mental health problems (Sullivan et al., 1998). The seven health variables (see Table 1) were considered to be indicators of the unobserved latent class variable, with a limited number of mutually exclusive categories or classes of health problems (Magidson and Vermunt, 2004). We compared models by assessing the relative fit based on reductions in the Bayesian Information Criterion [BIC and the Sample-size Adjusted BIC (SABIC)], as well as Bivariate Residuals (BVRs) and outcomes of the Bootstrap Likelihood-Ratio Test (BLRT; Magidson and Vermunt, 2004; Nylund et al., 2007; Statistical innovations, 2016; Tein et al., 2013 Vermunt and Magidson, 2013). We chose the most parsimonious model with the lowest BIC or SABIC, but also examined the BVRs of models that seemed to be parsimonious (BVRs larger than 3.84 indicate statistical significance at the 0.05 level meaning that the estimated model failed to account for the pairwise associations of the specific indicators). We looked at entropy values that are measures of the quality of classification (approaching one indicates a clear delineation of classes (Celeux and Soromenho, 1996)). Finally, the results of the BLRTs, i.e. the assessment of the difference in model fit between subsequent models (current model and model with one class less) needed to be significant. LPA was conducted using LatentGold (version 5.1; Vermunt and Magidson, 2013). Finally, we added class membership to each respondent's data for further analyses. When reporting the results of the latent profile analyses, we used the GRoLTS checklist (van den Schoot, Sijbrandij, Winter, Depaoli, and Vermunt, 2017).

3. Results

3.1. Demographic characteristics subgroups

The demographic characteristics of the three sub groups are presented in Table 1. The mean age of the three groups differed significantly, but the differences were small (all Cohen's D $<$ 0.20). The percentage of young adults with a higher education (highest level apart from having received a diploma) and the percentage of students increased in the past decade, which is in line with the data of Statistics Netherlands (for instance: the percentage of employed residents with a higher education level (with diploma) increased from about 29.7% in 2007 to 36.6% in 2017: CBS Statline, 2019). No significant differences were found in sex between the three cohorts.

3.2. Comparisons between cohorts, gender, education level and student status

Table 2 shows that the 2012 and 2017 subgroups did not have more (or less) MHP than the 2007 subgroup: none of the adjusted odd ratios was significant. Of the three groups, 49.1%, 50.1% and 53.0% respectively had MHP according to at least one MHP measure (of the seven health problems presented in Table 2). However, respondents with university/ higher professional education level more often rated their general health level as high as respondents at college level. Females compared to males rated their mental health as worse, but no differences between females and males were found with respect to the use of medicines for anxiety or depression. No significant differences were found between students and non-students.

Analyses with a much lower cut-off for mental health problems (MHI-5 $<$ 33), indicative for very severe MHP, did not reveal significant differences. In addition, four ANCOVAs using the total scores of MHI-5 did not reveal significant main effects for the study variables group, education and student, but again showed that females had more mental health problems than males ($F(1,1091) = 22.34$, $p < 0.001$), while controlling for the other three study variables.

3.3. Interaction effects

The multivariate logistic regression analyses were repeated with several interaction effects as predictors. Results showed that the Education level*Student status interaction effects were all non-significant. Because of the differences between females and males, we also included the interaction effect Sex*Group in the multivariate logistic regression models to examine a possible increase among young females compared to young males. Results showed no significant Sex*Group interaction effects. ANCOVA with the total MHI-5 scores including the Education level*Student status interaction effect showed that this effect was not significant.

3.4. Latent classes of mental health problems

The latent profile analysis showed that, according to the BIC value, two classes of profiles can be identified. However, several BVRs of indicators of the 2-class and 3-class solution were too high ($\geq$3.84) and the results of the BLRT showed that a 3-class and 4-class solution improved the fit (–2LL difference = 44.91, $p < 0.001$ and -22 L difference = 39.27, $p < 0.0001$ respectively). The BVRs of the 4-class solution were low and acceptable ($\leq$0.68). A new BLRT showed that a 5-class solution did not improve the fit (–2LL difference = 11.69, $p = 0.16$). According the SABIC, the 4-class model was also the best solution. For these reasons we chose the 4-class solution with an entropy R of 0.80 (see Table 3).

