Promoting physical, mental, and social well-being of adolescents and young adults

Suzanne J. van den Toren

PROMOTING PHYSICAL, MENTAL, AND SOCIAL WELL-BEING OF ADOLESCENTS AND YOUNG ADULTS

Suzanne J. van den Toren

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of Adolescents and Young Adults

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van adolescenten en jongvolwassenen

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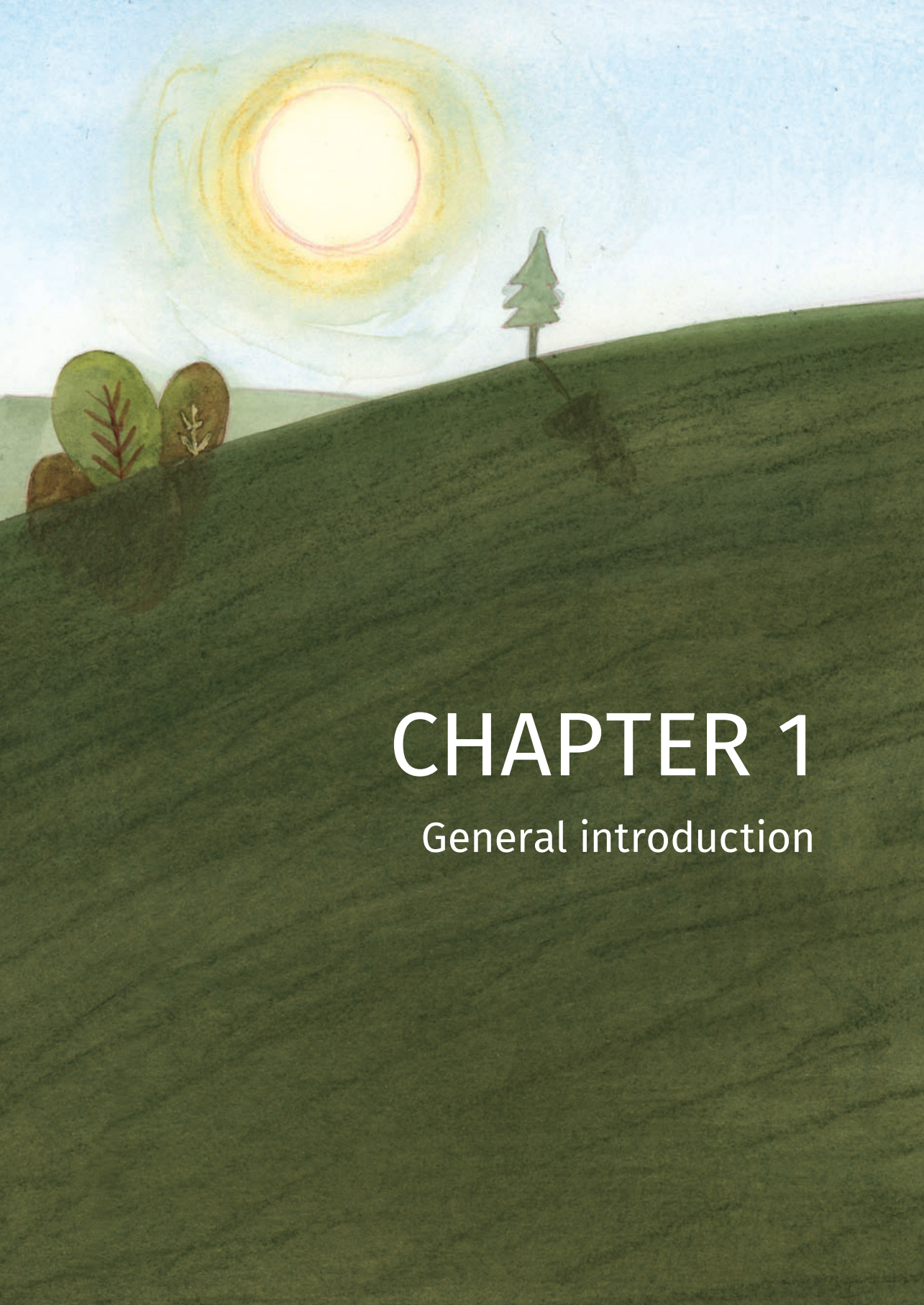
CONTENTS

Chapter 1	General introduction	8
Part I	***Well-being and risk behaviors of adolescents and young adults***	
Chapter 2	School absenteeism, health-related quality of life (HRQOL) and happiness among young adults aged 16-26 years	28
Chapter 3	Young adults' self-sufficiency in daily life: the relationship with contextual factors and health indicators	46
Chapter 4	Associations of social-demographic characteristics, well-being, school absenteeism, and substance use with recreational nitrous oxide use among adolescents: a cross-sectional study	70
Part II	***Promotion of health behaviors among adolescents and young adults***	
Chapter 5	Addressing sickness absence among adolescents and young adults: an evaluation of the Medical Advice for Sick-reported Students intervention	90
Chapter 6	Adolescents' views on seeking help for emotional and behavioral problems: a focus group study	118
Chapter 7	General discussion	140
Appendices	Summary	160
	Samenvatting	163
	List of publications	167
	About the author	169
	PhD portfolio	171
	Dankwoord	173



CHAPTER 1

General introduction

The World Health Organization defined health as *"a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"* [1]. Huber et al. defined health as "*the ability to adapt and to self-manage in the face of physical, emotional, and social challenges in life*" [2]. The process of enabling people to increase control over, and to improve their health is considered health promotion [3]. Health promotion during adolescence and young adulthood can lay the foundation of good health in adulthood [4 5]. It can take place in the form of developing, evaluating, and implementing interventions focused on addressing health risk behaviors, or on promoting mental health, educational attainment, and help-seeking behavior [3-5]. In this regard, interventions focusing on the school environment have certain advantages, such as the high probability of reaching many adolescents and young adults, and the possiblity of integrating intervention activities in the educational curriculum of schools [6].

Health risk behaviors

Health risk behaviors, such as smoking and alcohol drinking, pose a threat to adolescents' and young adults' well-being. For example, chronic marijuana use in adolescence is associated with physical and mental health problems in young adulthood [7].

Health risk behaviors may have their onset in adolescence [8 9]. This can be illustrated with the results of the Health Behavior in School-aged Children (HBSC) study [10]. This study consists of a cross-national survey conducted every four years focused on the health of adolescents aged 12-16 years. Participants from 50 countries fill out questionnaires regarding their health, health risk behaviors and lifestyle. Findings of the year 2017/2018 showed that adolescents' lifetime alcohol consumption increased between the ages of 11 and 15 from 19% to 60% for boys and from 10% to 59% for girls. Furthermore, 15% of 15-year-olds reported to have been smoking in the past 30 days and 13% of 15-year-olds reported lifetime cannabis use [11].

A Dutch national survey from 2017 showed that 17% of 16-year-olds had used nitrous oxide (i.e. laughing gas, N_2O) ever in their life [8]. In the short term, substance use such as nitrous oxide can cause loss of consciousness [12]. Especially in the developing brain of adolescents, substance use, such as cannabis use and alcohol drinking, may negatively impact cognitive functioning, intelligence, and working memory in the long term [13 14]. A review has demonstrated that successful health promotion by reducing health risk behaviors can take place. School-based alcohol prevention interventions including features such as personalized feedback, goal setting, and identification of risky situations

were observed to reduce the frequency of alcohol drinking [15]. To aid Youth Health Care professionals in preventing health risk behaviors among adolescents, this thesis reports on a study focused on sociodemographic and psychosocial factors potentially associated with the recreational use of nitrous oxide among adolescents.

Mental well-being and school absenteeism

Findings from the HSBC study in 2017/2018 also showed that, compared to the findings in 2013/2014, fewer adolescents liked school and the pressure to perform well academically had increased [11]. The high level of perceived academic pressure was negatively associated with adolescents' satisfaction in life. Furthermore, adolescents reported declining mental well-being with increasing age [11]. An overview of systematic reviews demonstrated that mental health in adolescence could be promoted; for example, school-based interventions applying cognitive behavioral therapy have shown to reduce depressive symptoms and anxiety [15].

School absenteeism is also associated with the well-being of adolescents and young adults. School absenteeism can be divided into excused absence (e.g. sickness absence) and unexcused absence (e.g. truancy) [16]. In the short term, school absenteeism due to health issues or truancy may be associated with lower educational performance, physical complaints and psychosocial problems [17-22]. In the long term, it may be associated with dropping out of school [16 23 24], which in turn may negatively affect labor force participation, earnings, and health in later life [16 18 25 26].

Health-related quality of life (HRQOL) is a subjective and multidimensional measure of physical and mental well-being related to health [27]. Previous studies focusing on HRQOL in adolescents and young adults showed associations with fitness and sleep quality and revealed decreased HRQOL for 16–23 years olds compared to 13–15 year olds [28 29]. In this thesis, the association between school absenteeism and HRQOL was studied to provide a broader overview of the health status of absent adolescents and young adults.

The number of days absent from school has been reported to increase with age during adolescence [8]. The prevalence of school absenteeism varies among and within countries. In the United States 11% of youth was reported truanting in the past month, while prevalence rates ranging between 7%–42% of youth truanting in the past two weeks have been reported among 24 European countries [30 31]. In a national survey in the Netherlands among 16-year-olds, 40% reported sick one day in the past month, and 15% reported sick at least three days in the past month [9].

Interventions to detect school absenteeism on time and offering appropriate support to adolescents might increase chances for educational performance and attainment among adolescents and young adults. In this thesis, we evaluated a school-based intervention focused on sickness absence among adolescents and young adults.

Self-sufficiency during the transition from adolescence to adulthood

During the transition from adolescence to adulthood, several changes occur that may challenge adolescents' and young adults' well-being. This transition is typically defined as a separate phase of emerging adulthood, a stage between adolescence and adulthood. This stage has been described in Western countries [32-34] and is marked with several changes. Adolescents transfer from lower secondary school to upper secondary education or the labor market. In addition, a transition occurs from dependence on parents to more autonomy and financial independence. In the field of health and lifestyle, adolescents transfer from Youth Health Care to adult health services. All these changes in a young adults' life may result in a gap between the (health care) needs and the provision of care [25 35 36]. Moreover, the transition induces challenges for adolescents in different life areas, e.g. finances, education and employment, leisure time activities, and physical and mental health behaviors [36-40]. These challenges might account for an increase in mental health problems and an increase in behaviors risky to health (e.g. binge drinking, smoking, and being physically inactive) [36 38 41 42].

Adolescents who are self-sufficient are more likely to have a successful transition to adulthood [43 44]. Self-sufficiency is defined as the ability of individuals to attain an acceptable level of functioning regarding specific life-domains, such as daytime activities and social support [44]. This ability could either be achieved by the person him/herself or by adequately organizing help from formal or informal care providers [44].

To aid adolescents in a smooth transition to adulthood, this thesis studies contextual factors and indicators of health status as possible factors associated with self-sufficiency in the transition from adolescence to young adulthood.

Help-seeking behavior

Several studies have indicated that support from family, friends or school can function as a protective factor against stress or difficult issues in adolescence and young adulthood [45-49]. Therefore, it is important to aid adolescents and young adults in their ability to seek this support if this is needed. Help-seeking is defined as the behavior

of actively seeking help by communicating with informal (e.g. family and friends) and formal (e.g. professionals with a recognized role and appropriate training in providing help and advice) sources, to obtain help in terms of understanding, advice, information, treatment, and general support in response to problems or distressing experiences [50]. In a study on the perceived benefits of seeking help for mental health problems among university students, the participating students reported reduced feelings of stress, improved mental functioning, and the resolution of one's problem as the main perceived benefits of seeking help [46].

In general, help-seeking plays an important role in maintaining healthy adolescents and young adults, therefore, this thesis elaborates on seeking help for emotional and behavioral problems among adolescents.

THIS THESIS

Planned health education and promotion

This thesis is guided by the model for planned health education and promotion (Figure 1) [51]. This model contains multiple steps for health promotion planning. The first step concerns analysis of health and quality of life. Step 2 continues with an analysis of behavior and environmental risk factors. In step 3, the determinants of risk behaviors are analyzed. An intervention mapping approach is advocated in step 4, where the outcomes of the first three steps are integrated into a comprehensive intervention package. This intervention package is implemented and disseminated in step 5. Continuous evaluation of all the steps is needed to further improve health education and promotion.

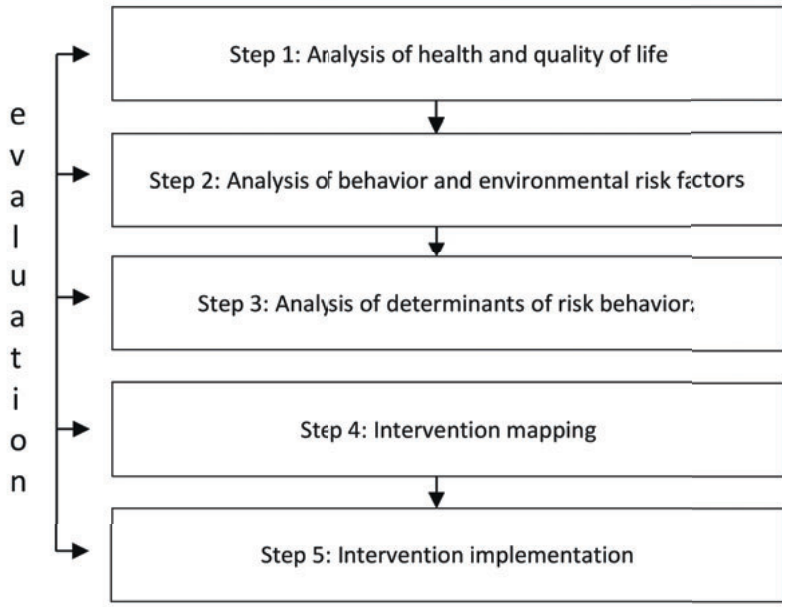


Figure 1. Model for planned health education and promotion [51].

In the first part of this thesis, there is a focus on evaluation and analysis of health and quality of life (chapter 2), of self-sufficient daily functioning (chapter 3) and of the recreational use of nitrous oxide (i.e. laughing gas) as a risk behavior (chapter 4) (i.e. step 1, 2, and 3 of the model). In the second part of this thesis, there is a focus on evaluation and analysis of health promotion in the form of intervention evaluation (chapter 5) and analysis of help-seeking behavior (chapter 6) (i.e. step 4 and 5 of the model).

The studies in this thesis included adolescents and young adults with ages from 13 years through 26 years.

The aim of this thesis is to contribute to promoting physical, mental, and social well-being of adolescents and young adults.

The following research questions are addressed:

Part I: Well-being and risk behaviors of adolescents and young adults

- What is the association of absence from school with health-related quality of life (HRQOL) and happiness among young adults aged 16-26 years? (chapter 2)

- To what extent are contextual factors and indicators of health status associated with self-sufficiency of young adults aged 16-26 years? (chapter 3)
- Which factors are associated with recreational nitrous oxide use among adolescents? (chapter 4)

Part II: Promotion of health behaviors among adolescents and young adults

- What are the effects of a school-based intervention, primarily on addressing sickness absence, education fit, school performance, and secondarily on addressing seven health indicators among young adults aged 16-26 years? (chapter 5)
- What are adolescents' views on seeking help for emotional and behavioral problems? (chapter 6)

Studies and data used in this thesis

In this thesis, we utilized data from two studies. A brief description of each study is presented below.

MASS at intermediate vocational education

The Medical Advice for Sick-reported Students (MASS) intervention is a proactive school-based intervention with a focus on addressing sickness absence and associated indicators of health among students. Activities of the MASS intervention focus at the individual level (i.e. the student) and at the school level (i.e. school staff and policy) [52] [53]. The individual-level activities entail a systematic 5-step route, including a proactive approach by school personnel on the day of the first sickness report and referring to a consultation with a Youth Health Care professional (i.e. a Youth Health Care physician) if this is deemed necessary (due to continued or increased sickness absence or if the students requests this). The school-level activities entail agreements at policy level on how to actively monitor students' absence.

The MASS intervention has been implemented at lower secondary education among students aged 12 to 16 years [54]. The intervention was then adapted to intermediate vocational education, which is a form of upper secondary education with four levels, offering specialized job-oriented programs for students aged 16 years and older [55] [56].

Since students from intermediate vocational education are older and education is no longer compulsory for many students, they can report themselves sick, as opposed to parents reporting them sick. Therefore, in the adapted intervention, the school

attendance officer is less involved. Also, intermediate vocational education students have indicated to receive little attention from their school when reporting sick, which made it easier for them to report sick [57]. These circumstances increase the importance for intermediate vocational education schools to define actions for preventing sickness absence in their school policy. A study was initiated to evaluate MASS at intermediate vocational education and the results are presented in this thesis.

The MASS intervention evaluation was conducted among adolescents and young adults aged 16-26 years attending intermediate vocational education. More details on the evaluation of MASS at intermediate vocational education have been published by Van der Vlis et al. [52].

In short, a total of ten intermediate vocational education school locations participated; eight locations that implemented MASS were included as intervention schools and two locations that offered care as usual were included as control schools. Students in both control and intervention schools filled out a questionnaire at baseline and six months post-baseline. They answered questions regarding socio-demographic characteristics, health and health behavior. At baseline, both students with and without sickness absence were included (n=758). Students with sickness absence at intervention schools received the MASS intervention and students with sickness absence at control schools received care as usual. At six-month follow-up, only students with sickness absence at baseline (n=508) were invited to participate. Chapters 2, 3, and 5 reported on data collected with the MASS intervention evaluation.

The additional preventive health consultation for adolescents

The Dutch preventive Youth Health Care offers anticipatory guidance to parents, children and youth to promote and monitor growth, development, and health, and to prevent diseases. This guidance is provided by specialized physicians and nurses who work in teams and is offered free of charge [58 59].

Activities of the Youth Health Care consist of providing vaccinations, advising and informing on healthy lifestyle, and monitoring growth by measuring height and weight. If treatment or specialized care is needed, Youth Health Care professionals may refer to other health care providers, most often the general practitioner [58 59].

As of 2013, a specific focus for the Youth Health Care is the so called ‘additional preventive health consultation for adolescents’. The goal of this consultation is

to promote a healthy lifestyle, to empower adolescents and to prevent health risk behaviors, with structural attention for topics such as overweight, school absenteeism, mental health, resilience, and drug use. The additional health consultation consists of a package of possible modules, which may include group intervention, peer education, e-coaching, self-report questionnaires in combination with a consultation, contact through social media, e-health, and gamification. Each Youth Health Care organization executes one or more modules in close collaboration with secondary schools and the municipality in their region to promote health and a healthy lifestyle among adolescents. The choice for which modules are implemented may depend on education level and/or region-specific trends regarding the health of adolescents, such as the amount of sickness absence in a specific region or school. The additional health consultation for adolescents is in general organized in close collaboration with secondary schools and embedded in local prevention and health care systems [54 60-62].

The study on the additional preventive health consultation for adolescents was conducted among adolescents in the third and fourth year of secondary school (the age of these adolescents: circa 15-16 years) [59 62]. The study consisted of several components, such as questionnaires and focus groups among participating adolescents. The questionnaires contained questions about socio-demographic characteristics, health and health behavior. Focus groups were conducted to explore adolescents' perspectives on the additional consultation and adolescents' views on seeking help for emotional and behavioral problems. Chapters 4 and 6 reported on data collected with the study on the additional preventive health consultation for adolescents.

Outline of this thesis

The current thesis provides an overview of five studies that are divided into two overarching parts (see Table 1), guided by the model for planned health education and promotion.

Part I of this thesis consists of studies about well-being and risk behaviors of adolescents and young adults. In **chapter 2**, the association of school absenteeism with HRQOL and happiness is studied among young adults aged 16-26 years who attend intermediate vocational education. In **chapter 3**, the association of self-sufficient functioning in daily life with contextual factors and indicators of health status among young adults aged 16-26 years who attend intermediate vocational education is studied. In **chapter 4**, the recreational use of nitrous oxide is studied among adolescents aged 14-18 years.

Lifetime nitrous oxide use is considered, as well as potentially associated factors: socio-demographic characteristics, well-being, school absenteeism, and substance use.