Table 4 provides an overview of the prevalence of the distinguished mental health problems within each class, showing large differences between classes. Based on the relatively low prevalence of problems, we consider Class 1, covering the vast majority of young adults ($N = 871$, 82.2%) as a "healthy" class. The prevalence of problems in Class 2 were higher than in Class 1, and we consider this class as a group "at risk" also because almost all young adults in this group reported that their health was (much) worse (95.1%) than last year ($N = 102$, 9.6%). Class 3 had very high prevalence rates of for instance anxiety and depression symptoms (100%) and of study problems due to emotional problems

Table 3
Results latent profile analysis.

		LL	BIC(LL)	SABIC(LL)	N^{par}	Class.Err.	Entropy *R*	Sample Size Classes
Model1	1 Class	−2567.44	5183.64	5161.40	7	0.0000	1.00	1059
Model2	2 Classes	−2341.34	4787.16	4739.52	15	0.0530	0.83	924/135
Model3	3 Classes	−2318.89	4797.97	4724.92	23	0.0599	0.83	910/109/40
Model4	***4 Classes***	***−2299.25***	***4814.41***	***4715.95***	***31***	***0.0844***	***0.80***	***871/102/45/41***
Model5	5 Classes	−2292.15	4855.93	4732.06	39	0.0854	0.81	863/61/47/26/12
Model6	6 Classes	−2287.11	4901.58	4752.30	47	0.2874	0.69	791/133/44/47/32/12
Model7	7 Classes	−2283.91	4950.93	4776.22	55	0.2425	0.70	816/47/64/42/35/27/28

The best fitting model is presented in bold. LL = log likelihood. BIC = Bayesian Information Criterion. SABIC = Sample-size Adjusted BIC. N^{par} = number of estimated parameters. Cass. Err. = Classification error. Indicators were entered as ordinal-fixed variables. $N = 1059$.

Table 4
Health problems among four classes.

	Class 1 "healthy" (*n* = 871, 82.2%)		Class 2 "at risk" (*n* = 102, 9.6%)		Class 3 "clinical" (*n* = 45, 4.2%)		Class 4 "treatment" (*n* = 41, 3.9%)			
	n	(%)	*n*	(%)	*n*	(%)	*n*	(%)	χ(3)[a]	P
Anxiety and depression symptoms	31	(3.6)	14	(13.7)	45	(100.0)	7	(17.1)	484.8	< 0.0001
Regular feel fatigue	226	(25.9)	79	(77.5)	43	(95.6)	40	(97.6)	248.9	< 0.0001
Good general health	836	(96.0)	56	(54.9)	16	(35.6)	41	(100.0)	316.0	< 0.0001
Problems with study, etc. due to health or emotional problems	17	(2.0)	24	(23.5)	37	(82.2)	0	(0.0)	449.3	< 0.0001
Health worse than past year	41	(4.7)	97	(95.1)	25	(55.6)	1	(2.4)	631.8	< 0.0001
Contact with psychiatrist etc. in past 12 months	41	(4.7)	17	(16.7)	22	(48.9)	37	(90.2)	366.1	< 0.0001
Medicine for anxiety or depression	0	(0.0)	0	(0.0)	6	(13.3)	12	(29.3)	239.8	< 0.0001

[a] Degree of Freedom (DF) between brackets.

(82.2%), suggesting that many youngsters belonging to this class may need professional help. We therefore consider this group a "clinical" class (N = 45, 4.2%). Finally, we consider Class 4 as a "therapeutic" group since almost all had contact with a psychiatrist in the past 12 months (90.2%) and because a considerable minority in this Class used medicine for anxiety or depression (29.3%).

A cross tabulation between classes and groups is presented in Table 5, showing that the distributions of the 4 classes were similar across the 2007, 2012 and 2007 groups, as they were across education level and student status. The chi-square tests showed no significant differences. However, females compared to males were often present in the class "at risk", "clinical" and "treatment" ($p < 0.001$).