Part II of this thesis consists of studies focused on the promotion of health behaviors among adolescents and young adults, by evaluating the MASS intervention and by exploring adolescents' help-seeking behavior. **Chapter 5** is an evaluation of the MASS intervention among young adults aged 16-26 years. Primary outcomes were sickness absence from school, education fit, and school performance, and secondary outcomes were seven health indicators. **Chapter 6** is focused on adolescents' views on seeking help for emotional and behavioral problems.

Finally, **chapter 7** provides a general discussion where the results of this thesis are summarized and interpreted. Strengths and limitations of the presented studies are discussed, recommendations for future research are made, and implications for policy and practice are given.

Table 1. Overview of the studies presented in this thesis.

Chapter	Data source	Study design	Population for analysis	Sample	Research focus
Part I: Well-being and risk behaviors of adolescents and young adults					
2	The MASS study[a]	Cross-sectional	n=679	Young adults aged 16-26 years	School absenteeism, health-related quality of life and happiness
3	The MASS study[a]	Cross-sectional and longitudinal	T0 n=755 T1 n=200	Young adults aged 16-26 years	Self-sufficient functioning in daily life, contextual factors and indicators of health status
4	The additional preventive health consultation for adolescents study	Cross-sectional	n=555	Adolescents aged 14-18 years	Nitrous oxide use, biological factors and social cultural factors, psychological factors and health, and behavioral factors
Part II: Promotion of health behaviors among adolescents and young adults					
5	The MASS study[a]	A controlled before-and-after study	n=200	Young adults aged 16-26 years	Outcome and process indicators of the MASS intervention
6	The additional preventive health consultation for adolescents study	A focus group study	n=71	Adolescents aged 13-18 years	Seeking help for emotional and behavioral problems

[a] MASS is the abbreviation for Medical-Advice for Sick-reported Students.

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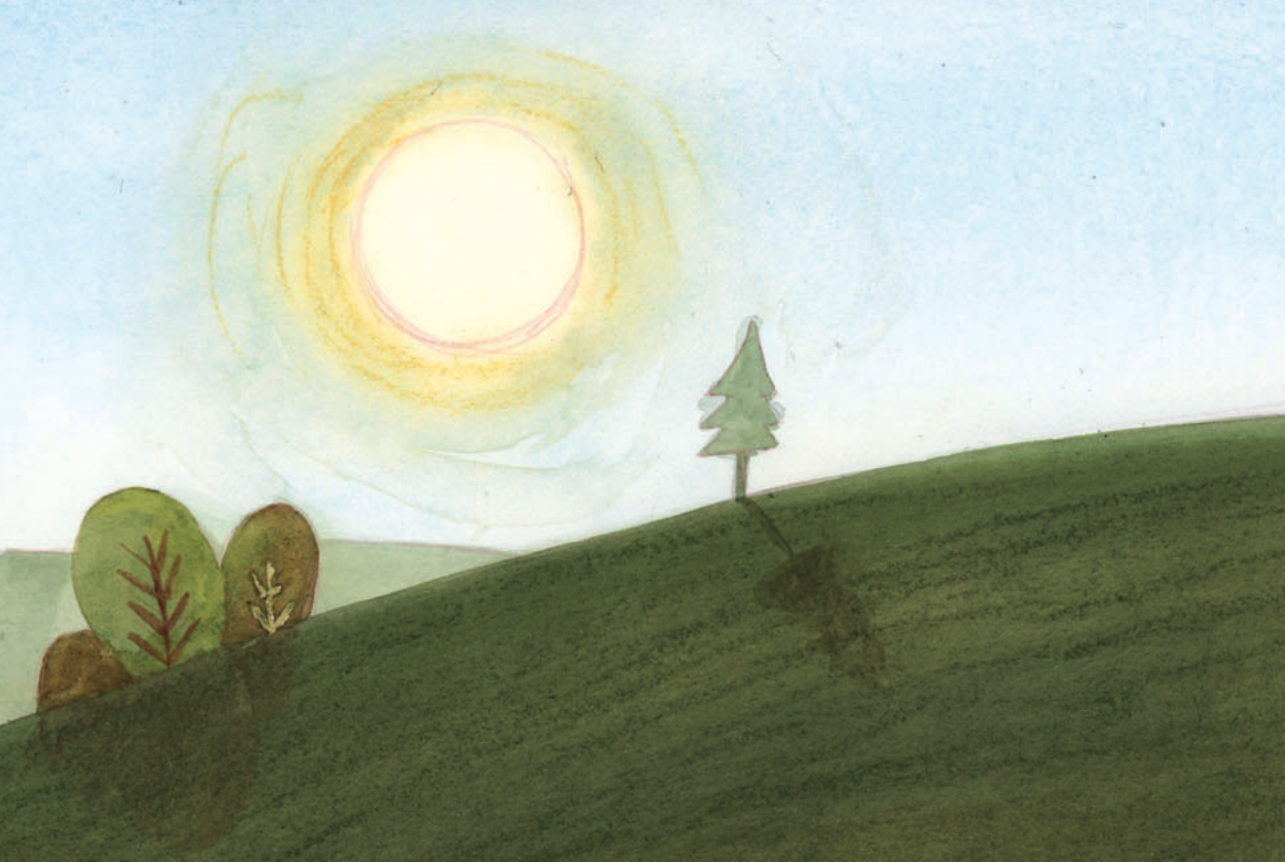
PART I

Well-being and risk behaviors of adolescents and young adults



CHAPTER 2

School absenteeism, health-related quality of life (HRQOL) and happiness among young adults aged 16–26 years

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ABSTRACT

Purpose

This study examines the association between school absenteeism, health-related quality of life (HRQOL), and happiness among young adults aged 16–26 years attending intermediate vocational education.

Methods

Cross-sectional data from a survey of 676 young adults were analyzed. School absenteeism was measured by the self-reported number of sick days in the past eight weeks and hours of truancy in the past four weeks. HRQOL was measured by the 12-item Short Form Health Survey; physical and mental component summary scores were calculated. General happiness was assessed on a scale of 0–10, higher scores indicating greater happiness. Linear regression analyses were performed.

Results

The study population had a mean age of 18.5 years (SD=2.2); 26.1% were boys. Young adults with ≥5 sick days or ≥6 hours of truancy reported lower mental HRQOL compared to young adults without sickness absence or truancy (p<0.05). Young adults with 1–4 and ≥5 sick days reported lower physical HRQOL compared to young adults who had not reported to be sick (p<0.05). Young adults with 1–5 hours and ≥6 hours of truancy reported higher physical HRQOL compared to young adults who were not truant (p<0.05). No associations were observed between school absenteeism and happiness (p>0.05).

Conclusion

Lower self-reported mental HRQOL was observed among young adults with more school absenteeism due to sickness or truancy. Sickness absence was additionally associated with lower physical HRQOL.

INTRODUCTION

Improving mental and physical well-being of young adults is of great importance to public health. Previous research reported an increase in the prevalence of major depressive episodes over a ten-year period among 18–24 year olds [1]. Between adolescence and young adulthood, an increase in smoking and binge drinking is demonstrated [2]. Furthermore, a study found more school absenteeism in older youth (15–17 years) compared to younger youth (12–14 years) [3]. These increases in major depressive episodes, risk (health) behaviors, and school absenteeism seem to intertwine, since depression and risky health behaviors, such as tobacco use, alcohol use, and risky sexual behaviors, are found to be associated with school absenteeism [3-7] and are clustering together [8]. It is unclear whether school absenteeism is associated with poorer health-related quality of life or with happiness. Health-related quality of life (HRQOL) is a subjective and multidimensional measure of physical functioning and well-being related to health, incorporating satisfaction with physical, social, and occupational functioning, as well as vitality and psychological state of mind [9 10]. Previous studies on HRQOL in adolescents and young adults found associations with fitness and sleep quality and revealed decreased HRQOL for 16–23 years olds compared to 13–15 year olds [11 12]. Furthermore, happiness is conceptualized as both pleasure or satisfaction and the avoidance of suffering, as well as having a purpose in life. Multiple factors contribute to happiness, such as education, time use, and activities [13]. To our knowledge, the association between school absenteeism and HRQOL or happiness has not been studied.

School absenteeism is divided into excused absence (e.g. sickness absence) and unexcused absence (e.g. truancy) [6]. The prevalence of school absenteeism varies greatly among and within countries. Studies reported 11% of youth truanting in the United States in the past month and 7%–42% of youth truanting in 24 European countries in the past two weeks. In The Netherlands, 13% of youth displayed truancy in the past month and 15% reported sick at least three days in the past month [14-18].

In the short term, school absenteeism due to health issues or truancy is associated with lower educational performance, physical complaints, and psychosocial problems [3 19-23]. A main long-term consequence is early school leaving [6 24 25]. Youth at intermediate vocational education (i.e. education where vocational/job oriented training is offered to students) have an especially increased risk for school dropout or early school leaving; in The Netherlands in the school years 2016/2017 and 2017/2018, more than 75% of early

school leaving occurred in intermediate vocational education [26]. Early school leavers are students up until the age of 23 who leave education and training without completing upper secondary education or an equivalent (i.e. attaining a basic education qualification for successfully entering the labor market) [27 28]. These non-qualified students are in a more vulnerable situation compared to peers who do obtain this qualification in terms of receiving welfare, lower earnings, and reduced health [3 6 29]. Studying the association between school attendance and students' well-being is important to support preventive intervention programs in motivating young adults to stay in school.

This study evaluates whether and how school absenteeism is associated with mental and physical HRQOL and happiness among young adults attending intermediate vocational education. The hypotheses are that young adults who are absent from school, either excused or unexcused, have lower mental and physical HRQOL and report lower rates of happiness.

METHODS

Study design

For this study, baseline data from the Medical Advice for Sick-reported Students (MASS) intervention study were used [30].

The Medical Ethics Committee of the Erasmus University Medical Centre Rotterdam reviewed the research proposal and declared that the Dutch Medical Research Involving Human Subjects Act (in Dutch: Wet medisch-wetenschappelijk onderzoek met mensen) did not apply. They issued a declaration of no objection to conduct this study and gave permission to submit the results for publication in a scientific journal in the future (proposal number MEC-2015-614).

Setting and study population

This study included Youth Health Care providers that also provide preventive health care to students from intermediate vocational education. A total of 22 schools were contacted about the possibility to participate in the study. Ten intermediate vocational education schools in the Dutch regions of Amsterdam, West-Brabant, Utrecht, and Rotterdam participated in this study. The remaining twelve schools did not have the possibility to participate because of the time investment of the research (n = 9), other priorities (n = 2), and non-response (n = 1). Finally, ten schools participated in the study.

Participants were students aged 16–26 years attending intermediate vocational education level one to four. The included educations were media manager/developer, assistant care, trade, interior design, nursing, and technician studies (see Table 1 for detailed demographic information about the participants). Two sampling methods were used to invite students. In the first method, a selective sample was taken by an appointed coordinator or researcher. The coordinator or researcher selected students through the school sickness register. Students reporting sick at least four times in twelve weeks or more than six consecutive school days were selected. In the second method, a broader school sample was invited. Random classes were selected to participate. With this method, no selection was done based on sickness absence (see Figure 1).

Students and parents of students under 18 years of age were informed about the study through an information letter and leaflet with the informed consent form and questionnaire attached. These documents explained the aim of the study and the content of the questionnaire and included contact information of the researchers. An appointed coordinator from the participating schools sent the documents to the students and parents. Parents could object to having their child participate in the study by sending an objection letter to the school. The students were asked to provide written informed consent prior to filling out the questionnaire. The appointed coordinator collected all completed questionnaires and sent them to the researchers.

In total, 758 students provided written informed consent. For this study, we excluded students with missing information on self-reported sickness absence (n=51) and on the composite scores of the HRQOL measure (n=24). Twelve students gave conflicting answers on questions about their sickness absence (i.e., non-medical reasons for the absence, such as a wedding or sick family members (n=12)) and three students were above the age of 26 and were excluded to limit the age range from 16–26 years (n=3). Some overlap existed in the exclusion, leaving a study population of 676 participants (see Figure 1).

Measurements

The questionnaire contained the following topics: socio-demographic characteristics, school absenteeism, HRQOL, and happiness.

Socio-demographic characteristics of the students included age, gender, country of birth, living situation (e.g. living at home with caretaker), level of intermediate vocational

education ranging from level one to four with one being the lowest and four being the highest level, and debts (i.e. none, <500 and >500 euro)

Questions used by various national health monitors were used to measure school absenteeism [14 31]. These questions measured the duration and incidence of sickness absence in the past eight weeks as well as the reasons for sickness absence. Truancy was assessed by the question: "Have you been truanting in the past four weeks?" Response categories ranged from one (no hours) to six (more than 20 hours). For analysis purposes, sickness absence was divided into three categories corresponding to the definition of chronic absence (i.e. missing 10% of school days) [32]: never, one to four days, and more than four days. Truancy was also divided into three categories: never, one to five hours, and more than five hours.

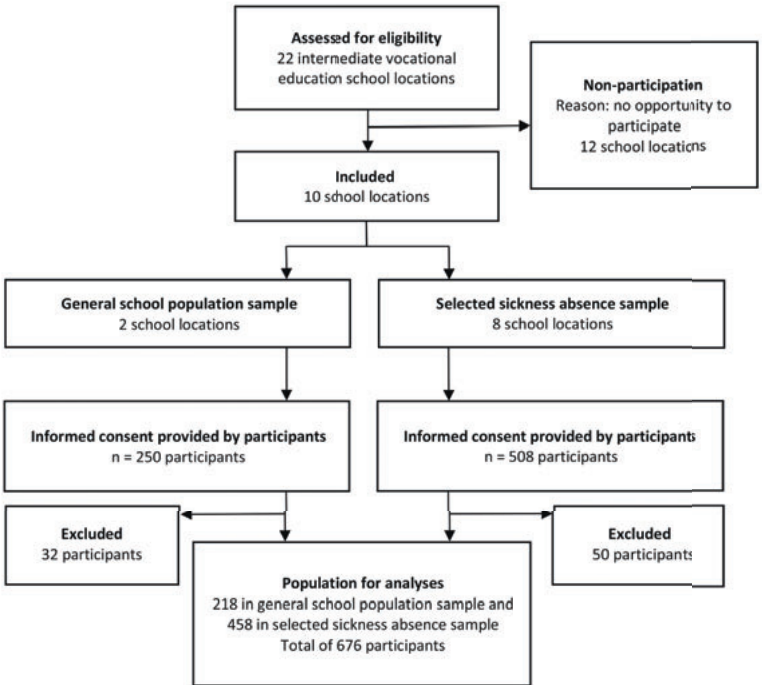

Figure 1. Flowchart of the participants in this study.

The 12-item Short Form Health Survey (SF-12) was used to measure self-perceived mental and physical HRQOL [33]. The SF-12 includes 12 items regarding eight scales: physical functioning, role limitations due to physical problems, bodily pain, general

health, vitality, social functioning, role limitation due to emotional problems, and perceived mental health. Some items were recoded in order to have higher scores corresponding to better HRQOL. The raw score of each scale was transformed into 0 (the worst) to 100 (the best) before we calculated the raw Physical Component Summary (PCS-12) score and the raw Mental Component Summary (MCS-12) score. Finally, the raw PCS-12 and MCS-12 scores were transformed into the standard scores based on the normalized algorithms from the United States general population with the mean value of 50 and the standard deviation of 10. The SF-12 has been reported to have good reliability and validity [33 34].

Happiness was assessed with a single item: "Do you feel happy in general? Give an estimate of how you feel in general (so not how you feel at this moment)." Students could answer with a grade range of 0–10, with 10 being the happiest [35].

Data analysis

Descriptive statistics were used to describe the characteristics of the participants. Chi-square tests and one-way analysis of variance were conducted to compare students with 1–4 absent days and more than four absent days to students without sickness absence in the past eight weeks.

To examine the association of school absenteeism and socio-demographic characteristics with mental and physical HRQOL and happiness, general linear regression models were fitted for each outcome measure. First, associations were tested for school absenteeism with mental HRQOL, physical HRQOL, and happiness (crude model). In the next model, socio-demographic variables (age, gender, education level, country of birth, and debts) were added to the crude model as confounders (adjusted model). Additionally, interaction effects were explored between school absenteeism and socio-demographic characteristics (age, gender, education level, country of birth, and debts) for each outcome [3 11]. After applying the Bonferroni correction for multiple testing (p=0.05/15 = 0.003), no statistically significant interaction was found.

The intraclass correlation was checked due to data collection within schools as part of the MASS study. The highest intraclass correlation was observed for mental HRQOL (ICC=0.09); therefore, we did not apply multilevel analysis.

Missing data analysis were performed by comparing students who were excluded from analysis due to missing data (n=82) with included students (n=676). Excluded students were significantly older (p=0.03) and less often attended education level four (p=0.02).

All analyses were performed using SPSS version 25 for Windows (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0, IBM Corp., Armonk, NY, USA).

RESULTS

Participant characteristics

Table 1 shows the outcomes for school absenteeism, socio-demographic characteristics, HRQOL, and happiness for three groups of sickness absence. Students were on average 18.6 years old (range 16–26), 73.8% were female and 92.1% were born in the Netherlands.

Table 1. General characteristics, HRQOL and happiness of the participants (N=676).

	Total (N = 676)	**0 days of sickness (n = 115)**	**1–4 days of sickness absence (n = 275)**	**≥5 days of sickness absence (n = 286)**	***p*-value**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
School absenteeism					**.000**
Number of sick days in past 8 weeks	5.4 (6.3)	0 (0.0)	2.5 (1.1)	10.3 (7.1)	
	n (%)	n (%)	n (%)	n (%)	
Truancy in past 4 weeks					**.005**
Never	411 (60.9)	85 (73.9)	161 (58.8)	165 (57.7)	
1–5 hours	197 (29.2)	17 (14.8)	84 (30.6)	96 (33.6)	
≥6 hours	67 (9.9)	13 (11.3)	29 (10.6)	25 (8.7)	
Age in years					.527
Mean (SD)	18.5 (2.1)	18.5 (2.2)	18.5 (2.0)	18.6 (2.1)	
	n (%)	n (%)	n (%)	n (%)	
Gender					.088
Boys	176 (26.1)	26 (22.8)	63 (22.9)	87 (30.4)	
Girls	499 (73.9)	88 (77.2)	212 (77.1)	199 (69.6)	
Country of birth					.108
The Netherlands	617 (92.1)	100 (87.7)	250 (91.9)	267 (94.0)	
Other	53 (7.9)	14 (12.3)	22 (8.1)	17 (6.0)	
Living situation					.064
At home with parents/caretakers	597 (88.3)	108 (93.9)	244 (88.7)	245 (85.7)	
Not at home with parents/caretakers	79 (11.7)	7 (6.1)	31 (11.3)	41 (14.3)	

Table 1. Continued

	Total (*N* = 676)	0 days of sickness (*n* = 115)	1–4 days of sickness absence (*n* = 275)	≥5 days of sickness absence (*n* = 286)	*p*-value
Intermediate vocational education level					**.004**
Starting level and level 1	47 (7.2)	4 (3.6)	18 (6.8)	25 (9.1)	
Level 2	86 (13.2)	25 (22.7)	40 (15.0)	21 (7.6)	
Level 3	81 (12.4)	12 (10.9)	31 (11.7)	39 (13.8)	
Level 4	437 (67.1)	69 (62.7)	177 (66.5)	191 (69.5)	
Debts					.101
None	543 (81.8)	95 (85.6)	229 (84.5)	219 (77.7)	
<500 euro	50 (7.5)	4 (3.6)	17 (6.3)	29 (10.3)	
>500 euro	71 (10.7)	12 (10.8)	25 (9.2)	34 (12.1)	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
SF-12/HRQOL					**.000**
Mental health composite	45.8(12.8)	48.1 (11.1)	47. 8 (11.5)	42.9 (14.1)	
Physical health composite	50.8 (9.3)	54.1 (6.0)	52.1 (8.1)	48.3 (10.7)	
Grade for happiness (range 0–10)					**.015**
Mean (SD)	7.2 (1.6)	7.4 (1.9)	7.3 (1.5)	7.0 (1.6)	

Note: bold *p*-values indicate significant differences between sickness groups.