4. Discussion

We found no indications that mental health-related problems (MHP) *increased* in the past 10 years among 19–24 year old respondents, and we found no indications that students or highly educated young adults more often suffer from MHP than non-students or those with a lower educational level. These findings are in line with the conclusions of the study by Costello et al. (2006b) and in line with the results of the study by Mojtabai et al. (2016) among 20–25 year old adults (cf. Hunt and Eisenberg, 2010). In addition, and in line with previous research, females more often suffered from mental health problems than males (Van de Velde et al., 2018).

Furthermore, the latent profile analyses using 7 mental health indicators revealed four classes of profiles of mental health problems which were substantially dissimilar. Based on the various mental health problems that we included in the study, we considered Class 1 as a "healthy" group, Class 2 as a group "at risk" that may need further attention, Class 3 as a "clinical group" that may need professional help and Class 4 as a "treatment" group. The large majority of young adults (82%) belonged to the "Healthy" class. A cross tabulation showed that the distributions of the 4 latent classes were rather similar for the three cohorts. This indicates that no evidence was found that, among the 2012 and 2017 cohorts, the more problematic classes such as the "clinical" Class 3 (4.2%) and "treatment" Class 4 (3.9%) were more prevalent than among the 2007 cohort. The high prevalence of various problems among Class 3 may serve as an indication that their problems were more complex compared to Class 1 and 2. However, we have found no studies covering the same groups of young adults to compare our latent class findings with.

The absence of a significant main and interaction effect in the logistic regression parameter estimates for education and student status, indicates that in our samples, students were not more at risk than non-students, and that those with a higher educational level were not more at risk than those with lower levels. These findings partly differ from the study by Cvetkoski et al. (2012) using three different samples of students and non-students. In two samples, tertiary education students more often showed moderate distress than non-students, although standardized rates for age and sex attenuated these differences. Costello et al. (2006b, p. 1263) furthermore suggested that "*Public perception of an 'epidemic' may arise from heightened awareness of a disorder that was long under-diagnosed by clinicians*". An increase in the use of services observed in other studies (CCMH, 2017) could also be attributed to a decrease in the negative stigma of seeking professional

Tabel 5
Distribution of classes among sub samples.

		Class 1 "healthy" (*n* = 871, 82.2%)		Class 2 "at risk" (*n* = 102, 9.6%)		Class 3 "clinical" (*n* = 45, 4.2%)		Class 3 "treatment" (*n* = 41, 3.9%)			
	N	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	χ(DF)	P
Groups											
−2007	378	310	(82.0)	37	(9.8)	15	(4.0)	16	(4.2)	2.9 (6)	0.821
−2012	335	280	(83.6)	27	(8.0)	17	(5.1)	11	(3.3)		
−2017	346	281	(81.2)	38	(11.0)	13	(3.8)	14	(4.0)		
Sex											
-Male	445	397	(89.2)	28	(6.3)	10	(2.2)	10	(2.2)	25.9 (3)	< 0.001
-Female	614	474	(77.2)	74	(12.1)	35	(5.7)	31	(5.0)		
Highest Education level											
-College	197	162	(82.1)	21	(10.7)	12	(6.1)	2	(1.0)	9.97 (6)	0.126
-Inter. vocational	258	208	(80.6)	23	(8.9)	14	(5.4)	13	(5.0)		
-Higher education	604	501	(92.9)	58	(9.6)	19	(3.1)	26	(4.3)		
Student											
-No	383	318	(83.0)	30	(7.8)	21	(5.5)	14	(3.7)	4.2 (3)	0.233
-Yes	676	553	(81.8)	72	(10.7)	24	(3.6)	27	(4.0)		

Education: college level (including primary school, intermediate secondary education, junior high school, higher secondary education/preparatory university education, senior high school, not (yet) started any education, other), intermediate vocational (junior college) and higher education (including higher vocational education, university).

help, instead of to an increase in MHP.

In the (Dutch) media, the alleged pressure to perform as a student and other study-related stressors such as the burden of study loans are held responsible for mental health problems among students (Twenge et al., 2018). However, Auerbach et al. (2016) concluded that a very large proportion of mental disorder cases (83.1%) had pre-matriculation onsets indicating that the cause of mental health problems is at least multifactorial.