Mental HRQOL

The crude model in Table 2 shows the association between school absenteeism and mental HRQOL without controlling for potential confounders. The participants with more than four days of sickness absence in the past eight weeks had a significantly lower mental HRQOL compared to participants without sickness absence in the past eight weeks (β=-5.13, 95% CI=-8.84; -1.42, *p*=0.007). Participants with more than five hours of truancy in the past four weeks had a significantly lower mental HRQOL compared to participants who did not truant in the past four weeks (β=-4.70, 95% CI=-8.14; -1.26, *p*=0.007). In the adjusted model, the negative associations between school absenteeism and mental HRQOL remained (β=-5.14, 95% CI=-8.02; -2.25, *p*=0.001 for more than four days of sickness absence and β=-3.84, 95% CI=-7.22; -0.47, *p*=0.026 for more than five hours of truancy).

Table 2. Results from the multivariable general linear models evaluating the association of school absenteeism with mental HRQOL.

	SF-12 Mental Component Summary					
	Crude model			Adjusted model		
	β	(95% CI)	*p*-value	β	(95% CI)	*p*-value
School absenteeism						
Number of sick days in past 8 weeks						
Never	Ref.			Ref.		
1–4 days	–0.06	(–3.73; 3.62)	.976	–0.34	(–3.19; 2.52)	.818
≥5 days	**–5.13**	**(–8.84; –1.42)**	**.007**	**–5.14**	**(–8.02; –2.25)**	**.001**
Truancy in past 4 weeks						
Never	Ref.			Ref.		
1–5 hours	–0.05	(–2.72; 2.61)	.968	1.31	(–0.92; 3.55)	.249
≥6 hours	**–4.70**	**(–8.14; –1.26)**	**.007**	**–3.84**	**(–7.22; –0.47)**	**.026**

Note*:* bold numbers indicate significant *p*-values.
Crude model: School absenteeism associated with mental HRQOL.

Adjusted model: school absenteeism associated with mental HRQOL controlled for socio-demographic characteristics as possible confounders (age, gender, country of birth, living situation, education level and debts).

Physical HRQOL

The crude model in Table 3 assesses the association between school absenteeism and physical HRQOL and shows that participants with more than four days of sickness absence in the past eight weeks had a significantly lower physical HRQOL compared to participants without sickness absence (β=-5.87, 95% CI=-8.49; -3.25, $p<0.001$). In the adjusted model, participants with one to four days and more than four days of sickness absence in the past eight weeks had a lower physical HRQOL (β=-2.70, 95% CI=-4.74; -0.66, $p=0.010$ and β=-6.86, 95% CI=−8.93; -4.80, $p<0.001$) when compared to participants without sickness absence. Concurrently, participants with one to five hours and more than five hours of truancy had a higher physical HRQOL (β=2.98, 95% CI=1.38; 4.58, $p<0.001$ and β=2.63, 95% CI=0.21; 5.04, $p=0.033$) when compared to participants without truancy.

Table 3. Results from the multivariable general linear models evaluating the association of school absenteeism with physical HRQOL.

	SF-12 Physical Component Summary					
	Crude model			Adjusted model		
	β	(95% CI)	*p*-value	β	(95% CI)	*p*-value
School absenteeism						
Number of sick days in past 8 weeks						
Never	Ref.			Ref.		
1–4 days	–0.91	(–3.51; 1.68)	.489	**–2.70**	**(–4.74; –0.66)**	**.010**
≥5 days	**–5.87**	**(–8.49; –3.25)**	**.000**	**–6.86**	**(–8.93; –4.80)**	**.000**
Truancy in past 4 weeks						
Never	Ref.			Ref.		
1–5 hours	1.83	(–0.05; 3.71)	.057	**2.98**	**(1.38; 4.58)**	**.000**
≥6 hours	1.71	(–0.72; 4.14)	.168	**2.63**	**(0.21; 5.04)**	**.033**

Note*:* bold numbers indicate significant *p*-values.
Crude model: School absenteeism associated with physical HRQOL.
Adjusted model: School absenteeism associated with physical HRQOL controlled for socio-demographic characteristics as possible confounders (age, gender, country of birth, living situation, education level and debts).

Happiness

Table 4 shows that for both the crude and adjusted model, no significant relationships were found in studying the association between school absenteeism and happiness.

Table 4. Results from the multivariable general linear models evaluating the association of school absenteeism with happiness.

	Happiness					
	Crude model			Adjusted model		
	β	(95% CI)	*p*-value	β	(95% CI)	*p*-value
School absenteeism						
Number of sick days in past 8 weeks						
Never	Ref.			Ref.		
1–4 days	0.07	(–0.41; 0.55)	.760	–0.05	(–0.42; 0.33)	.802
≥5 days	–0.34	(–0.83; 0.14)	.167	–0.35	(–0.73; 0.03)	.068
Truancy in past 4 weeks						
Never	Ref.			Ref.		
1–5 hours	–0.17	(–0.52; 0.18)	.343	0.04	(–0.25; 0.34)	.783
≥6 hours	–0.40	(–0.85; 0.04)	.077	–0.23	(–0.67; 0.21)	.306

Crude model: School absenteeism associated with happiness.
Adjusted model: School absenteeism associated with happiness controlled for socio-demographic characteristics as possible confounders (age, gender, country of birth, living situation, education level and debts).

DISCUSSION

This study illustrates that sickness absence and truancy are associated with mental and physical HRQOL. The hypothesized negative association between sickness absence and both mental and physical HRQOL was confirmed. Furthermore, the hypothesized negative association between truancy and mental HRQOL was confirmed. In contrast to our expectations, we found a positive association between truancy and physical HRQOL. No significant associations were found between sickness absence or truancy and happiness.

The demonstrated significant negative association especially between sickness absence and mental HRQOL in young adults warrants research and policy attention. The beta coefficient for this association showed half a standard deviation decrease in mental HRQOL and, therefore, transcends the threshold of discriminating change in HRQOL [36]. Previous reviews on the association between mental health issues and school absenteeism did not find an association between sickness absence and depression or anxiety since mixed results from a small amount of evidence were found [4 37]. Another study did find a link between psychopathology and school absenteeism but did not discriminate between excused and unexcused absence [38]. Subsequently, researchers called for future research to study this association. The current research fills this gap by demonstrating a significant association between chronic sickness absence and decreased mental HRQOL. Furthermore, both students who report one to four sick days in the past eight weeks, and students with more than four sick days in the past eight weeks showed decreased physical HRQOL. This is in accordance with previous research that found a link between physical conditions and school absenteeism [6 23].

Our finding that students who had been truanting showed decreased mental HRQOL is in agreement with previous reviews and studies on the association between unexcused absence and depression or anxiety [37-40]. The association between higher physical HRQOL and truancy might be explained within previous research where five out-of-school activity portfolios were identified. The highest truancy was found in the group of unstructured recreation. This group is characterized by activities such as playing non-school sports and hanging out with friends [41]. Being able to participate in these unstructured leisure time activities suggests that one is physically fit to do so, which could partly explain the improved physical HRQOL.

We did not observe an association between school absenteeism and happiness. However, the descriptive data showed that with an increase in sick days there was a decrease in happiness. The association between happiness and school absenteeism should be further explored to establish the strength and causal pathway of the association.

When entering the three outcomes of mental and physical HRQOL and happiness in the same model, similar results were found. Sickness absence was associated with mental and physical HRQOL, and truancy was associated with mental HRQOL. The significant association between truancy and physical HRQOL disappeared in this model (data not shown).

This study has several limitations that need to be considered when interpreting the results. First, analysis comparing included participants with excluded participants due to missing data indicated that excluded participants were significantly older and less often attended a higher level of education (i.e. education level four). This could have led to selection bias if young adults with missing data were more often sick compared to included young adults. Second, students could have adhered to socially desirable answers, for example, on their amount of school absenteeism. However, we still identified associations between poor attendance and HRQOL; thus, a stronger association may be expected when objective data are used. Third, non-response bias may have occurred when young adults did not respond to the questionnaire due to their school absenteeism. The impact, however, may be limited as previous research shows that non-response in school-based health surveys is mainly linked to lifestyle factors. Physical or chronic health problems were less related to non-participation [42]. Fourth, due to the cross-sectional nature of the study, the direction of the association cannot be distinguished. For example, it is not known whether low HRQOL preceded sickness absence or truancy, and vice versa. Therefore, we recommend that future studies perform longitudinal research on this topic with multiple waves to establish the causal pathway of the association. We recommend that future studies examine the relation between HRQOL and school absenteeism and potential mediating and confounding factors such as risk (health) behaviors, depression, and relevant health indicators. Also, it is recommended to study whether different reasons for the absence relate to different levels of HRQOL, i.e. if there are specific absence reasons that render the worst HRQOL scores.

The results of the current study could raise awareness among policymakers and health care professionals working with young adults with poor school attendance. Missed days in school due to sickness or truancy seems to be associated with impaired mental HRQOL and is therefore an area of concern. A focus on the mental health of these absent youth is necessary. It is recommended that Youth Health Care professionals, school staff, and young adults communicate with each other about school absenteeism and collaborate to improve policy regarding school attendance and the HRQOL of young adults attending intermediate vocational education. Interventions focusing on reducing school absenteeism and improving HRQOL should be developed, implemented and improved regularly to establish maximal attendance rates and the best HRQOL for school-attending young adults. Furthermore, the most mentioned reasons for truanting indicate motivational issues, oversleeping, and scheduling problems. This information might help schools to support young adults, for example, with regard to improving school schedules.

Conclusion

Students from intermediate vocational education aged 16–26 with poor school attendance due to sickness absence or truancy reported lower mental HRQOL. This underlines the importance for schools, policymakers, and Youth Health Care professionals to pay attention to the HRQOL of students who are regularly absent from school.

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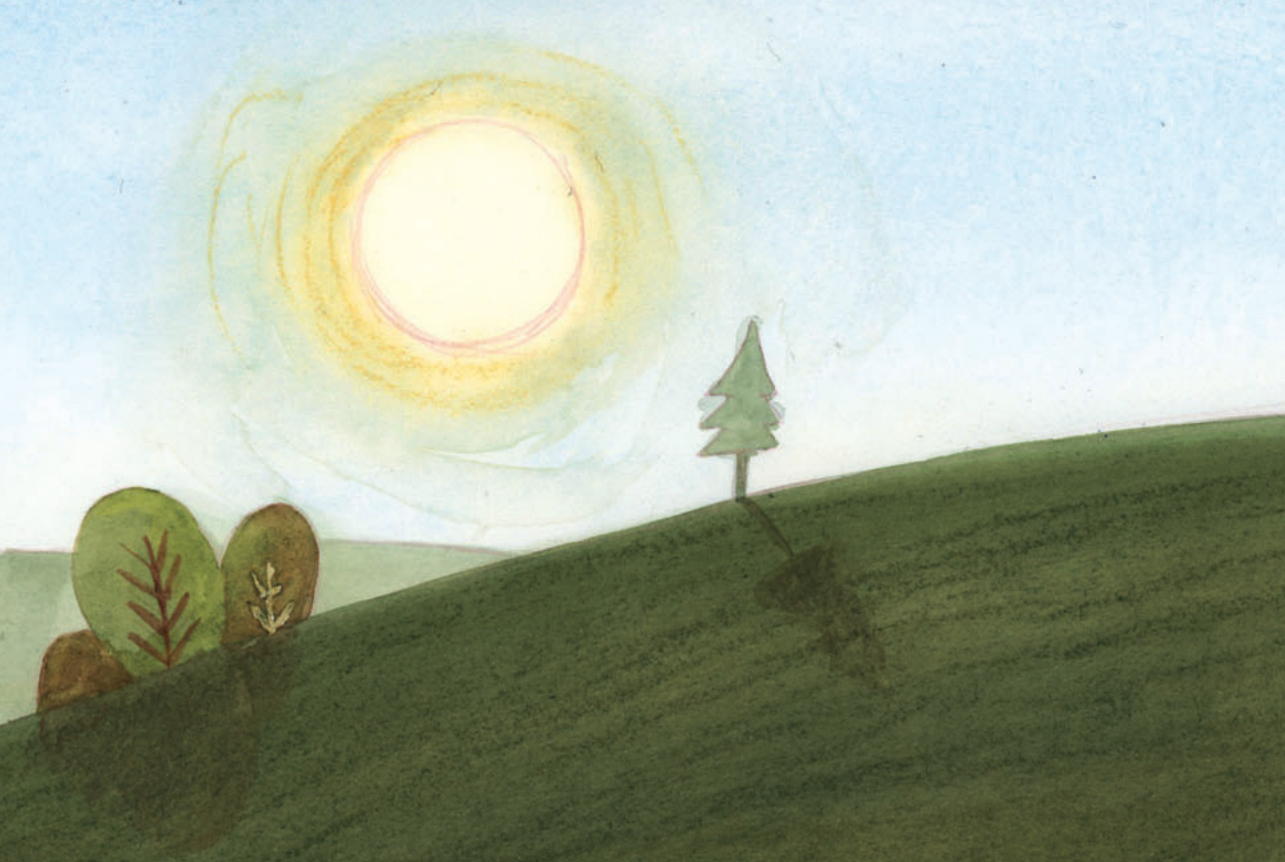

CHAPTER 3

Young adults' self-sufficiency in daily life: the relationship with contextual factors and health indicators

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ABSTRACT

Purpose

Certain factors, such as depressive symptoms and binge drinking, may be linked to young adults' ability to attain an acceptable level of functioning on specific life-domains (i.e. self-sufficiency). We studied the association of contextual factors and health indicators with self-sufficiency in young adults.

Methods

We used both baseline (n=755) and six-month follow-up (n=200) self-reported questionnaire data of intermediate vocational education students (16-26 years). The questionnaire included the adapted Dutch self-sufficiency matrix (SSM-D), which addresses self-sufficiency regarding 11 life-domains (e.g. finances and housing). The questionnaire also included potentially associated contextual factors (e.g. socio-demographic characteristics) and health indicators (e.g. sickness absence from school). Ordinal (overall self-sufficiency: self-sufficient on 11, 10, 9 or ≤ 8 life-domains), and logistic (self-sufficiency per life-domain: self-sufficient yes/no) regression models were applied.

Results

The studied population was 18.6 years on average (SD=2.04), and 73.6% were female. Cannabis use was associated with a lower overall self-sufficiency category at baseline (OR=0.57, 95% CI=0.33-0.99), as were an increase in sick days (OR=0.94, 95% CI=0.91-0.98) and an increase on the scale of depressive symptoms (OR=0.87, 95% CI=0.85-0.89). An increase in sick days and an increase on the scale of depressive symptoms were associated with lower odds of being self-sufficient on three and ten life-domains, respectively (p<0.05). An increase on the scale of depressive symptoms was associated with a lower overall self-sufficiency category six-month post-baseline (OR=0.90, 95% CI=0.86-0.93).

Conclusion

Our findings underline the importance of addressing self-sufficiency, sickness absence, and depressive symptoms, preferably before the transition from adolescence to young adulthood has begun.

INTRODUCTION

Self-sufficiency is defined as the ability of individuals to attain an acceptable level of functioning regarding specific life-domains, such as daytime activities and social support. This ability could either be achieved by the person him/herself or by adequately organizing help from formal or informal care providers [1]. Enhancing self-sufficiency in emerging adults may contribute to a more successful transition from adolescence to adulthood [1 2]. This transitional period is typically defined as a separate phase of emerging adulthood, a stage between adolescence and adulthood, which primarily exists in Western countries [3-5]. In this phase, adolescents transition from lower secondary school to further education or the labor market. Moreover, a transition occurs from dependence on parents to more autonomy and financial independence and from Youth Health Care to adult health care. These transitions induce challenges for emerging adults in different life areas, e.g. finances, education and employment, leisure time activities, and physical and mental health behaviors [6-10]. These challenges might account for a decline in health status along with an increase in mental health problems and behaviors risky to health, such as binge drinking, smoking, and being physically inactive [7 10-12]. Furthermore, the aforementioned transitions may result in a gap between the (health care) needs of emerging adults and the provision of care [10 13 14]. Therefore, studying self-sufficiency and potentially associated (risk) factors could inform the development of programs that aim to empower young adults' functioning in daily life. Previous research illustrated that, for instance, financial self-sufficiency can be improved by financial education to students [15], and effective mental health services in the school context can help with a successful transition to adulthood [16].

Emerging adults attending intermediate vocational education (upper secondary education with specialized job-oriented programs, ISCED 3 [17]) are expected to struggle more with becoming self-sufficient than their peers from other school levels. These emerging adults display the highest percentage of leaving school without a diploma and report relatively high levels of risk behaviors, such as more than 50% of monthly binge drinking and 45% of daily smoking [18 19].

This study examined the association of contextual factors (i.e. socio-demographics and context, and risk behaviors) and indicators of health status (i.e. sickness absence and depressive symptoms) with self-sufficiency in intermediate vocational education students aged 16-26 years, both cross-sectionally and longitudinally. We hypothesized

that less favorable contextual factors and less favorable indicators of health status will be associated with a lower likelihood of being self-sufficient.

METHODS

Study design

For this study, baseline and follow-up data from the Medical Advice for Sick-reported Students (MASS) intervention evaluation study were used, which is described in more detail elsewhere [20].

The Medical Ethics Committee of the Erasmus University Medical Center Rotterdam reviewed the research proposal and declared that the Dutch Medical Research Involving Human Subjects Act (Dutch abbreviation: WMO) did not apply. They issued a declaration of no objection to conducting this study and permitted to submit the results for publication in a scientific journal in the future (proposal number MEC-2015-614). All participants provided written informed consent.

Setting and study population

A total of 22 intermediate vocational education school locations were invited to participate in the study (Figure 1). Twelve locations could not participate, mainly because of the anticipated time investment. Finally, ten schools participated in the study in the Dutch regions of Utrecht, West-Brabant, Amsterdam, and Rotterdam. The baseline data was collected between December 2015 and October 2016. The follow-up data was collected between July 2016 and April 2017.

Participants were students aged 16-26 years attending intermediate vocational education level 1-4 (level 1 is considered assistant training and level 4 is considered middle management training). They attended the following vocational programs: media manager/developer, assistant care, trade, interior design, nursing, and technician studies. To adhere to the preferences of the schools, two different procedures were followed to select participants. (1) At eight schools, a school employee selected and invited students for participation if they had reported an extensive amount of sick days from school (i.e. reporting sick at least four times, or, more than six consecutive school days in twelve school weeks). (2) At the two remaining schools, all students in randomly selected classes were invited to participate. The involved researcher selected students who met the criteria for extensive sickness absence afterward. All students

from the first procedure and students from the second procedure who met the criteria for extensive sickness absence were placed in the 'selected sickness absence' sample. The remaining participants from the second procedure were placed in the 'general school population' sample (see Figure 1).

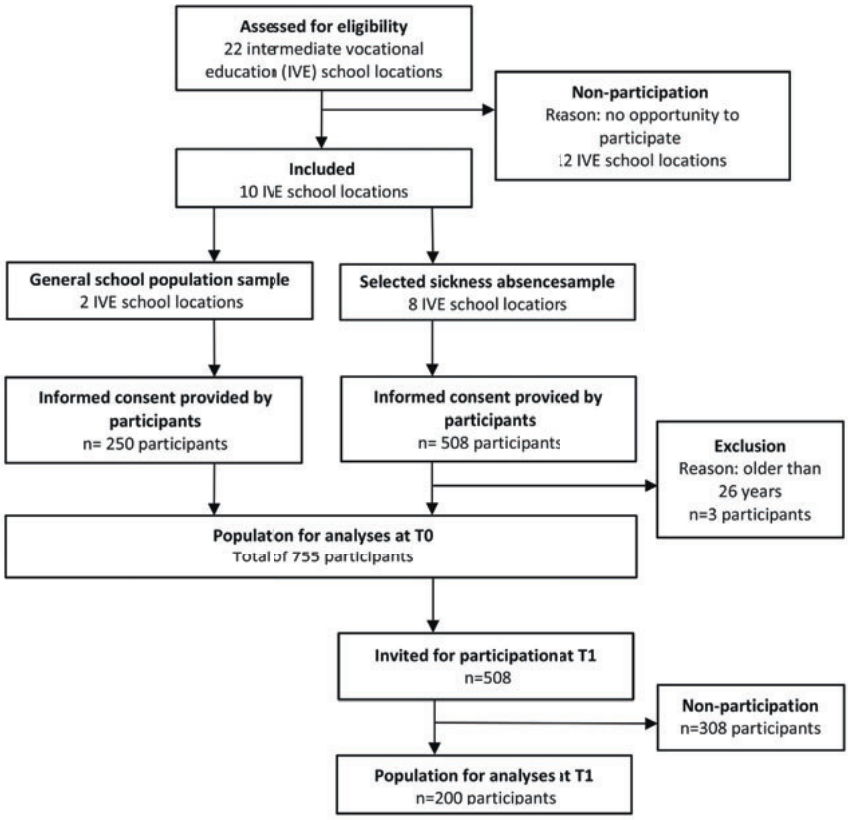

Figure 1. Flowchart of the participants in this study.

All students and parents of students between 16 and 18 years of age were informed about the study through an information letter and a leaflet. These documents explained the aim of the study and included contact information of the researchers. An appointed coordinator from the participating schools sent the documents to the students and parents. Parents could object to having their child participate in the study by notifying their objection towards school or the researchers. The students were asked to provide written informed consent before filling out the questionnaire. The appointed

coordinator collected all completed questionnaires and sent them to the researchers. Approximately six months later, the participants in the selected sickness absence sample (i.e. where the selection was based on the amount of sickness absence) received the follow-up questionnaire at home with a return envelope or through a link in their e-mail. The broader school sample was not invited to fill out the follow-up questionnaire. In total, 758 students provided written informed consent at baseline. Before analysis, we excluded students who were older than 26 years (n=3).

Measurements

The questionnaire contained the following topics: self-sufficiency, contextual factors (i.e. socio-demographic characteristics and context, and risk behaviors), and indicators of health status (i.e. sickness absence and depressive symptoms).

Self-sufficiency

An adapted version of the Dutch self-sufficiency matrix (SSM-D) was included in the questionnaire [1 21]. This version was developed for and validated among students attending intermediate vocational education, corresponding to the language skills of the students, and addresses the ability of students to provide for themselves regarding 11 specific life-domains (i.e. finances, daytime activities, housing, domestic relations, mental health, physical health, addiction, activities daily life, social network, community participation, and judicial) [21]. Each life-domain was assessed by how many problems the student had in the past six months in a certain life-domain, e.g. 'Finances. Think of: having the money to make ends meet' (see supplementary material: Table S1). Five response categories ranged from 'no problems' to 'many problems'. Response categories were dichotomized into 'self-sufficient' (few problems and no problems) versus 'not to barely self-sufficient' (many problems to not few/not many problems) for each life-domain. For analysis purposes, one overall self-sufficiency score was calculated, ranging from self-sufficient on all life-domains, ten life-domains, nine life-domains, and eight or fewer life-domains.

Contextual factors and indicators of health status

Elements of the International Classification of Functioning, Disability, and Health (ICF) from the World Health Organization were used to select relevant factors [22 23]. In this framework, human functioning is considered at the level of the whole person in a

social context. We applied an adapted version of this framework to our study (see supplementary material: Figure S1).

Contextual factors

Socio-demographics and context included age (years), gender (boy/girl), level of intermediate vocational education (higher level 4 vs. lower levels 1-3), ethnic background (Dutch versus non-Dutch by following the definition of Statistics Netherlands [24]), living situation, and perceived school performance. For living situation, ten different response categories were dichotomized into 'living with a caretaker' versus 'living without a caretaker'. Perceived school performance was assessed by the question: "How do you think your teacher estimates your school performance compared to your classmates?". Five response categories ranged from 'very good' to 'not good', and were dichotomized into 'good' versus 'average or less'. Previous research showed this item can distinguish students who get good grades at school from students that do not [25].

Risk behaviors included cigarette smoking, binge drinking, cannabis use, delinquency, and truancy. Cigarette smoking was assessed by the question: "How often do you currently smoke?". Four response categories ranged from 'not' to 'yes, daily' and were dichotomized into 'current smoking' versus 'no current smoking'. Binge drinking was assessed by the question: "How many times did you consume five or more alcoholic drinks on one occasion in the past four weeks?", by following the international definition of binge drinking [26]. Seven response categories ranged from 'never' to 'nine or more times' and were dichotomized into 'not once' versus 'one or more times'. Cannabis use was assessed by the number of times the student had used cannabis over the past four weeks. Eight response categories ranged from 'never' to '20 or more times' and were dichotomized into 'not once' versus 'one or more times'. Criminal behavior was assessed by ten items covering criminal behavior in the past six months (e.g. bought stolen goods). Five response categories ranged from 'never' to 'six times' or more. All ten items were merged into one dichotomous item 'no criminal behavior' versus 'at least one criminal behavior' in the past six months. Truancy was assessed by the question: "Have you been truanting in the past four weeks?". Six response categories ranged from 'no truancy' to 'more than 20 hours of truancy', and were categorized into 'never', '1-5 hours' and 'more than 5 hours' [27].

Indicators of health status

Sickness absence was assessed by the question: "How many days in the past eight school weeks did you stay home from school, because you were sick? (do not count holidays)" [27]. The continuous score for number of sick days was used. Depressive symptoms were assessed using the validated Center for Epidemiologic Studies Depression scale (CES-D) [28 29]. The CES-D is a 20-item scale used to determine the clinical relevance of depression. The items cover main components of depressive symptoms such as depressed mood, guilt, feelings of helplessness, loss of appetite, and sleep. The frequency of experiencing these symptoms in the past week was assessed. Four response categories ranged from 'always' to 'hardly ever'. The continuous total CES-D score was used with higher scores indicating higher levels of depressive symptoms (range of 0-60).

Data analysis

Descriptive statistics were used to describe the socio-demographic characteristics of the study population (Table 1). We compared participants who completed both the baseline and follow-up questionnaire with participants who did not respond to the follow-up questionnaire using chi-square tests (for categorical variables) and independent sample *t*-tests (for continuous variables) (Supplementary material: Table S2). Also, descriptive statistics were used to show the distribution of students who were self-sufficient and who were not self-sufficient in each life-domain at baseline and six months post-baseline (Table 2).

We examined associations of contextual factors and indicators of health status (i.e. predictor variables) with self-sufficiency (i.e. outcome variable) using ordinal and logistic regression analysis. First, ordinal regression analysis were performed on baseline data to analyze the association between predictor variables and overall self-sufficiency at baseline as the ordinal outcome variable (ranging from self-sufficient on: all life-domains, ten life-domains, nine life-domains, and eight or fewer life-domains) (Table 3). Second, logistic regression analysis were performed on baseline data to assess the association between predictor variables and the separate self-sufficiency life-domains as outcome variables (Table 4). Third, ordinal regression analysis were performed to analyze the association between baseline predictor variables and overall self-sufficiency at follow-up as the ordinal outcome variable (ranging from self-sufficient on: all life-domains, ten life-domains, nine life-domains, and eight or fewer life-domains) (Table 5). We also explored interaction between gender and all other predictors in the association

between baseline predictors and baseline overall self-sufficiency. No significant interaction was found.

Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated. For the ordinal regression models, we present the univariable and multivariable models. The estimated ORs represent the odds for a student to be allocated within a higher self-sufficiency category if they would have scored one point higher on a predictor variable [30].

We considered a *p*-value of 0.05 or lower to be statistically significant. All analyses were performed using SPSS version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.).

RESULTS

Participant characteristics

Participants were on average 18.6 years old (SD=2.04, with a minimum age of 16 years and a maximum age of 26 years); 73.6% were female and 60.6% were classified as Dutch (Table 1). Results of the lost to follow-up analysis showed that participants lost to follow-up were more often male ($p<0.05$), were lower educated ($p<0.001$) and more often had a non-Dutch ethnic background ($p<0.001$) than participants included at both time-points (Supplementary material: Table S2).

Table 1. Socio-demographic characteristics of the study population at baseline (N=755).

Socio-demographic characteristics	Total population
Age in years, mean (SD)	
Age in years	18.6, range 16-26 (SD=2.04)
Gender, n (%)	
Male	199 (26.4)
Female	554 (73.6)
Intermediate vocational education, n (%)[a]	
Level 1-3	249 (34.3)
Level 4	478 (65.7)
Ethnic background, n (%)	
Dutch	452 (60.6)
Non-Dutch	294 (39.4)
Living situation, n (%)	
With parents/caretakers	664 (88.1)
Not with parents/caretakers	90 (11.9)

Note: SD=Standard Deviation.

[a] Intermediate vocational education consists of four levels: 1=assistant training; 2=basic vocational training; 3=vocational training; 4=middle-management training.

The judicial life-domain had the highest number of self-sufficient participants at baseline (97.8%) and at follow-up (98.9). The three life-domains with the lowest number of self-sufficient participants were 'finances' (at baseline 73.5%, at follow-up 72.2%), 'mental health' (at baseline 60.0%, at follow-up 53.9%), and 'physical health' (at baseline 71.1%, at follow-up 64.4%) (Table 2).

Table 2. Baseline and six-month follow-up distribution of overall self-sufficiency and of the separate self-sufficiency life-domains.

	Overall self-sufficiency			
Time-point	**On 11 life-domains n (%)**	**On 10 life-domains n (%)**	**On 9 life-domains n (%)**	**On ≤ 8 life-domains n (%)**
Baseline (n=755)	265 (36.6)	116 (16.0)	103 (14.2)	240 (33.1)
Follow-up (n=200)	58 (32.4)	38 (21.2)	20 (11.2)	63 (35.2)
	Baseline (n=755)		**six-month follow-up (n=200)**	
Self-sufficiency life-domain	**Self-sufficient[a] n (%)**	**Not to barely self-sufficient[a] n (%)**	**Self-sufficient[a] n (%)**	**Not to barely self-sufficient[a] n (%)**
Finances	537 (73.5)	194 (26.5)	130 (72.2)	50 (27.8)
Daytime activities	545 (75.0)	182 (25.0)	147 (81.7)	33 (18.3)
Housing	661 (90.4)	70 (9.6)	171 (95.0)	9 (5.0)
Domestic relations	591 (80.8)	140 (19.2)	142 (78.9)	38 (21.1)
Mental health	437 (60.0)	291 (40.0)	97 (53.9)	83 (46.1)
Physical health	520 (71.1)	211 (28.9)	116 (64.4)	64 (35.6)
Addiction	663 (90.7)	68 (9.3)	168 (93.3)	12 (6.7)
Daily life skills	678 (92.7)	53 (7.3)	161 (89.4)	19 (10.6)
Social network	631 (86.3)	100 (13.7)	151 (83.9)	29 (16.1)
Community participation	566 (77.4)	165 (22.6)	142 (78.9)	38 (21.1)
Judicial	715 (97.8)	16 (2.2)	178 (98.9)	2 (1.1)

[a] Self-sufficiency was measured on eleven life-domains. Participants indicated whether they were able to provide for themselves regarding these life-domains. Five response categories ranged from 'no problems' to 'many problems'. Response categories were dichotomized into 'self-sufficient' versus 'not to barely self-sufficient' for each life-domain.

Results of the regression analysis

Table 3 shows the associations of contextual factors and indicators of health status with overall self-sufficiency at baseline, as assessed with ordinal regression analysis. In de multivariable model, young adults using cannabis were at risk of having a lower overall self-sufficiency category (OR=0.57, 95% CI=0.33; 0.99), as were young adults with more sick days from school (OR=0.94, 95% CI=0.91; 0.98), and young adults with a higher score on the depressive symptoms scale (OR=0.87, 95% CI=0.85; 0.89).

Table 3. Results of the cross-sectional ordinal regression analysis evaluating associations of contextual factors and indicators of health status with overall self-sufficiency (n=755).

	Univariable model of self-sufficiency[a]	**Multivariable model of self-sufficiency[b]**
	OR (95% CI)*	**OR (95% CI)***
Contextual factors		
Socio-demographics and context		
Age (in years)	**0.85 (0.80; 0.91)**	0.91 (0.83; 1.00)
Gender		
Male	Ref.	Ref.
Female	1.01 (0.75; 1.37)	1.09 (0.71; 1.65)
Intermediate vocational education[c]		
Level 1-3	Ref.	Ref.
Level 4	**0.62 (0.47; 0.83)**	0.72 (0.47; 1.09)
Ethnic background		
Dutch	Ref.	Ref.
Non-Dutch	1.28 (0.97; 1.69)	0.98 (0.66; 1.45)
Living situation		
With caretaker	Ref.	Ref.
Not with caretaker	**0.31 (0.20; 0.49)**	0.65 (0.34; 1.25)
Perceived school performance		
> Average	Ref.	Ref.
≤ Average	**0.39 (0.29; 0.52)**	0.79 (0.54; 1.15)
Risk behaviors		
Current smoking		
No	Ref.	Ref.
Yes	**0.60 (0.44; 0.80)**	0.81 (0.51; 1.27)
Binge drinking[d]		
0 times/ 4 weeks	Ref.	Ref.
≥ 1 time/4 weeks	**0.76 (0.58; 0.99)**	0.76 (0.51; 1.13)
Cannabis use		
0 times/4 weeks	Ref.	Ref.
≥ 1 time/4 weeks	**0.44 (0.31; 0.64)**	**0.57 (0.33; 0.99)**
Criminal behavior		
0 times/year	Ref.	Ref.
≥ 1 time/year	0.81 (0.55; 1.21)	1.19 (0.70; 2.02)

Table 3. Continued

	Univariable model of self-sufficiency[a]	Multivariable model of self-sufficiency[b]
	OR (95% CI)*	**OR (95% CI)***
Truancy		
0 hours	Ref.	Ref.
1-5 hours	0.84 (0.62; 1.14)	0.95 (0.64; 1.41)
≥ 6 hours	**0.37 (0.23; 0.59)**	0.59 (0.32; 1.11)
Indicators of health status		
Sickness absence (days/8 weeks)	**0.89 (0.86; 0.91)**	**0.94 (0.91; 0.98)**
Depressive symptoms (CES-D scale)	**0.87 (0.85; 0.88)**	**0.87 (0.85; 0.89)**

Note: Self-sufficiency was entered as an ordinal variable ranging from self-sufficient on all life-domains, self-sufficient on ten life-domains, self-sufficient on nine life-domains and self-sufficient on eight or fewer life-domains. Odds ratios represent the odds for a participant to be allocated within a higher self-sufficiency category if they would have scored one point higher on the predictor variable. Bold numbers indicate a statistically significant (p<0.05) association.

*Odds ratio (OR) and 95% confidence interval (95% CI) from ordinal regression analysis.

[a] The predictor variables were entered separately in the univariable model.

[b] The predictor variables were entered simultaneously in the multivariable model.

[c] Intermediate vocational education consists of four levels: 1=assistant training; 2=basic vocational training; 3=vocational training; 4=middle-management training.

[d] Binge drinking was defined as consuming five or more alcoholic drinks on one occasion.

Table 4 presents the results of the associations of contextual factors and indicators of health status with the separate self-sufficiency life-domains at baseline, assessed with logistic regression analyses. An increase in sick days was associated with lower odds of being self-sufficient on three life-domains, ORs varied from 0.92 to 0.95. An increase on the scale of depressive symptoms was associated with lower odds of being self-sufficient on ten life-domains, ORs varied from 0.81 to 0.96.

Table 4. Results of the logistic regression analyses evaluating associations of contextual factors and indicators of health status with separate self-sufficiency life-domains (n=755).

	Finances	Daytime activities	Housing	Domestic relations	Mental health	Physical health
	OR (95% CI)*	OR (95% CI)*	OR (95% CI)*	OR (95% CI)*	OR (95% CI)*	OR (95% CI)*
Contextual factors						
Socio-demographics and context						
Age (in years)	**0.84 (0.75; 0.94)**	0.96 (0.85; 1.09)	1.07 (0.89; 1.28)	0.98 (0.86; 1.12)	0.91 (0.79; 1.05)	0.92 (0.82; 1.03)
Gender (female)	1.05 (0.63; 1.74)	1.17 (0.69; 2.00)	1.15 (0.52; 2.52)	0.83 (0.45; 1.51)	0.73 (0.40; 1.34)	0.81 (0.48; 1.34)
Intermediate vocational education (level 4)[a]	0.78 (0.46; 1.34)	0.84 (0.49; 1.46)	1.03 (0.44; 2.40)	0.59 (0.32; 1.10)	0.57 (0.31; 1.06)	1.31 (0.80; 2.15)
Ethnic background (non-Dutch)	0.82 (0.50; 1.32)	0.83 (0.50; 1.38)	**0.47 (0.23; 0.98)**	0.62 (0.36; 1.07)	1.72 (0.98; 3.01)	1.33 (0.83; 2.13)
Living situation (not with caretaker)	**0.49 (0.25; 0.96)**	0.97 (0.45; 2.06)	**0.25 (0.10; 0.65)**	0.59 (0.27; 1.27)	1.50 (0.62; 3.65)	0.68 (0.34; 1.37)
Perceived school performance (≤ average)	0.86 (0.54; 1.39)	**0.37 (0.23; 0.59)**	0.73 (0.36; 1.49)	0.75 (0.44; 1.26)	0.72 (0.41; 1.25)	1.02 (0.64; 1.63)
Risk behaviors						
Current smoking (yes)	**0.49 (0.29; 0.84)**	0.91 (0.52; 1.60)	0.59 (0.25; 1.40)	**0.45 (0.24; 0.83)**	1.60 (0.85; 3.02)	0.81 (0.47; 1.37)
Binge drinking[b] (≥ 1 time/4 weeks)	0.71 (0.43; 1.17)	**0.53 (0.32; 0.90)**	0.75 (0.34; 1.65)	0.96 (0.54; 1.69)	0.69 (0.39; 1.22)	1.11 (0.69; 1.78)
Cannabis use (≥ 1 time/4 weeks)	0.58 (0.33; 1.04)	0.73 (0.39; 1.38)	0.69 (0.28; 1.67)	0.88 (0.45; 1.72)	0.66 (0.31; 1.38)	0.71 (0.38; 1.32)
Criminal behavior (≥ 1 time/6 months)	0.69 (0.38; 1.25)	1.76 (0.88; 3.54)	2.09 (0.71; 6.18)	0.85 (0.43; 1.69)	1.16 (0.56; 2.42)	1.44 (0.75; 2.75)
Truancy						
0 hours	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
1-5 hours	1.00 (0.61; 1.64)	0.75 (0.45; 1.25)	0.74 (0.34; 1.62)	0.77 (0.45; 1.33)	0.73 (0.42; 1.26)	1.57 (0.96; 2.56)
≥ 6 hours	0.70 (0.36; 1.36)	0.57 (0.28; 1.15)	1.21 (0.41; 3.63)	1.37 (0.61; 3.08)	0.69 (0.30; 1.59)	1.93 (0.93; 4.02)
Indicators of health status						
Sickness absence (days/8 weeks)	1.02 (0.98; 1.05)	**0.92 (0.88; 0.95)**	0.96 (0.93; 1.00)	1.00 (0.97; 1.04)	0.96 (0.91; 1.01)	**0.92 (0.88; 0.95)**
Depressive symptoms (CES-D scale)	**0.96 (0.94; 0.98)**	**0.94 (0.92; 0.96)**	**0.93 (0.90; 0.96)**	**0.91 (0.89; 0.94)**	**0.81 (0.78; 0.84)**	**0.95 (0.93; 0.97)**

Table 4. (continued)

	Addiction	Activities daily life	Social network	Community participation	Judicial	Total significant
	OR (95% CI)*	**OR (95% CI)***	**OR (95% CI)***	**OR (95% CI)***	**OR (95% CI)***	**n life-domains**
Contextual factors						
Socio-demographics and context						
Age (in years)	1.11 (0.93; 1.33)	0.87 (0.72; 1.06)	0.96 (0.81; 1.13)	0.98 (0.87; 1.11)	1.23 (0.81; 1.86)	1
Gender (female)	**2.71 (1.34; 5.50)**	1.46 (0.58; 3.70)	1.40 (0.67; 2.91)	0.92 (0.53; 1.59)	**7.61 (1.20; 48.18)**	2
Intermediate vocational education (level 4)[a]	0.77 (0.35; 1.68)	1.55 (0.60; 4.03)	1.88 (0.90; 3.95)	**0.45 (0.25; 0.82)**	1.14 (0.21; 6.14)	1
Ethnic background (non-Dutch)	0.63 (0.32; 1.27)	1.12 (0.47; 2.69)	0.55 (0.28; 1.09)	0.66 (0.40; 1.09)	0.77 (0.15; 4.06)	1
Living situation (not with caretaker)	0.40 (0.16; 1.00)	0.81 (0.27; 2.46)	0.54 (0.21; 1.35)	0.71 (0.34; 1.47)	0.34 (0.03; 3.41)	2
Perceived school performance (≤ average)	0.75 (0.38; 1.45)	1.25 (0.54; 2.88)	0.77 (0.41; 1.46)	0.69 (0.43; 1.12)	1.18 (0.25; 5.56)	1
Risk behaviors						
Current smoking (yes)	0.52 (0.24; 1.14)	1.14 (0.41; 3.17)	0.81 (0.36; 1.84)	1.32 (0.73; 2.40)	1.79 (0.23; 13.72)	2
Binge drinking[b] (≥ 1 time/4 weeks)	0.50 (0.23; 1.08)	0.73 (0.31; 1.76)	1.81 (0.88; 3.73)	0.76 (0.46; 1.28)	1.05 (0.17; 6.37)	1
Cannabis use (≥ 1 time/4 weeks)	0.59 (0.27; 1.28)	0.63 (0.22; 1.81)	0.78 (0.32; 1.94)	0.82 (0.42; 1.58)	0.78 (0.13; 4.68)	0
Criminal behavior (≥ 1 time/year)	1.03 (0.45; 2.37)	2.26 (0.56; 9.10)	**3.92 (1.22; 12.64)**	0.93 (0.47; 1.83)	**0.06 (0.01; 0.32)**	2
Truancy						
0 hours	Ref.	Ref.	Ref.	Ref.	Ref.	
1-5 hours	0.72 (0.35; 1.49)	0.66 (0.27; 1.64)	0.68 (0.33; 1.40)	0.66 (0.40; 1.08)	0.87 (0.17; 4.30)	0
≥ 6 hours	0.93 (0.36; 2.40)	0.86 (0.26; 2.80)	0.47 (0.18; 1.24)	1.25 (0.58; 2.71)	3.69 (0.22; 60.80)	0
Indicators of health status						
Sickness absence (days/8 weeks)	0.98 (0.94; 1.02)	0.99 (0.94; 1.03)	**0.95 (0.92; 0.99)**	1.00 (0.97; 1.03)	1.28 (0.98; 1.67)	3
Depressive symptoms (CES-D scale)	**0.94 (0.92; 0.97)**	**0.89 (0.86; 0.93)**	**0.89 (0.87; 0.92)**	**0.93 (0.91; 0.95)**	0.96 (0.90; 1.03)	10

*Odds ratio (OR) and 95% confidence interval (95% CI) from logistic regression analyses. The full models are presented. All variables were entered simultaneously to analyze the independent association of each variable with self-sufficiency. Note: bold numbers indicate a statistically significant (p<0.05) association.