4.1. Limitations

The strength of our longitudinal study is the use of population-based samples, the comparison of three exclusive cohorts across a time span of 10 years, and the use of a multiple set of measures of MHP. However, we did not conduct clinical interviews and, although a much lower cut-off for the MHI-5 did not change our findings, future research is needed to assess mental disorders among different cohorts of young adults. We have no data available with respect to the reliability of the questions about fatigue and problems with study (etc.), although the last question resembles a question in the European Health Interview Surveys (EHIS-EU; Eurostat, 2016) and in the MOS-36 (Ware and Sherbourne, 1992). We did not examine other relevant aspects of mental health such as suicidal thoughts or social relationships, and thus cannot rule out the possibility that distinguished groups do differ in these or other aspects. Due to the number of respondents, we could not analyze possible differences between those who were 19 years old in 2007, 2012 or 2017 (cf. Mojtabai et al., 2016). Although, as expected, the percentage of young adults with a higher education (highest level) increased between the 2007, 2012 and 2017 cohorts, it seems that young adults with a higher education level more often participated in our surveys than young adults with a lower education level. However, this did not affect our findings because we controlled for education level and the Education level*Student status interaction effect.

Our data did not allow us to examine possible differences between Dutch universities, different scientific disciplines or across subgroups with dissimilar study careers (cf. Christensson et al., 2010; Ludwig et al., 2015). The response among young adults was lower than among the total LISS panel.

5. Conclusions

Expressed concerns about the increase of mental health problems among young adults and especially students aged 19–24 years on the one hand, and the absence of clear empirical supportive evidence on the other hand, resembles earlier concerns about a possible increase of mental disorders among the general population. Interestingly, Kessler et al. (2005) showed that the 12-month prevalence of any mental disorder was more or less stable over a 10-year period, i.e. 29.5% and 26.2% respectively, according to the National Comorbidity Survey Replication-study. A similar pattern was found in the Dutch population-based NEMESIS study (Vollebergh et al., 2001) showing that, in contrast to the expectations of mental health professionals, the 12-month prevalence remained stable at about 17% over a similar period (Graaf et al., 2010). Of course, the absence of evidence regarding an increase of mental health problems certainly does not imply the absence of mental health problems among the 2007, 2012 and 2017 cohorts. Our study does clearly show that, in line with previous research, a considerable minority suffers from various mental health problems. Moreover, about 50% had *some* mental health problem according to the seven mental health-related variables.

Declaration of Competing Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2019.112622.

References

Auerbach, R.P., Alonso, J., Axinn, W.G., Cuijpers, P., Ebert, D.D., Green, J.G., et al., 2016. Mental disorders among college students in the World Health Organization World Mental Health Surveys. Psychol. Med. 46, 2955–2970. https://doi.org/10.1017/S0033291716001665.

Bor, W., Dean, A.J., Najman, J., Hayatbakhsh, R., 2014. Are child and adolescent mental health problems increasing in the 21st century? A systematic review. Aust. N. Z. J. Psychiatry 48, 606–616. https://doi.org/10.1177/0004867414533834.

C.B.S. Statline, 2019. Information about education level Dutch employed population from Statline of Statistics Netherlands (In Dutch). https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82922NED/table?fromstatweb. Retrieved in September 14, 2019.

CCMH, 2017. 2016 Annual report Center for Collegiate Mental Health. Penn State University.

Christensson, A., Runeson, B., Dickman, P.W., Vaezet, M., 2010. Change in depressive symptoms over higher education and professional establishment – a longitudinal investigation in a national cohort of Swedish nursing students. BMC Public Health 10 (343), 1–11. https://doi.org/10.1186/1471-2458-10-343.

Costello, E.J., Foley, D.L., Angold, A., 2006a. 10-year research update review: the epidemiology of child and adolescent psychiatric disorders: II. Developmental epidemiology. J. Am. Acad. Child Adolesc. Psychiatry 45, 8–25. https://doi.org/10.1097/01.chi.0000184929.41423.c0.