[a] Intermediate vocational education consists of four levels: 1=assistant training; 2=basic vocational training; 3=vocational training; 4=middle-management training.

[b] Binge drinking was defined as consuming five or more alcoholic drinks on one occasion.

Table 5 shows the results of the associations of contextual factors and health status at baseline with overall self-sufficiency at follow-up, assessed with ordinal regression analyses. In de multivariable model, young adults with a higher score on the depressive symptoms scale were at risk of having a lower overall self-sufficiency category (OR=0.90, 95% CI=0.86; 0.93).

Table 5. Results of the longitudinal ordinal regression analyses evaluating associations of contextual factors and indicators of health status with overall self-sufficiency (n=200).

	Univariable model of self-sufficiency[a]	**Multivariable model of self-sufficiency[b]**
	OR (95% CI)*	**OR (95% CI)***
Contextual factors		
Socio-demographics and context		
Age (in years)	**0.80 (0.69; 0.93)**	0.96 (0.78; 1.18)
Gender		
Male	Ref.	Ref.
Female	0.73 (0.38; 1.38)	1.09 (0.48; 2.49)
Intermediate vocational education[c]		
Level 1-3	Ref.	Ref.
Level 4	0.78 (0.39; 1.57)	1.23 (0.52; 2.92)
Ethnic background		
Dutch	Ref.	Ref.
Non-Dutch	0.95 (0.49; 1.86)	0.80 (0.34; 1.87)
Living situation		
With caretaker	Ref.	Ref.
Not with caretaker	**0.21 (0.07; 0.61)**	0.25 (0.05; 1.36)
Perceived school performance		
> Average	Ref.	Ref.
≤ Average	0.59 (0.32; 1.08)	0.88 (0.43; 1.83)
Risk behaviors		
Current smoking		
No	Ref.	Ref.
Yes	0.53 (0.28; 1.01)	0.90 (0.39; 2.07)
Binge drinking[d]		
0 times/4 weeks	Ref.	Ref.
≥ 1 time/4 weeks	0.71 (0.41; 1.24)	0.67 (0.34; 1.35)
Cannabis use		
0 times/4 weeks	Ref.	Ref.
≥ 1 time/4 weeks	**0.25 (0.10; 0.60)**	0.59 (0.18; 1.93)

Table 5. Continued

	Univariable model of self-sufficiency[a]	Multivariable model of self-sufficiency[b]
	OR (95% CI)*	OR (95% CI)*
Criminal behavior		
0 times/year	Ref.	Ref.
≥ 1 time/year	0.50 (0.16; 1.62)	0.86 (0.21; 3.57)
Truancy		
0 hours	Ref.	Ref.
1-5 hours	1.10 (0.60; 2.02)	1.66 (0.77; 3.57)
≥ 6 hours	0.36 (0.10; 1.26)	0.67 (0.14; 3.10)
Indicators of health status		
Sickness absence (days/ 8 weeks)	**0.93 (0.89; 0.98)**	0.98 (0.93; 1.04)
Depressive symptoms (CES-D scale)	**0.90 (0.87; 0.93)**	**0.90 (0.86; 0.93)**

Note: Self-sufficiency was entered as an ordinal variable ranging from self-sufficient on all life-domains, self-sufficient on ten life-domains, self-sufficient on nine life-domains and self-sufficient on eight or less life-domains. Odds ratios represent the odds for a participant to be allocated within a higher self-sufficiency category if they would have scored one point higher on the predictor variable. Bold numbers indicate a statistically significant (p<0.05) association.

*Odds ratio (OR) and 95% confidence interval (95% CI) from ordinal regression analyses.

[a] The predictor variables were entered separately in the univariable model.

[b] The predictor variables were entered simultaneously in the multivariable model.

[c] Intermediate vocational education consists of four levels: 1=assistant training; 2=basic vocational training; 3=vocational training; 4=middle-management training.

[d] Binge drinking was defined as consuming five or more alcoholic drinks on one occasion.

DISCUSSION

This study investigated the association of young adults' self-sufficiency to function in daily life with contextual factors and indicators of health status. Our results suggest that the life-domains 'finances', 'mental health', and 'physical health' were most often reported as a problem area regarding self-sufficiency among young adults. Furthermore, young adults reporting more sick days from school or higher depressive symptom levels were less likely to be self-sufficient overall and on several life-domains.

Our finding that a large percentage of young adults participating in our study seemed to face challenges in functioning on the life-domains of 'finances', 'mental health', and 'physical health' was partly in line with a previous study. Bannink et al. [21] studied the same eleven life-domains of self-sufficiency among a comparable sample of intermediate vocational education students aged 18.3 years on average. Similar to our study, they reported that the life-domains 'finances' and 'mental health' were the

most challenging areas. However, the second largest problem area in their study was 'domestic relations', while in our study, this was 'physical health' (i.e. physical self-sufficiency regarding sickness and the ability to deal with the sickness). Furthermore, their study showed overall fewer problems in being self-sufficient on all life-domains. These differences could be explained by an overrepresentation of young adults who display extensive sickness absence as a result of our sample selection, in which we purposely aimed to select more students with extensive sickness absence.

Overall, especially indicators of health status (i.e. sickness absence and depressive symptoms) were related to diminished overall self-sufficiency and self-sufficiency on specific life-domains, for instance 'daytime activities' and 'social network'. These findings concur with previous research where mental disorders were found to affect daily functioning by limiting personal, social, and work life [31]. And with research where depressive symptom levels among adolescents were inversely related to life satisfaction, and academic and emotional self-efficacy [32 33]. Finally, absence from school, either due to sickness or truancy, was found to be related to low levels of academic achievements and antisocial or risky behaviors, such as ineffective coping [34 35].

Cannabis use was related to diminished overall self-sufficiency in the ordinal regression analyses, but not in the logistic regression analyses for the separate life-domains. This difference may be due to the fact that cannabis users had the likelihood of falling especially into the group that was self-sufficient on eight or fewer life-domains on the ordinal variable (data are not shown). This suggests that cannabis users are more likely to have trouble with self-sufficiency on multiple life-domains simultaneously.

The finding that young adults who do not live with a caretaker are less self-sufficient on the life-domains 'finances' and 'housing' suggests that specific attention should be given to young adults' financial situation and future housing situation, especially for those who are on the verge of moving out of their caretakers' house. Parents, school staff and Youth Health Care professionals should be encouraged to address this, for example in the form of parental role-modeling or parental teaching and by communication between parents and their child about work [36 37].

Our findings underline the importance of early promotion of self-sufficiency, preferably before the transition from adolescence to young adulthood has begun. In this regard, it is recommended to stimulate social-emotional competencies through social and emotional learning programs [38] and to use resilience-focused school-based interventions

[39]. These resilience-focused interventions focus on resilience protective factors (e.g. personal strengths and qualities of community environments) that enable an individual to thrive and to overcome disadvantage. Also, sickness absence and depressive symptoms appear to be risk factors associated with diminished self-sufficiency and should therefore be monitored and addressed when empowering young adults in their functioning in daily life.

This study has some limitations that warrant consideration when interpreting the results. First, some factors that are possibly related to self-sufficiency were not assessed. For instance, income as a possible factor affecting (financial) self-sufficiency or dietary and sedentary behaviors as possible factors affecting (mental) health [40-42]. Second, this study was exploratory in the sense that we used a large set of predictor variables to test for possible associations with self-sufficiency. If we would apply the Bonferroni correction for multiple testing on both the ordinal regression analyses (corrected significance level is 0.05/13=0.004), similar results would be obtained, except for the non-significant association of cannabis use and self-sufficiency after correction. Third, the questionnaires were completed at two time points; therefore, we could not infer causality. Also, a relatively large number of participants did not respond to the follow-up questionnaire, which could have led to power problems in detecting significant associations at follow-up. A large study with multiple follow-up measures is recommended to gain insight into the direction of the associations. Lastly, our study was done in a population of students attending intermediate vocational education, which is a relatively low level of education [17]; also, there was an overrepresentation of students with extensive sickness absence from school; therefore, we recommend to repeat this study in large varied samples in other countries and settings.

Conclusion

This study assessed the association of young adults' self-sufficiency to function in daily life with contextual factors and indicators of health status. Several factors were associated with worse self-sufficiency, especially indicators of health status in the form of sick days from school and depressive symptoms. Our findings underline the importance of early promotion of self-sufficiency, preferably before the transition from adolescence to young adulthood has begun. It is recommended to stimulate adolescents' and young adults' social-emotional competencies, and to address sickness absence and depressive symptoms.

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SUPPLEMENTARY MATERIAL

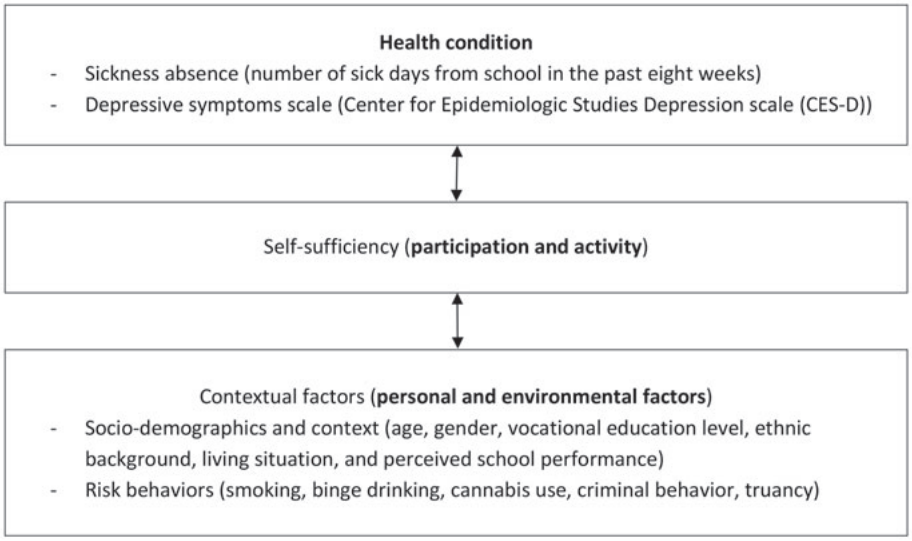


Figure S1. Studied factors incorporated in the International Classification of Functioning, Disability and Health (ICF) of the WHO.

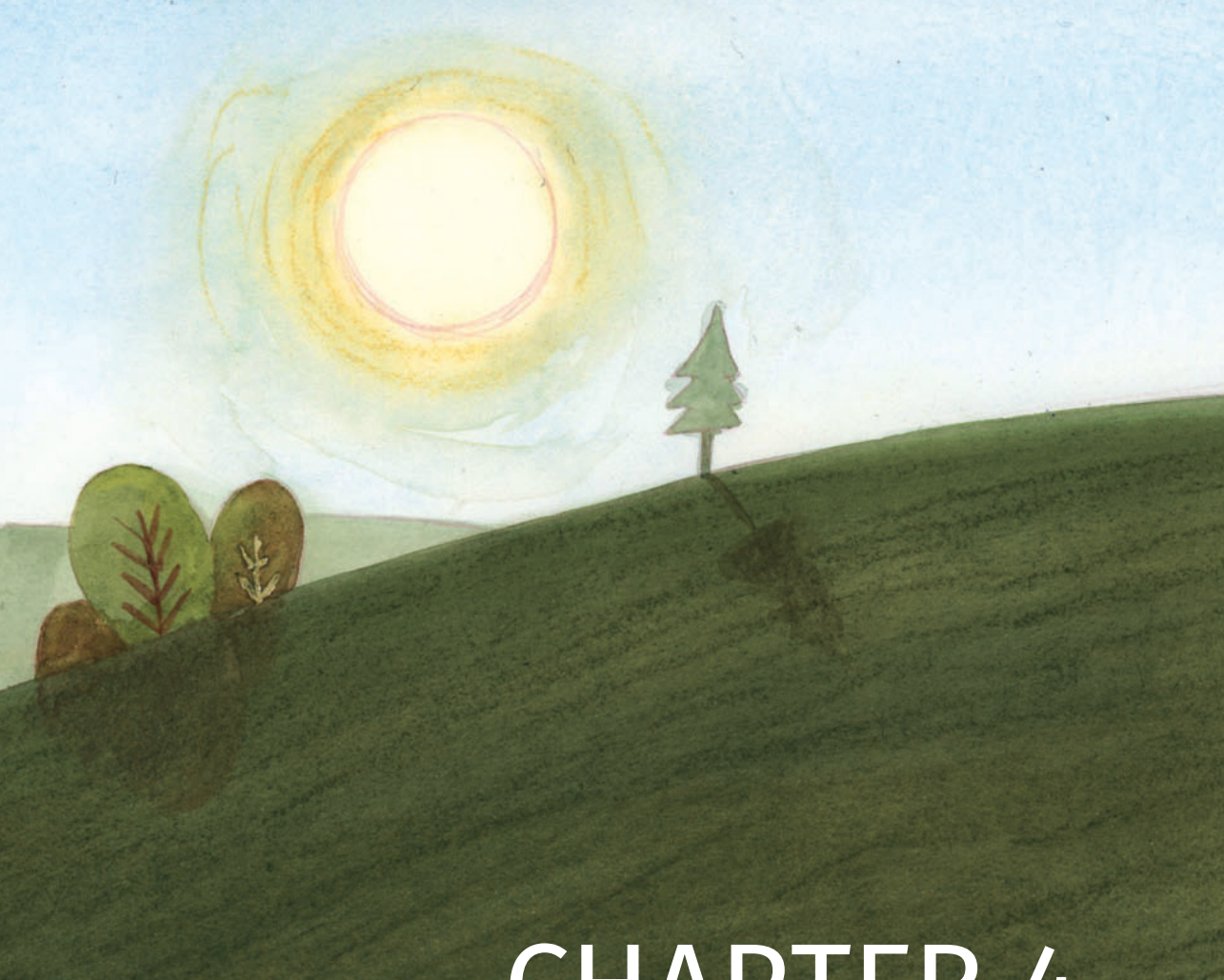
Table S1. Description of life-domains derived from the Dutch self-sufficiency matrix.

Life-domain	Description
Finances	*Think of:* having the money to make ends meet
Daytime activities	*Think of:* attending a course or education, go to the classes
Housing	*Think of:* having a fixed and safe place to live
Domestic relations	*Think of*: trusting each other, supporting each other
Mental health	*Think of:* feeling good and being happy
Physical health	*Think of:* having a disease or disability and being able to deal with that
Addiction	*Think of:* quitting with gaming, alcohol or cannabis
Activities daily life	*Think of:* eating, washing, getting dressed, grocery shopping
Social network	*Think of:* support from family and friends
Community participation	*Think of:* leisure time activities
Judicial	*Think of:* contact with police or having a criminal record

Table S2. Lost to follow-up analysis on socio-demographic characteristics (N=755).

		Population for longitudinal data analysis n=200	Lost to follow-up n=555	*p*-value
Socio-demographic characteristics				
Age in years, mean (SD)	[3]	18.5 (1.9)	18.6 (2.1)	.711
Gender, n female (%)	[2]	157 (78.9)	398 (71.7)	**.049**
Intermediate vocational education level, n level 4 (%)	[28]	153 (80.1)	325 (60.6)	**.000**
Ethnic background, n Dutch (%)	[9]	151 (77.4)	301 (54.6)	**.000**

Note: [number of missing answers]. Bold numbers indicate statistical significance ($p<0.05$) between the population for the longitudinal data analysis and lost to follow-up.



CHAPTER 4

Associations of socio-demographic characteristics, well-being, school absenteeism, and substance use with recreational nitrous oxide use among adolescents: a cross-sectional study

Suzanne J. van den Toren, Amy van Grieken, Hein Raat

Submitted

ABSTRACT

Purpose

A rapid increase of recreational nitrous oxide use (i.e. laughing gas, N_2O) has been reported in several countries, while it has received limited attention in scientific research. We aimed to study the association of socio-demographic characteristics, internalizing and externalizing problems, mental well-being, sickness absence, truancy, and substance use with the frequency of lifetime nitrous oxide use among adolescents.

Methods

We used self-reported questionnaire data of adolescents (N=555) attending secondary schools to cross-sectionally assess the frequency of nitrous oxide use and potential factors associated with nitrous oxide use, such as gender, mental well-being, and binge drinking. Ordinal logistic regression models were applied with lifetime nitrous oxide use (never, once, ≥ two times) as the outcome variable.

Results

Adolescents were on average 15.6 years old (SD=0.83, range 14-18), 47.0% were female. In total, 86 (15.6%) adolescents had used nitrous oxide at least once in their life.

In the multivariable ordinal regression model, the risk of having a higher category of lifetime nitrous oxide use was associated with a non-Dutch ethnic background (OR=2.10, 95% CI 1.22; 3.61), attending pre-vocational education (OR=1.88, 95% CI 1.06; 3.34), having a higher score on the scale of externalizing problems (OR=1.10, 95% CI 1.01; 1.20), binge drinking twice or more in the past four weeks (OR=2.49, 95% CI 1.25; 4.94), and cannabis use (OR=1.98, 95% CI 1.03; 3.79).

Conclusion

Youth Health Care professionals should be aware of nitrous oxide use in adolescents, especially among adolescents with a non-Dutch ethnic background, lower education levels, externalizing problems, frequent binge drinking, and cannabis use.