Costello, E.J., Erkanli, A., Angold, A., 2006b. Is there an epidemic of child or adolescent depression? J. Child. Psychol. Psychiatry 47 (12), 1263–1271. https://doi.org/10.1111/j.1469-7610.2006.01682.x.

Curran, T., Hill, A.P., 2017. Perfectionism is increasing over time: a meta-analysis of birth cohort differences from 1989 to 2016. Psychol. Bul. https://doi.org/10.1037/bul0000138. (Advance online publication).

Celeux, G., Soromenho, G., 1996. An entropy criterion for assessing the number of clusters in a mixture model. J. Classification 13, 195–212.

Cvetkovski, S., Reavley, N.J., Jorm, A.F., 2012. The prevalence and correlates of psychological distress in Australian tertiary students compared to their community peers. A. N. Z. J. Psychiatry 46, 457–467. https://doi.org/10.1177/0004867411435290.

Dinther, M., 2018. Studenten bezwijken psychisch onder prestatiedruk: 'De psychologen zijn niet aan te slepen' [Students Succumb Under Pressure to Performance: Number of Psychologists Can't Keep Up]. Volkskrant (Dutch Newspaper) August 13.

Driessen, M., 2011. Een beschrijving van de MHI-5 in de gezondheidsmodule van het Permanent Onderzoek Leefsituatie [A Description of the MHI-5 in the Health Module of Permanent Research of Living Conditions, POLS]. CBS, Statistics Netherlands, Den Haag.

Eurostat, 2016. European Health Interview Survey. http://ec.europa.eu/eurostat/documents/3859598/5926729/KS-RA-13-018-EN.PDF/26c7ea80-01d8-420ebdc6-e9d5f6578e7c(Assessed February 2, 2016).

Graaf, R.de, Have, M.ten, Dorsselaer, S van, 2010. De psychische gezondheid van de Nederlandse bevolking NEMESIS-2: Opzet en eerste resultaten [The Mental Health of the Dutch Population NEMISIS-2: Design and First Results. In Dutch]. Trimbos, Utrecht.

Heck, G.L.van, Vingerhoets, A.J.J.M., 2001. De CentERdata gezondheidsmonitor: ontwikkeling en eerste resultaten [CentERdata Health Monitor: Development and First Results]. Departement Klinische Gezondheidspsychologie Tilburg University, Tilburg.

Hunt, J., Eisenberg, D., 2010. Mental health problems and help-seeking behavior among college students. J. Adolesc. Health 46, 3–10. https://doi.org/10.1016/j.jadohealth.2009.08.008.

Huygen, M., 2016. Studenten lijden onder keuzestress en prestatiedruk [Students Suffer from Decision Stress and Pressure to Performance]. NRC Oktober 20.

Krisberg, K., 2016. Medical School Burnout. Association of American Colleges News, AAMCNews September 27.

Limburg, K., Watson, H.J., Hagger, M.S., Egan, S.J., 2017. The relationship between perfectionism and psychopathology: a meta-analysis. J Clin. Psychol. 73, 1301–1326. https://doi.org/10.1002/jclp.22435.

Ludwig, A.B., Burton, W., Weingarten, J., Milan, F., Myers, D.C., Kligler, B., 2015. Depression and stress amongst undergraduate medical students. BMC Med. Educ. 27 (15), 141. https://doi.org/10.1186/s12909-015-0425-z.

Kessler, R.C., Chiu, W.T., Demler, O., Walters, E.E., 2005. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch. Gen. Psychiatry 62, 617–627. https://doi.org/10.1001/archpsyc.62.6.617.

Lazarsfeld, P.F., Henry, N.W., 1968. Latent Structure Analysis. Houghton Mifflin, Boston.

Sullivan, P.F., Kessler, R.C., Kendler, K.S., 1998. Latent class analysis of lifetime depressive symptoms in the national comorbidity survey. Am. J. Psychiatry 155, 1398–1406. https://doi.org/10.1176/ajp.155.10.1398.

Magidson, J., Vermunt, J.K., 2004. Latent class models. In: Kaplan, D. (Ed.), Handbook of Quantitative Methodology For the Social Sciences. Sage Publications, Thousand Oaks, USA, pp. 175–198.

Means-Christensen, A.J., Arnau, R.C., Tonidandel, A.M., Bramson, R., Meagher, M.W., 2005. An efficient method of identifying major depression and panic disorder in primary care. J. Behav. Med. 28, 565–572. https://doi.org/10.1007/s10865-005-9023-6.

Mojtabai, R., Olfson, M., Han, B., 2016. National trends in the prevalence and treatment of depression in adolescents and young adults. Pediatrics 138 (6), e20161878. https://doi.org/10.1542/peds.2016-1878.

Nylund, K.L., Asparouhov, T., Muthén, B.O., 2007. Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. Struct. Equ. Model. 14, 535–569. https://doi.org/10.1080/10705510701575396.

Patel, V., Flisher, A.J., Hetrick, S., McGorry, P., 2007. Mental health of young people: a global public-health challenge. Lancet 369, 1302–1313. https://doi.org/10.1016/S0140-6736(07)60368-7.

Patton, G.C., Coffey, C., Romaniuk, H., Mackinnon, A., Carlin, J.B., Degenhardt, L., Olsson, C.A., Moran, P., 2014. The prognosis of common mental disorders in adolescents: a 14-year prospective cohort study. Lancet 19, 1404–1411. https://doi.org/10.1016/S0140-6736(13)62116-9.

Rumpf, H.J., Meyer, C., Hapke, U., John, U., 2001. Screening for mental health: validity of the MHI-5 using DSM-IV Axis I psychiatric disorders as gold standard. Psychiatry Res. 105, 243–253. https://doi.org/10.1016/s0165-1781(01)00329-8.

Scherpenzeel, A., Das, M., 2011. True longitudinal and probability-based internet panels: evidence from the Netherlands. In: Das, M., Ester, P., Kaczmirek, L. (Eds.), Social and Behavioral Research and the Internet: Advances in Applied Methods and Research Strategies. Taylor & Francis, Boca Raton, FL, pp. 77–104.

Schoot, R.van de, Sijbrandij, M., Winter, S.D., Depaoli, S., Vermunt, J.K., 2017. The GRoLTS-Checklist: guidelines for reporting on latent trajectory studies. Struct. Equ. Model. 24, 451–467. https://doi.org/10.1080/10705511.2016.1247646.

Simon, J.G., de Boer, J.B., Joung, I.M., Bosma, H., Mackenbach, J.P., 2005. How is your health in general? A qualitative study on self-assessed health. Eur. J. Public Health 15, 200–208. https://doi.org/10.1093/eurpub/cki102.

Tein, J., Coxe, S., Cham, H., 2013. Statistical power to detect the correct number of classes in latent profile analysis. Struct. Equ. Model. 20, 640–657. https://doi.org/10.1080/10705511.2013.824781.

Twenge, J.M., Joiner, T.E., Rogers, M.L., Martin, G.N., 2018. Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. Clin. Psychol. Sci. 6, 3–17. https://doi.org/10.1177/2167702617723376.

Velde, S.van de, Boyd, A., Villagut, G., Alonso, J., Bruffaerts, R., Graaf, R.de, Florescu, s., Haro, j., Kovess-Masfetyet, V., 2018. Gender differences in common mental disorders: a comparison of social risk factors across four European welfare regimes. Eur. J. Public Health 29, 48–487. https://doi.org/10.1093/eurpub/cky240.

Vermunt, J.K., Magidson, J., 2013. Latent GOLD 5.0 Upgrade Manual. Statistical Innovations Inc., Belmont, MA.

Vollebergh, W.A.M., Iedema, J., Bijl, R.V., Graaf, R.de, Smit, F., Ormel, J., 2001. The structure and stability of common mental disorders: the Nemesis-study. Arch. Gen. Psychiatry 58, 597–603. https://doi.org/10.1001/archpsyc.58.6.597.

Ware, J.E., Sherbourne, C.D., 1992. The MOS 36-item short-form health survey, SF-36: conceptual framework and item selection. Med. Care 30, 473–483.