INTRODUCTION

The recreational use of nitrous oxide (i.e. laughing gas, N_2O) has been reported to increase rapidly in western countries [1-4]. In a study among night lifers in 2016, nitrous oxide has the third-highest percentage of lifetime (53.5%) and past-year 'drug users' (37.3%), after cannabis and ecstasy [2].

Studies using a representative sample of 12-16-year-old secondary school students demonstrated an increase in lifetime nitrous oxide use between 2015 (7.8%) and 2017 (9.4%), which was significant for girls [3 4]. Between the ages of 12 and 16 years, the lifetime use of nitrous oxide was found to increase from 3.5% to 16.9%, with the biggest increase at 14 and 15 years-of-age [4]. Especially in the developing brain of adolescents, the use of nitrous oxide might impact functioning in the long term, as is seen in substance use other than nitrous oxide [5 6].

Users inhale nitrous oxide most commonly from balloons filled with nitrous oxide [7]. In rare cases, users inhale the gas directly from the cylinder or whipped cream dispenser, which could result in complications, such as a frostbite injury [8]. The use causes lowered consciousness, dizziness, and deformation of vision and sound. These consequences may result in euphoric feelings as well as anxiety or distress. The effects disappear circa five minutes after inhaling, but there is some evidence that the effects may linger on for hours [7].

Recently, awareness of the risks of recreational nitrous oxide use is growing [1 9-11]. In the short term, excessive nitrous oxide use at one occasion might cause oxygen deficiency in the brain. This could lead to dizziness and risk of accidents, for example through falling. Of respondents who lost consciousness after substance use, 11% reported having used nitrous oxide before their black-out [2]. The Dutch police reported an increase in traffic incidents related to the use of nitrous oxide between 2018 and 2019 [10]. In the long term or with excessive use over time, users reported confusion and headache, probably as a result of oxygen deficiency. Also, a deprivation of vitamin B12 could occur. This deprivation may lead to neurological deficits and anemia [1 7 9 11 12]. A study found psychiatric symptoms, such as panic attacks, confusion, or delusions as a result of nitrous oxide abuse in 11 cases out of 91 in total [13].

Substance use, such as alcohol drinking and alcohol intoxication, has been associated with conduct problems and mental health problems among adolescents [14-16].

Furthermore, the onset of alcohol, tobacco, and marijuana use has been associated with school attendance problems, such as truancy [17 18]. So far, it is unknown whether the use of nitrous oxide is associated with similar issues among adolescents.

We aim to explore the association of social-demographic characteristics, internalizing and externalizing problems, mental well-being, sickness absence from school, truancy, and substance use (tobacco, alcohol, and cannabis) with the frequency of lifetime nitrous oxide use among adolescents in a general population sample.

METHODS

Study design, setting, and participants

A cross-sectional design was used to explore what factors are associated with lifetime nitrous oxide use among adolescents. Questionnaire data were used derived from the study on the extension of preventive Youth Health Care for adolescents. This extension of preventive health care for adolescents aims to promote health and health behaviors in adolescents above the age of 13 years, with a specific focus on preventive education on substance use and lifestyle [19]. It is offered by the Dutch Youth Health Care in collaboration with the local municipality and schools. The Youth Health Care offers nationwide anticipatory guidance for children and youth to promote growth, development, and health. This guidance generally entails health consultations, which often take place at school with a youth physician or nurse [20]. A project was set up to evaluate the extension of preventive Youth Health Care for adolescents in two simultaneous parts, e.g. by conducting a survey and focus group interviews among adolescents [21].

All twenty-five organizations in the Dutch Youth Health Care regions were invited to participate in this study (Figure 1). Twenty-two organizations responded to this invitation (88%), of which twelve organizations indicated their willingness to participate (48% of all invited organizations). Four Youth Health Care organizations in four different regions participated in the questionnaire part of the study (other organizations participated in other parts of the project, such as focus groups). Each of these four participating organizations provided a contact person at one or two schools within their region to inform about the possibility of conducting a study at that school. Finally, seven schools within the four different regions were included, which entailed twenty-seven classes. These classes consisted of 609 adolescents in total, of whom 555 adolescents

(91.1%) provided informed consent and participated in our study (Figure 1). The contact person at the school was informed about the procedure of preparation and execution of the study. All parents and potential participants (adolescents) were informed prior to the study about the purpose and the procedure of the study; the parents had the possibility to object to participation. Adolescents provided written informed consent before completing the questionnaire (N=555). An appointed fieldworker conducted the anonymous online questionnaire in class during school hours (+/- 20 minutes). Data were collected in the fall of 2016.

The Medical Ethics Committee of the Erasmus University Medical Centre Rotterdam issued a declaration of no objection to conducting this study and permitted to submit the results for publication in a scientific journal (number MEC-2016-297).

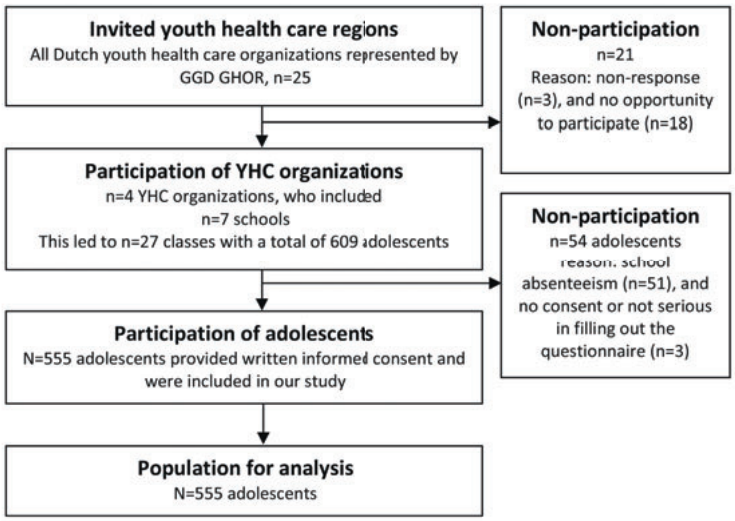


Figure 1. Flowchart of the study population.

Measurements

The questionnaire assessed nitrous oxide use, social-demographic characteristics, mental health, sickness absence, truancy, and substance use.

Nitrous oxide use

Nitrous oxide use was assessed by the question: "How many times did you use nitrous oxide in your life". Answer options ranged from 'never', 'once', 'twice', '3 times', '4-10 times', and '≥ 11 times'. For analysis purposes, this variable was recoded into three categories: 'never used', 'used one time', and 'used ≥ two times' [22].

Participants who indicated that they had never used nitrous oxide answered a subsequent question: "Do you think you will ever use nitrous oxide?". Answer options were a 5-point Likert scale 'definitely', 'maybe', 'probably not', 'definitely not', and 'I do not know'.

Participants who indicated that they had used nitrous oxide answered another subsequent question: "Do you think you will use nitrous oxide again?" Answer options were 'definitely', 'maybe', and 'never again'.

Predisposing factors

Predisposing factors of the integrated change model were used to select relevant factors [23]. This model considers biological factors, social & cultural factors, psychological factors, and behavioral factors as factors preceding behavior.

Biological factors and social-cultural factors

Characteristics such as age (in years), gender (boy vs. girl), ethnic background (Dutch vs. non-Dutch), school level (pre-vocational education vs. senior secondary & pre-university education), and living situation (living with both parents vs. not living with both parents) were entered as biological and social-cultural factors. Ethnic background was classified as Dutch or non-Dutch, by following the definition of Statistics Netherlands; adolescents with at least one parent born outside the Netherlands were classified as non-Dutch [24].

Psychological factors and health

Internalizing and externalizing difficulties were assessed by the Dutch self-report version of the Strengths and Difficulties Questionnaire (SDQ) [25]. The SDQ consists of 25 items regarding emotional problems, conduct problems, hyperactivity-inattention, peer problems, and prosocial behavior, all scored on a 3-point scale: 0 = 'not true', 1 = 'somewhat true', and 2 = 'certainly true'. The SDQ can be divided into two subscales, i.e. an internalizing scale (items on emotional and peer problems) and an externalizing

scale (items on conduct problems and hyperactivity-inattention), both ranging from 0-20. A higher score indicates more problems [26].

Mental well-being was assessed by the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) [27]. This scale consists of 14 items assessing elements of mental well-being, such as happiness and sense of purpose in life. Each of the 14 items was answered on a 5-point Likert scale (1 'none of the time' to 5 'all of the time'), based on the adolescents' experiences in the past two weeks. A total score is generated based on the 14 answers, with a minimum total score of 14 and a maximum total score of 70. A higher score indicated a higher level of mental well-being.

Sickness absence was assessed by the question: "How many days in the past four weeks have you been absent from school because you were sick?" (Answer categories ranged from '0 days' to '≥ 7 days') [28]. For analysis purposes, sickness absence in the past four weeks was recoded into '0 days', '1 day', and '≥ 2 days'.

Behavioral factors

Truancy was assessed by the question: "How many days in the past four weeks have you been absent from school because you were truanting?" (Answer categories ranged from '0 days' to '≥ 7 days') [22]. For analysis purposes, truancy in the past four weeks was dichotomized into '0 days' and '≥ 1 day'.

Binge drinking was assessed by the question: "How many times in the past four weeks did you consume 5 or more alcoholic drinks on one occasion in the past four weeks? (for example at a party or in one evening)"; by following the international definition of binge drinking [29]. The response categories ranged from 'never' to 'nine or more times' and were recoded into 'not once', 'once', and '≥ 2 times'.

Cigarette smoking was assessed by the question: "Did you ever smoke?"(Answer categories ranged from 'no' to 'yes a whole cigarette or more' and were dichotomized into 'never' and '≥ 1 time in life' [22].

Cannabis use was assessed by the question: "Did you ever use weed (marijuana) or hashish?" (Answer categories ranged from 'never' to '30 days or more' and were dichotomized into 'never' and '≥ 1 time in life' [22].

Data Analysis

Descriptive statistics were used to describe the social-demographic characteristics of adolescents. Differences between the group that had never used nitrous oxide in their life versus the group that had used nitrous oxide in their life were tested by chi-square tests (for categorical variables) and independent sample t-tests (for continuous variables) (Table 1).

Descriptive statistics were used to describe adolescents' nitrous oxide use in their life in terms of frequency and future preferences (Table 2).

To examine associations of socio-demographic characteristics, internalizing and externalizing problems, mental well-being, sickness absence from school, truancy, and substance use on the one hand and lifetime nitrous oxide use on the other hand, ordinal logistic regression analyses were performed. Nitrous oxide use was entered as an ordinal outcome variable ranging from never used, used one time, and used two times or more. All the other before mentioned factors were entered as predictor variables. We present the univariable and multivariable models (Table 3). To identify if multicollinearity between predictors existed, the variance inflation factors (VIFs) were explored. All VIFs were lower than 2, suggesting weak multicollinearity between predictors [30]. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated. The estimated odds ratios represent the multiplicative change in the odds for an adolescent to be allocated to a higher lifetime nitrous oxide user category when they would have scored one point higher on a predictor variable. We considered a p-value of 0.05 or lower to be statistically significant. All analyses were performed using SPSS version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.).

RESULTS

Participant characteristics

The study population was on average 15.6 years old (SD=0.83, range 14-18), 47.0% were female and 71.9% were classified as Dutch (Table 1). Of the 552 participants who answered questions about their nitrous oxide use, 86 (15.6%) had used nitrous oxide at least once in their life.

Table 1. Socio-demographic characteristics of the study population (N=555).

Socio-demographic characteristics	Total population N=555	Never used nitrous oxide n= 466	Used nitrous oxide ≥ 1 time n=86	*p*-value
Age in years, mean (SD)				
Age in years	15.6 (0.83), range 14-18	15.6 (0.82)	15.6 (0.91)	0.701
Gender, n (%)				
Male	294 (53.0)	248 (53.2)	44 (51.2)	0.726
Female	261 (47.0)	218 (46.8)	42 (48.8)	
Ethnic background, n (%)				
Dutch	399 (71.9)	343 (73.6)	53 (61.6)	**0.027**
Non-Dutch	156 (28.1)	123 (26.4)	33 (38.4)	
School level, n (%)				
Pre-vocational education	288 (51.9)	226 (48.5)	61 (70.9)	**<0.001**
Senior secondary & pre-university education	267 (48.1)	240 (51.5)	25 (29.1)	
Living situation, n (%)				
With both my parents	379 (68.3)	327 (70.2)	49 (57.0)	**0.023**
Not with both my parents	176 (31.7)	139 (29.8)	37 (43.0)	

Note: bold numbers indicate a statistically significant ($p<0.05$) difference between the group that never used nitrous oxide versus the group that did use nitrous oxide, calculated using an independent-samples t-test (continuous variables) or a chi-square test (categorical variables). There were zero missing answers on the socio-demographic questions. There were three missing answers on question regarding the use of nitrous oxide.

Table 2 presents the descriptive statistics of nitrous oxide use in the total study population. A total of 466 participants had never used nitrous oxide in their life and a total of 86 participants had used nitrous oxide in their life. Furthermore, 35/86 participants had used nitrous oxide once, 51/86 participants had used it twice or more. The largest proportion of participants who had never used nitrous oxide indicated they were sure they would never use it in the future (n=200/466). The largest proportion of participants who had used nitrous oxide before indicated they would definitely use it again (n=45/86).

Table 2. Recreational nitrous oxide use in the total population (N=555).

Nitrous oxide use	N (%)
In whole life [3]	
Never	466 (84.4)
1 time	35 (6.3)
2 times	17 (3.1)
3 times	13 (2.4)
4-10 times	14 (2.5)
≥ 11 times	7 (1.3)
For the participants who did not use nitrous oxide: Do you think you will ever use nitrous oxide? [89]	
Definitely	26 (5.6)
Maybe	89 (19.1)
Probably not	67 (14.4)
Definitely not	200 (42.9)
I do not know	84 (18.0)
For the participants who did use nitrous oxide before: Do you think you will use nitrous oxide again? [469]	
Definitely	45 (52.3)
Maybe	35 (40.7)
Never again	6 (7.0)

Note: [number of missing answers].

Results of the regression analyses

Table 3 shows the association of biological factors and social-cultural factors, psychological factors and health, and behavioral factors with lifetime nitrous oxide use, as assessed with ordinal logistic regression analyses. In the multivariable model, participants classified as non-Dutch were at risk of having a higher category of nitrous oxide use (OR=2.10, 95% CI 1.22; 3.61), as were participants who attend pre-vocational education (OR=1.88, 95% CI 1.06; 3.34). Participants with a higher score on the externalizing SDQ scale were also at risk of having a higher category of nitrous oxide use (OR=1.10, 95% CI 1.01; 1.20), as were participants who indicated they had been binge drinking twice or more in the past four weeks OR=2.49, 95% CI 1.25; 4.94), and participants who used cannabis (OR=1.98, 95% CI 1.03; 3.79).

Table 3. Results of the univariable and multivariable ordinal logistic regression analyses evaluating associations of biological factors and social-cultural factors, psychological factors and health, and behavioral factors with recreational nitrous oxide use.

	Univariable model[a]	Multivariable model[b]
	OR (95% CI)*	**OR (95% CI)***
Biological factors and social-cultural factors		
Age (in years)	0.97 (0.73; 1.27)	0.90 (0.65; 1.24)
Gender		
Male	Ref.	Ref.
Female	1.06 (0.67; 1.67)	0.87 (0.50; 1.51)
Ethnic background		
Dutch	Ref.	Ref.
Non-Dutch	**1.74 (1.08; 2.80)**	**2.10 (1.22; 3.61)**
School level		
Senior secondary and pre-university	Ref.	Ref.
Pre-vocational	**2.66 (1.62; 4.38)**	**1.88 (1.06; 3.34)**
Living situation		
With both parents	Ref.	Ref.
Not with both parents	**1.82 (1.14; 2.91)**	1.45 (0.85; 2.46)
Psychological factors and health		
Internalizing problems (range 0-20)[c]	**1.10 (1.03; 1.19)**	1.04 (0.94; 1.15)
Externalizing problems (range 0-20)[c]	**1.20 (1.12; 1.29)**	**1.10 (1.01; 1.20)**
Mental wellbeing (range 14-70)[d]	**0.96 (0.93; 0.99)**	1.00 (0.97; 1.03)
Sickness absence from school		
0 days/4 weeks	Ref.	Ref.
1 day/4 weeks	1.32 (0.72; 2.40)	1.20 (0.62; 2.32)
≥ 2 days/4 weeks	1.69 (0.99; 2.90)	1.11 (0.60; 2.04)
Behavioral factors		
Truancy		
0 days/4 weeks	Ref.	Ref.
≥ 1 day/4 weeks	**4.04 (1.85; 8.83)**	1.60 (0.65; 3.96)
Binge drinking[e]		
0 times/4 weeks	Ref.	Ref.
1 time/4 weeks	1.84 (0.84; 4.01)	1.25 (0.53; 2.97)
≥ 2 times/4 weeks	**4.77 (2.79; 8.16)**	**2.49 (1.25; 4.94)**
Cigarette smoking		
Never	Ref.	Ref.
≥ 1 time in life	4.22 (2.63; 6.79)	1.68 (0.86; 3.25)
Cannabis use		
Never	Ref.	Ref.
≥ 1 time in life	**4.05 (2.45; 6.71)**	**1.98 (1.03; 3.79)**

Note: bold numbers indicate a statistically significant (p<0.05) association. Nitrous oxide use was entered as an ordinal variable ranging from never used, used one time, used ≥ two times.
*Odds ratio (OR) and 95% confidence interval (95% CI) from ordinal logistic regression analyses.
[a] The predictor variables were entered separately in the univariable model.
[b] The predictor variables were entered simultaneously in the multivariable model.
[c] As measured with the Strengths and Difficulties Questionnaire (SDQ).
[d] As measured with the Warwick-Edinburgh Mental Well-being Scale (WEMWBS).
[e] Binge drinking was defined as consuming 5 or more alcoholic drinks on one occasion.

DISCUSSION

This study investigated the association of socio-demographic characteristics, internalizing and externalizing problems, mental well-being, sickness absence from school, truancy, and substance use with the frequency of lifetime nitrous oxide use among adolescents (15.6 years). Our results indicate a lifetime nitrous oxide use prevalence of 15.6% among the studied population. Especially a non-Dutch ethnic background, a pre-vocational education school level, externalizing problems, frequent binge drinking, and cannabis use were associated with increased lifetime use of nitrous oxide.

The lifetime prevalence of nitrous oxide of 15.6% in our study is comparable with the prevalence in the Health Behaviour in School-aged Children study of 2017, where 13.9% of 15-year-olds and 16.9% of 16-year-olds reported lifetime nitrous oxide use [4]. This prevalence is slightly higher than the reported prevalence in a national representative study in 2015 of 10.6% among 15-year-olds and 14.1% among 16-year-olds [3]; lifetime nitrous oxide use among 15-16-year-olds might have increased.

In our study, participants with a non-Dutch ethnic background had higher odds of increased lifetime nitrous oxide use. This resonates with findings from the Health Behaviour in School-aged Children study among 12-16-year-olds where participants with a non-western migration background had a significantly higher prevalence of lifetime nitrous oxide use than participants who had no migration background [4]. This significant result is not visible in the general adult population in the Netherlands [31]. Nabben et al., based on information from experts, distinguishes a group of beginning nitrous oxide users that is typically formed by under aged secondary school students. These users are relatively often from urban areas and often have a migration background. For this group, nitrous oxide does not have the status of being a drug and is seen as more innocent than alcohol or cannabis. Moreover, using alcohol or cannabis is considered a taboo, for example for religious reasons [32]. Other research suggests that ethnic differences in adolescent tobacco, alcohol, and drug use are possibly explained by background and lifestyle factors, such as educational values and religious commitment [33]. We recommend future studies to explore the association between substance use, in particular nitrous oxide, and ethnic background.

Our results indicated that participants who attended pre-vocational education had higher odds of lifetime nitrous oxide use compared with adolescents attending higher

educational levels. This finding is confirmed by previous studies showing that lower Grade Point Average in adolescence was associated with alcohol and illicit drug use [34 35].

The association we found between externalizing problems and increased lifetime use of nitrous oxide concurs with previous research where associations were found between externalizing behavior problems and the use of alcohol and drugs among adolescents [36 37]. Externalizing behavior consists of outward behavior, such as impulsive and deviant behavior that may be closely linked to risk health behaviors, for instance, drug use [36].

Further, our findings suggest an association of frequent binge drinking and cannabis use with increased lifetime nitrous oxide use. Co-occurrence of risk behaviors has been reported in other studies where clustering of alcohol misuse, smoking, and illicit drug use was observed among young adults [38]. The combination of heavy alcohol drinking and nitrous oxide use is suggested to be a dangerous combination because heavy alcohol drinking may disrupt the stimulus to breathe, which could lead to a deficit in oxygen if nitrous oxide is inhaled [39].

We could not demonstrate a link between school attendance problems (i.e. sickness absence or truancy) and nitrous oxide use in the multivariable model. Previous research did find an association between attendance problems and substance use other than nitrous oxide [34]. One explanation can be found in the result of exploratory analyses where the significant association between truancy and nitrous oxide use in the univariable model disappears after adding binge drinking to the model (data not shown). This suggests that binge drinking and truancy are related. Another explanation might be that the use of nitrous oxide is particularly high at parties and festivals [2 31], therefore possibly does not interfere with school attendance.

We highlight the potential for interventions to target risk behaviors, such as nitrous oxide use, binge drinking, and cannabis use, preferably starting in early adolescence, to protect adolescents' developing brains before the risk behaviors are occurring. School-based interventions using approaches of social competence and social influence have been shown protective of drugs and cannabis use: we recommend to study whether this approach can be applied to promote a broad healthy lifestyle, including avoiding the risks of nitrous oxide use [40].

This study has several limitations that warrant consideration when interpreting the results. First, we might have missed some factors relevant to nitrous oxide use that were not available in our study, such as criminal behaviors. Second, for the outcome variable,

we depended on a self-reported question asking about the lifetime use of nitrous oxide. We did not take into account how many balloons filled with nitrous oxide were inhaled at one occasion. The number of balloons inhaled at one occasion has been reported to be associated with accidental injury [1]. Third, we could not detect certain trends over time as the questionnaire was analyzed cross-sectionally. A study with multiple follow-up measures is needed to draw conclusions on the direction of the associations. Lastly, we included adolescents from different areas in the Netherlands. However, the sample size was relatively small. We recommend future research to include a large sample of adolescents from several countries to increase the external generalizability of the results. This was one of the first studies that explored what factors were associated with lifetime nitrous oxide use among adolescents. Therefore, it is necessary that future research investigates whether our findings can be replicated.

Conclusion

This study assessed the association of adolescents' lifetime nitrous oxide use with socio-demographic characteristics, internalizing and externalizing problems, mental well-being, sickness absence from school, truancy, and substance use. A non-Dutch ethnic background, attending pre-vocational education, externalizing problems, binge drinking more than once in the past month, and cannabis use were associated with increased lifetime use of nitrous oxide. Our findings give implications for policy and practice to address drug use and in particular nitrous oxide use as an increasingly popular drug among adolescents and to promote healthy adolescent' lifestyles from an early age onwards.

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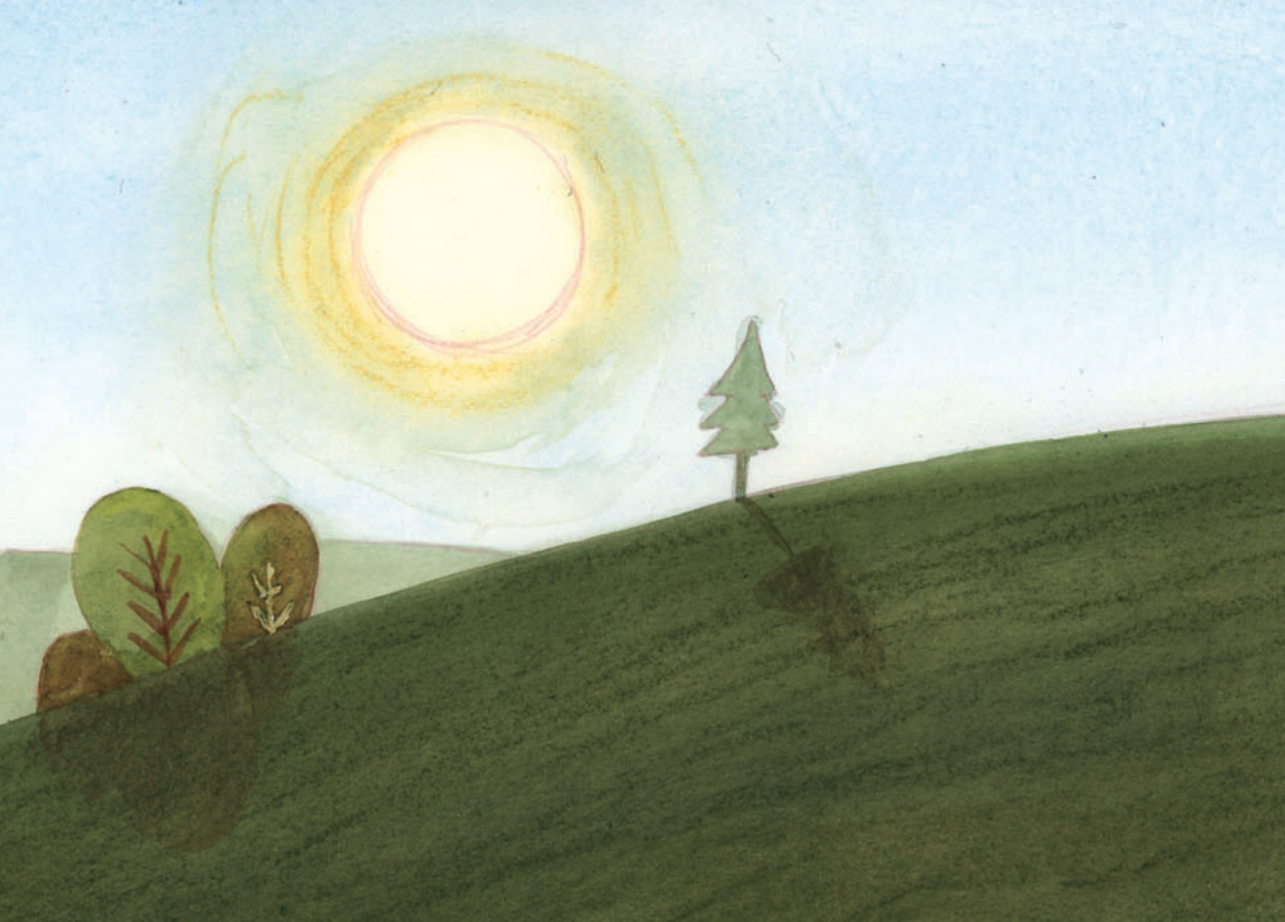
PART II

Promotion of health behaviors among adolescents and young adults



CHAPTER 5

Addressing sickness absence among adolescents and young adults: an evaluation of the Medical Advice for Sick-reported Students intervention

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ABSTRACT

Purpose

Sickness absence is associated with lower school achievements and early school leaving. The Medical Advice for Sick-reported Students (MASS) intervention is a proactive school-based intervention focused primarily on early identification and reduction of sickness absence. This study used a program evaluation framework to evaluate the MASS intervention among intermediate vocational education students and Youth Health Care professionals. Outcome indicators were primarily number of sick days, education fit, and school performance, and secondarily, seven health indicators. Process indicators were dose delivered and received, satisfaction, and experience.

Methods

The MASS intervention evaluation was conducted in ten intermediate vocational education schools. Students with extensive sickness absence from school in the past three months were included in either the intervention or control condition. Students completed a baseline and a six-month follow-up self-report questionnaire. Linear and logistic regression analyses were applied. Students and Youth Health Care professionals completed an evaluation form regarding their satisfaction and experience with the intervention.

Results

Participants (n=200) had a mean age of 18.6 years (SD=2.02) and 78.5% were female. The MASS intervention showed positive results on decreasing sickness absence in days (β=-1.13, 95% CI=-2.22; -0.05, $p<0.05$) and on decreasing depressive symptoms (β=-4.11, 95% CI= -7.06; -1.17, $p<0.05$). No effects were found for other health indicators ($p>0.05$). A significant interaction revealed a decline in sickness absence in males ($p<0.05$) but not in females ($p>0.05$). Youth Health Care professionals found the application of the MASS intervention useful (n=35 forms). The mean rating of students for the consultation within the MASS intervention was an 8.3 (SD=1.3) out of 10 (n=14 forms).

Conclusion

Our study provides some indication that the MASS intervention has positive effects on decreasing both sickness absence and depressive symptoms among intermediate vocational education students. The Youth Health Care professionals who provided the consultation as part of the MASS intervention considered the intervention to be useful

and stated that the consultation was delivered as intended in almost all cases. Students were generally satisfied with the intervention. We recommend that future research evaluates the MASS intervention in a large randomized controlled trial with a longer follow-up.

INTRODUCTION

Addressing frequent and/or prolonged school absenteeism among adolescents and young adults is considered to be of great societal importance as it is associated with decreased school performance and increased dropout rates [1]. School absenteeism can be divided into excused absence (e.g. sickness absence) and unexcused absence (e.g. truancy) [1 2]. Sickness absence is generally found to be more prevalent than truancy among adolescents [3-5]. In a study in the Netherlands, 40% of adolescents and young adults reported one or more sick days in the past month [4].

Another study found that more than half the cases of extensive sickness absence among adolescents were associated with problems such as psychosocial problems, sleeping difficulties, and lifestyle problems rather than related to a specific condition [6]. School-related factors, such as elevated study pressure, are also linked to sickness absence [7]. Increased sickness absence was also found to be associated with decreased mental and physical health-related quality of life, with physical complaints, and with decreased school performance [6 8-10]. Extensive sickness absence, a negative school attitude, and lower levels of achievement are strongly associated with early school leaving [11]. Early school leavers are students of up to 23 years old who leave education and training without attaining a basic education qualification for successfully entering the labor market [12 13]. These early school leavers are more vulnerable in terms of having lower earnings, needing government assistance, and reporting poor physical health than peers who do obtain their basic education qualification [1 14-16]. Adolescents who leave school due to health issues have been found to be especially vulnerable [17].

Sickness absence and early school leaving might be prevented through early identification of those students who report sick in order to evaluate whether additional support is needed. The Medical Advice for Sick-reported Students (MASS) intervention is a proactive school-based intervention with the focus on addressing sickness absence and associated indicators of health. In this intervention, schools collaborate directly with the Dutch Youth Health Care system. This system offers nationwide preventive

health care through anticipatory guidance for children and youth to promote growth, development, health, and well-being. The MASS intervention was initially implemented in pre-vocational education among students aged 12 to 16 years [18]. A significantly larger reduction in sickness absence was observed among students in the intervention condition receiving the MASS intervention than in the control condition. The MASS intervention has since been adapted to intermediate vocational education settings. In the Netherlands, this education is a type of upper secondary education (International Standard Classification of Education level 3), offering specialized job-oriented programs [13]. As students in intermediate vocational education are older (i.e. aged 15 years and older) than students in pre-vocational education, other factors may play a role in their reporting sick [7 19 20]. Furthermore, the majority of adolescents and young adults leave school when enrolled in intermediate vocational education [21 22]. Therefore, it is important to evaluate the MASS intervention among these students.

In this study, we applied the framework for program evaluation in public health from the Centers for Disease Control and Prevention (CDC) [23] to guide the MASS intervention evaluation. In this framework, a six-step approach toward program evaluation is proposed, including describing the program (i.e. the MASS intervention in our study) and justifying the conclusions. This framework advises to evaluate outcome indicators to measure whether the program is achieving the expected effects and process indicators to measure the programs' activities. First, we evaluated whether, at follow-up, students from intermediate vocational education with extensive sickness absence in the intervention condition have less sickness absence, a higher education fit, and higher school performance than students with extensive sickness absence who receive care as usual. In this regard, we further explored seven health indicators and hypothesize that students in the intervention condition will score better on these outcomes. Second, we evaluated the dose of the intervention delivered and received, and the satisfaction and experience of the intervention among students who received the intervention and the Youth Health Care professionals who delivered the intervention.

METHODS

Study design

The program evaluation of the MASS intervention was conducted between December 2015 and April 2017 [24].

A total of 22 intermediate vocational education school locations were invited to participate in the study (Figure 1). Twelve locations were not able to participate, mainly because of the anticipated time investment. Finally, eight locations in the city of Amsterdam and the regions of Utrecht and West-Brabant participated as intervention schools. These regions had implemented the MASS intervention during the course of our study as part of local policy. Two locations in the city of Rotterdam where the MASS intervention had not been implemented participated as control schools. These schools provided care as usual, which generally entailed a referral to a Youth Health Care professional on request of the student and, if possible, a consultation within the Care Advisory Team about the student [24]. Our intention was to include an equal number of students in the intervention and control condition, regardless of the number of participating schools.

The Medical Ethics Committee of the Erasmus University Medical Center Rotterdam reviewed the research proposal and gave permission to submit the results for publication in a scientific journal in the future (proposal number MEC-2015-614). This study was registered in the Netherlands Trial Register under number NTR5556, and it was reported according to the TREND guidelines [25].

Engage stakeholders

The schools and Youth Health Care professionals who implemented the MASS intervention were included in the development and the evaluation of the intervention, as were the students who were involved in the MASS intervention [7 24 26 27]. Youth Health Care professionals and researchers co-designed the participant questionnaire. Results of the current study were disseminated among schools and Youth Health Care professionals.

Describing the MASS intervention

The activities of the MASS intervention focus on the individual level (i.e. the student) and on the school level (i.e. school staff and policy) [19 24]. The individual-level activities entail a systematic five-step approach (see Table 1):

1) Appointed school personnel, most likely a mentor or counselor, contacts the student to address concerns about the sickness absence on the day of the sickness report. 2) A meeting between the student and appointed school personnel is arranged when the sickness absence becomes extensive (criteria predefined by each school). 3) The

school refers the student to a consultation with a Youth Health Care professional when this is deemed necessary. The school explains the benefit of this consultation to the student and hands out an information folder. 4) The professional analyses in depth the reason why a student reported himself sick, and then advises on and supports reintegration into school by making an action plan with the student and his/her parents for reintegration. For this, the biopsychosocial model and the self-sufficiency matrix are used. 5) The school is responsible for monitoring the sickness absence of the student and for implementing the action plan for reintegration, if this is created. The student who reported sick is not required to go through all five steps. The next step is only taken when the school deems this necessary as a result of ongoing or increasing sickness reporting by the student or when the student requests this.

The school-level activities entail agreements at policy level on how to actively monitor students' absences, i.e. approach students with extensive sickness absence via personal contact, request a consultation with the Youth Health Care professional, and arrange a follow-up for each student in the Care Advisory Team. In this team, Youth Health Care professionals, teachers, and other personnel who are concerned with students' health meet regularly to raise concerns about students and offer care to them. The MASS intervention is developed by following the intervention mapping approach [28 29]. Additionally, the intervention is based on Veerman's decision-making model, which was derived from occupational sickness absence. This model first considers the absence necessity (feeling sick) and then deliberates on weighing the pros and cons of reporting sick [30].

Table 1. Description of the key steps of the MASS intervention derived from van der Vlis et al. [24].

Step	Description
1	The school contacts the student who reports sick and asks about the context of the sickness report and condition of the student.
2	The school organizes a meeting with the student in case of extensive sickness absence (criteria predefined by each individual school). Parents are also invited when the student is younger than 18 years of age.
3	The school refers the student to a consultation with a Youth Health Care professional when this is deemed necessary and explains the benefit of this consultation to the student.
4	A consultation is organized by the regional Youth Health Care organization with the Youth Health Care professional and the student (and parents if the student is younger than 18 years old). Together they conduct a problem analysis, define the underlying problems and causes of the absence, using the biopsychosocial model and the self-sufficiency matrix. The possibilities of preventing recurrence of the absence and treatment are discussed and an action plan for reintegration is created, which is communicated to the school.
5	The school is responsible for monitoring the sickness absence of the student and school-related implementation of the reintegration plan, if created.

Participants and data collection

In both study conditions, students were included if they had 'extensive' sickness absence in the past three months (i.e. reporting sick at least four times or more than six consecutive school days in twelve school weeks).

To meet the wishes and ability of the schools to take part, two procedures were followed to select participants. At eight schools (i.e. seven intervention and one control school), an employee at the schools selected and invited students to participate if they met the inclusion criteria. At two schools (i.e. one intervention and one control school), whole classes were invited, and the involved researcher selected students who met the inclusion criteria afterward.

All selected students received an information letter and leaflet with information about the study from an employee at the schools. If they agreed to participate, they were asked to provide written consent. This consent form was attached to the baseline questionnaire. If eligible students were younger than 18 years old, their parents also received an information letter and brochure about the study, explaining that, if desired, they could object to their child's participation. Figure 1 presents the flow of participants through the study.

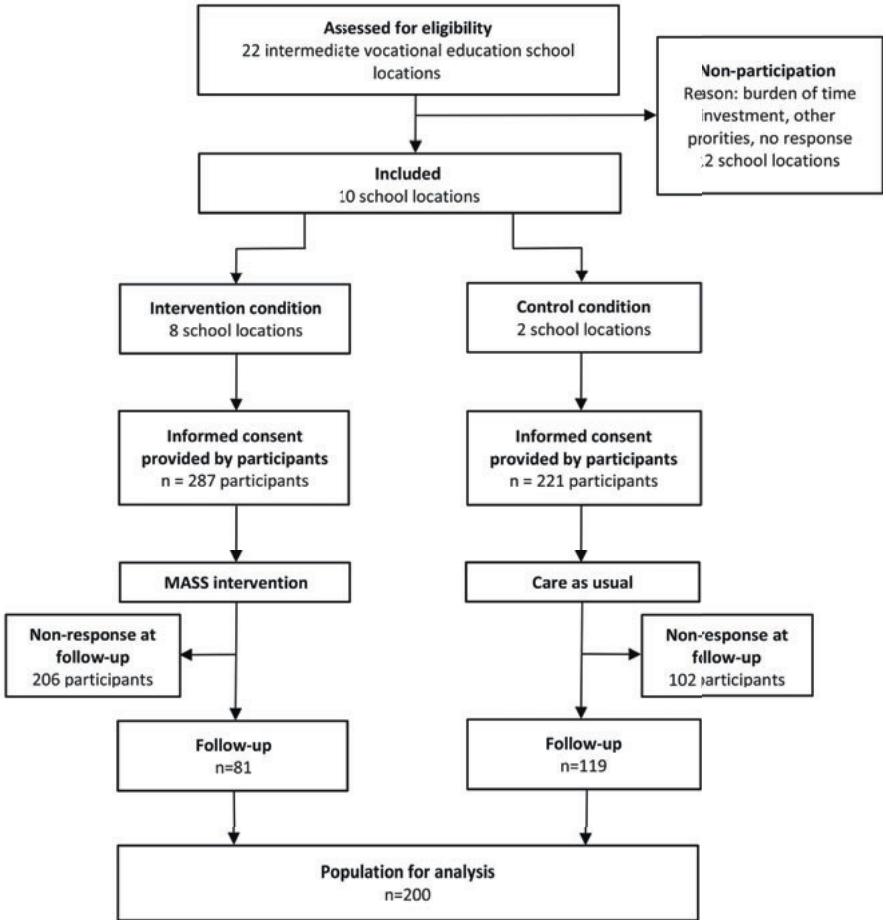

Figure 1. Flow chart of the study population.

Measurements

Data were collected among students at baseline and at six months post-baseline using a self-report questionnaire [24].

Program evaluation indicators

Primary outcome indicators

Sickness absence was measured with the item: "How many days in the past eight school weeks did you stay home from school because you were sick? (Do not count holidays)" [31].

Education fit was measured with the item: "Do you think this is a good education fit for you?"; answer options were dichotomized for analysis purposes: 'yes' ('yes' and 'a little') and 'no' ('I do not know', 'not really', and 'no') [31].

School performance was measured with the item: "How do you think your teacher estimates your school performance compared to other classmates?"; answer options were dichotomized for analysis purposes: 'above average' ('very good' and 'good') and 'average or less' ('average', 'less than average', and 'bad') [32].

Secondary outcome indicators

The Center for Epidemiologic Studies Depression scale (CES-D) was used to measure the scale of depressive symptoms. The CES-D is a validated 20-item scale covering the main components of depressive symptoms such as depressed mood, guilt, and feelings of inferiority (reported Cronbach's alpha coefficients across studies ranged from 0.85-0.90) [33]. The frequency of experiencing these symptoms was scored on a 4-point scale (answer categories ranging from 'always' to 'hardly ever'). These scores are summed (range 0-60), with higher scores indicating higher levels of depressive symptoms [34-36].

The validated 12-item Short-Form Health Survey (SF-12) was used to measure health-related quality of life. The SF-12 includes 12 items from which the Physical Component Summary (PCS-12) score and the Mental Component Summary (MCS-12) score were calculated (test-retest correlations of 0.89 and 0.76 were previously observed) [37]. These scores ranged from 0-100, with higher scores indicating better health-related quality of life.

Truancy was measured with the item: "Have you been truanting in the past four weeks?"(answer categories ranged from 'no' to 'more than 20 hours') [31]. For analysis purposes, truancy in the past four weeks was dichotomized into 'yes' and 'no'.

Financial and housing problems were measured with two corresponding items from the adapted and validated Self-Sufficiency Matrix (SSM-D) (reported Cronbach's alpha coefficients were 0.85 and 0.89) [38 39]. This matrix measures self-sufficiency with answer categories ranging from 'no problems' to 'many problems'. For analysis purposes, the answer options were dichotomized into 'self-sufficient' and 'not to barely self-sufficient'.

Criminal behaviors were measured with eleven items asking about criminal behaviors in the past six months, e.g. stealing something worth 5 euro and having been questioned at the police station (answer categories ranged from 'never' to 'six or more times'). For

analysis purposes, the answer options were dichotomized into 'no criminal behaviors' and 'at least one criminal behavior' in the past six months.

Potential confounders in assessing the primary and secondary outcome indicators were socio-demographic characteristics of the students, which included gender, age, intermediate vocational educational level (higher level 4 versus lower levels 1-3), ethnic background (Dutch versus non-Dutch according to the classification of Statistics Netherlands [40]), and living situation. Other potential confounders were binge drinking, cigarette smoking, and cannabis use. These were all dichotomized into 'yes' and 'no' [31].

Process indicators

Specific process indicators that we evaluated included dose delivered and received, satisfaction, and experience [41]. The Youth Health Care professionals who provided the intervention and the students who had a consultation with the professional filled out an evaluation form after the consultation according to step four of the intervention (see Table 1). The extent to which the professional and the school worked in accordance with the MASS intervention (dose delivered) was measured with four statements (see Table 5). Answer options were 'yes' or 'no'. Professionals' satisfaction and experience with the intervention were measured with three items regarding the usefulness of the application of the MASS intervention (see Table 5). Answer options ranged from 'very useful' to 'not useful'.

Students' satisfaction and experience with the consultation were measured with nine statements (e.g. 'I felt I was taken seriously by the Youth Health Care professional'). Answer options ranged from 'strongly disagree' to 'strongly agree'. Furthermore, the students gave a grade from one to ten for their satisfaction with the consultation with the Youth Health Care professional.

We evaluated the dose received in the second and fourth steps of the MASS intervention in the main self-report questionnaire at follow-up by asking whether students had a meeting with the school regarding their sickness absence and whether they had a consultation with a health care professional regarding their sickness absence.

Statistical analysis

Descriptive statistics were used to describe the characteristics and outcomes of students in both study conditions. Differences between the intervention condition

and the control condition at baseline were tested by chi-square tests (for categorical variables) and independent sample *t*-tests (for continuous variables).

The primary and secondary outcome indicators were investigated using linear (for continuous variables) and logistic (for categorical variables) regression analyses regarding primary and secondary outcome indicators. In the first model, each outcome was predicted with the study condition (intervention and control) and corresponding baseline value as predicting variables (crude model). In the second model, further adjustments to the crude model were made by adding potential confounders (adjusted model). The selection of these confounders was based on the literature and significant differences between the study conditions at baseline for socio-demographic and lifestyle behaviors. As such, gender and intermediate vocational education level were added as confounders. $p<0.05$ was considered statistically significant.

Subsequently, we explored whether gender, ethnic background, and the presence of a clinically relevant number of depressive symptoms (yes/no) moderated the effect of the intervention [24]. This was done by adding a study condition*possible moderator interaction term to the regression analyses for primary outcome indicators. If the interaction term was significant at $p<0.10$, a stratified analysis was conducted.

The intraclass correlation coefficient (ICC) was calculated to consider the potential variance in sickness absence explained by the clustering of schools. The estimated ICC was equal to zero (ICC<0.001); therefore, no adjustment for school was performed in subsequent analyses.

Descriptive statistics were used to analyze the evaluation forms filled out by students who received the intervention and Youth Health Care professionals who provided the intervention.

All analyses were performed using SPSS version 25 for Windows (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0, IBM Corp., Armonk, NY, USA).

RESULTS

Participant' characteristics

In total, 287 participants were included in the intervention condition, and 221 participants were included in the control condition at baseline. At six-month follow-up, 81 participants in the intervention condition (28.2%) and 119 participants in the control

condition (53.9%) completed the questionnaire (Figure 1). Reasons for not participating in the follow-up measurement were reported as an unwillingness to participate and the relocation of the participant.

We compared participants who completed both the baseline and follow-up questionnaire with participants who did not reply to the follow-up questionnaire. Those who did not reply to the follow-up questionnaire were more often male (p<0.001), were lower educated (p<0.001), were more often classified as non-Dutch (p<0.05), and had a worse education fit (p<0.05) than participants included in both measurements. Stratified by study condition, those who did not reply to the follow-up questionnaire in the intervention condition were more often male (p<0.001), were lower educated (p<0.05), and were more often classified as non-Dutch (p<0.05) than participants included in both measurements. Those who did not reply to the follow-up questionnaire in the control condition were more often male (p<0.05) and were more often classified as non-Dutch (p<0.05) than participants included in the control condition at follow-up (see supplementary material: Table S1).

Table 2 presents an overview of the socio-demographic and lifestyle characteristics of the study population at baseline. The mean age was 18.6 years (SD=2.1), and 78.5% were female. Participants in the intervention condition attended lower education levels than participants in the control condition (p=0.01). No other differences were observed (p>0.05).

Table 2. Socio-demographic and lifestyle characteristics of the intervention and control condition at baseline (N=200).

		Total	Intervention condition	Control Condition	*p*-value
		N = 200	**n=81**	**n=119**	
Socio-demographic characteristics					
Age in years, mean (SD)	[0]	18.6 (2.0)	18.6 (2.1)	18.6 (2.0)	.941
Female gender, n (%)	[0]	157 (78.5)	60 (74.1)	97 (81.5)	.209
Intermediate vocational education level 4, n (%)[a]	[8]	153 (79.7)	56 (70.9)	97 (85.8)	**.011**
Dutch ethnic background, n (%)	[4]	152 (77.6)	61 (77.2)	91 (77.8)	.926
Living at home with caretaker, n (%)	[1]	177 (88.9)	71 (88.8)	106 (89.1)	.943
Lifestyle characteristics					
Current smoking, n (%)	[9]	50 (26.2)	24 (30.0)	26 (23.4)	.308
Binge drinking in past 4 weeks, n (%)[b]	[7]	86 (44.6)	39 (48.8)	47 (41.6)	.324
Cannabis use in past 4 weeks, n (%)	[10]	29 (15.3)	12 (15.0)	17 (15.5)	.931

Note: [number of missing answers]. Bold numbers indicate statistical significance ($p<0.05$) between the intervention condition and the control condition, calculated using an independent-samples t-test (continuous variables) or a chi-square test (categorical variables).

[a] Intermediate vocational education consists of four levels: level 1 assistant training; level 2 basic vocational training; level 3 vocational training; level 4 middle-management training. Level 4 is considered the highest level.

[b] Binge drinking was defined as consuming 5 or more alcoholic drinks on one occasion.

Primary and secondary outcome indicators

Table 3 shows the differences between the study conditions at both time measurements for primary outcome indicators. At baseline, the number of sick days in the past eight weeks was higher in the intervention condition than in the control condition (p=0.028). At follow-up, education fit was higher in the intervention condition than in the control condition (p=0.032).

Table S2 in the supplementary material shows the differences between the study conditions at both time measurements for secondary outcome indicators. At follow-up, the intervention condition had fewer depressive symptoms (p=0.003) and a higher mental health-related quality of life (p=0.012) than the control condition. No other differences were observed (p>0.05).

Table 3. Differences between intervention and control condition at baseline and follow-up for primary outcomes.

	Baseline			
Primary outcomes	**Total**	**Intervention condition**	**Control condition**	***p*-value**
Days of sickness absence in past 8 weeks, mean (SD)	6.0 (6.6)	7.2 (6.4)	5.1 (6.6)	**.028**
Education fit, n yes/a bit (%)[a]	167 (87.4)	68 (86.1)	99 (88.4)	.634
School performance, n above average/average (%)[b]	124 (64.6)	49 (61.3)	75 (67.0)	.414
	Follow-up			
Primary outcomes	**Total**	**Intervention condition**	**Control condition**	***p*-value**
Days of sickness absence in past 8 weeks, mean (SD)	3.0 (3.7)	2.9 (3.4)	3.1 (3.9)	.803
Education fit, n yes/a bit (%)[a]	156 (88.1)	68 (94.4)	88 (83.8)	**.032**
School performance, n above average/average (%)[b]	140 (79.1)	59 (81.9)	81 (77.1)	.440

Note: bold numbers indicate statistical significance ($p<0.05$) between the intervention condition and the control condition, calculated using an independent-samples t-test (continuous variables) or a chi-square test (categorical variables).

[a] Measured on a 5-point Likert scale, dichotomized into 'yes' (i.e. 'yes' and 'a bit') and 'no' (i.e. 'I do not know-no').

[b] Measured on a 5-point Likert scale, dichotomized into 'good' (i.e. 'very good' and 'good') and 'not good' (i.e. 'average and less').

Table 4 shows the association of study condition with primary outcome indicators. The crude model showed an increase in education fit (OR=4.37, 95% CI=1.25; 15.25), which was no longer visible in the adjusted model. The adjusted model showed an average decrease of 1.13 sick days in the past eight weeks (β=-1.13, 95% CI=-2.22; -0.05, p=0.04) among students in the intervention condition compared with those in the control condition.

Table S3 in the supplementary material shows the association of study condition with secondary outcome indicators. Participants in the intervention condition showed a decrease of depressive symptoms compared with those in the control condition (β=-4.11, 95% CI=-7.06; -1.17, p=0.01). No other differences were observed ($p>0.05$).

A significant interaction was found between study condition and gender (p = 0.002) on sickness absence. The stratified analyses revealed a significant decline in sickness absence in males (β=-4.3, 95% CI=-6.5; -2.1, $p<0.001$) and not in females (β =-0.18, 95% CI=-1.4; 1.05, p=0.775).

Table 4. The association of study condition with primary outcome measures.

Primary outcomes	Crude model[a] Intervention vs control condition	Adjusted model[b] Intervention vs control condition
	β (95% CI)	**β (95% CI)**
Days of sickness absence in past 8 weeks	-0.71 (-1.77;0.35)	**-1.13 (-2.22;-0.05)**
	OR (95% CI)	**OR (95% CI)**
Education fit (yes/a bit)[c]	**4.37 (1.25; 15.25)**	3.61 (0.98;13.31)
School performance (very good/good)[d]	1.81 (0.81; 4.07)	1.77 (0.78; 4.03)

Note: bold numbers indicate statistical significance (p<0.05) between the intervention condition and the control condition, calculated using linear or logistic regression models with the control condition as reference.

[a] Model of follow-up score with correction for corresponding baseline score, without correction for confounders.

[b] Model of follow-up score with correction for corresponding baseline score, intermediate vocational education level and gender.

[c] Measured on a 5-point Likert scale, dichotomized into yes (is yes and a bit) and no (is I do not know-no).

[d] Measured on a 5-point Likert scale, dichotomized into good (very good and good) and not good (average and less).

Missings: Baseline days of sickness absence in past eight weeks=8, follow-up days of sickness absence in past eight weeks=20; baseline education fit=9, follow-up education fit=23; Baseline school performance=8, follow-up school performance=23; intermediate vocational education level =8; gender=0.

Process indicators

We received a total of 35 evaluation forms from Youth Health Care professionals (Table 5). In 34/35 cases, the professionals experienced the application of the MASS intervention as very useful or useful. In 31/35 cases, the professionals made a reintegration plan with the student. In 35/35 cases, they communicated the agreements originating from the consultation with the student with the school staff.

We received a total of 14 evaluation forms from students. Almost all students (12/14) answered that they (strongly) agreed with the statement that the Youth Health Care professional had taken them seriously, that they trusted this professional, and that the professional listened to them. The majority (10/14) agreed with the statement 'I dared to ask the Youth Health Care professional questions'. The mean rating for the consultation was an 8.3 (SD=1.3) out of 10.

Table 5. Evaluation of the consultation within the MASS intervention by Youth Health Care professionals.

Process indicator	Statement	
Satisfaction with MASS intervention		**% very useful and useful (n/total n)**
	How did you experience the application of the MASS intervention?	97.1 (34/35)
	How did you experience the application of the biopsychosocial model?	87.9 (29/33)
	How did you experience the application of the self-sufficiency matrix?	74.3 (26/35)
Use of MASS intervention		**% yes (n/total n)**
	Did school contact the student in response to the sickness absence?	100.0 (29/29)
	Did the school explain the added value of the consultation with the Youth Health Care professional?	96.6 (28/29)
	Did you make a reintegration plan with the student?	88.6 (31/35)
	Did you communicate the agreements you made with the student to school?	100.0 (35/35)

In the follow-up questionnaire, around half of the students in the intervention condition indicated that they had received the second step of the intervention (51.9%). A little less than 20% of students in the intervention condition indicated that they had received the fourth step of the intervention (17.3%).

DISCUSSION

In this study, a program evaluation framework was applied to evaluate the MASS intervention. A decrease in sickness absence and depressive symptoms was found among participants in the intervention condition at six-month follow-up compared with those in the control condition. The Youth Health Care professionals who provided the consultation as part of the MASS intervention considered the intervention to be useful, and students who had followed all steps of the intervention appreciated the consultation that was part of the intervention.

In accordance with step five of the program evaluation framework (i.e. justify conclusions), the results will be interpreted alongside the literature. Our finding that a decrease in sickness absence was found in those in the intervention condition at six-

month follow-up, compared with those in the control condition is in line with a previous study evaluating the MASS intervention at pre-vocational education [18]. A meta-analysis by Tanner-Smith et al. also found that vocationally oriented programs showed promise in reducing school absenteeism [42]. As suggested by previous research [1 43], the reduction in sickness absence may be attributed to both the increased monitoring of sickness absence and to the systematic collaboration between schools and health personnel. Additionally, factors such as an anonymous sickness reporting procedure at school, or the lack of a reaction to the sickness report by the school might make it 'easier' for students to report sick [26]. The MASS intervention actively monitors and systematically handles sickness absence from the first day of absence. Moreover, another reason for the reduction in sickness absence could be that adolescents with a record of high school absenteeism may not have timely contact with health care professionals [43]. For these adolescents, the MASS intervention could be the initiation of contact with a health care professional who can help with the underlying reasons for their sickness absence. However, we learned that relatively few participants go through step four of the intervention (i.e. the consultation with the Youth Health Care professional). It is unclear whether this is primarily a result of reduced sickness reporting prior to step four or if students perceive obstacles in attending the consultation. Suggestions to further improve the intervention and to make the intervention more approachable for students entail the use of digital tailored messages to students with extensive sickness absence or to develop a MASS app to meet the growing need for online support [44]. Indeed, phone apps have been found to improve physical and mental health outcomes [45].

The positive finding that a larger reduction of depressive symptoms was found in the intervention condition might be a result of the specific attention given by school personnel and the Youth Health Care professional to the students' mental and physical health. Depression has been found to be associated with sickness absence [1 46]; therefore, it may be important to address depressive symptoms and mental health when addressing sickness absence.

The number of participants who did not reply to the follow-up questionnaire was relatively large, especially in the intervention condition. MASS is implemented in schools as a whole (implementing sickness policy in schools and requiring the school to contact a student after a first sick-report). As such, all students with sickness absence from intervention schools are assumed to be exposed to the intervention. Analyses showed that those who did not reply to the follow-up questionnaire were more often male,

lower educated, more often classified as non-Dutch, and had a lower education fit. Although we included education level and gender as confounders and adjusted for corresponding baseline values in our analyses, it is possible that this selective non-response at follow-up led to an underestimation or overestimation of the results. This was especially the case when more motivated students participated in the follow-up measurement, which may have led to more positive results. We should therefore be careful with interpreting and generalizing the results. Taking this into account, we recommend replicating this study in large and varied populations. In the future, telephone reminders to non-respondents and incentives of interest to participants might contribute to a higher response to questionnaires [47]. Although non-response at follow-up was high, the results provide preliminary information for schools and health personnel who wish to reduce sickness absence from school. As early school leaving is a main consequence of sickness absence and is highest among vocational education students, our results indicate that the MASS intervention may contribute to the prevention of early school leaving, which, in turn, is an important outcome for public health.

Explorative analyses showed that the decrease in sickness absence was only observed in males. This was in accordance with a meta-analysis by Tanner-Smith et al. that found that positive effects of interventions on school absenteeism were predominantly detected in males [42]. An explanation for this might be that males are found less likely to seek help or delay help-seeking, for example, for depression [48 49]; however, in the MASS intervention, the help was offered to them timely and proactively. Another explanation might be found in the higher non-response to the follow-up questionnaire among males in the current study. Here, possibly more males with higher sickness absence did not reply to the follow-up questionnaire. Future research should study this possibility.

According to the Youth Health Care professionals, the consultation (step 4 of the intervention) was delivered as intended in almost all cases, as was the intervention in general. In a small portion of cases, however, the integration plan was not delivered. Since the integration plan for a student to join classes again is an important part of the MASS intervention, future research should address whether the delivery of the integration plan can be optimized. In almost all cases, the Youth Health Care professionals experienced the application of the MASS intervention to be useful. Despite this positive response, it might be possible to improve the MASS intervention by further evaluating the usefulness of the self-sufficiency matrix as part of the consultation. Students were

generally satisfied with the intervention and felt that they were taken seriously by the Youth Health Care professional in almost all cases. Being treated seriously has been shown to be an important aspect of preventing sickness reporting according to students in a previous study [26]. Some students indicated that they did not dare to ask questions to this professional during the consultation. Previous research has showed that a bond of trust between youth and a health care professional (e.g. a general practitioner) is often lacking [50], which might result in a barrier against students asking questions. Perhaps, as a means of resolving this issue, Youth Health Care professionals could be better trained to emphasize the possibility of students to ask questions and to invest in a bond of trust.

No significant positive results of the MASS intervention were found for the other primary and secondary outcome indicators, such as school performance, criminal behaviors, or health-related quality of life. Although students' education fit and school performance at follow-up were higher in the intervention condition than in the control condition, the improvement was not significantly different between the students in both conditions. There could be two reasons for this: first, these outcomes may be more indirectly affected by the intervention; and second, changes in behavior could take more than the six months follow-up time in our study. We therefore recommend that future studies evaluate the MASS intervention in a large randomized controlled trial and with a longer follow-up time of 1 to 2 years.

Study limitations

Some methodological considerations need to be discussed. Firstly, while the number of students that was included at baseline in the intervention and in the control condition was similar, eight schools contributed to the intervention condition and two schools to the control condition. For future evaluation studies, we recommend balancing the intervention and control condition by applying the design of a cluster-randomized trial. Secondly, the validity of the measurements needs to be considered. Sickness absence was self-reported by the students. It might be that students do not recall their sickness absence or that they might give socially desirable answers. For a subgroup of 44 participants in this study, additional school registry data on sickness absence were available. The correlation between sickness absence according to the school registry data and according to the self-reported data was 0.71 (p<0.001; data not shown). For future studies, we recommend using school registry data regarding sickness absence. The measurement of school performance by student self-report was validated by

Felder-Puig et al. in a comparison of students' self-report with the students' grades at school. The study showed that the self-report of school performance by students can distinguish groups of respondents that obtain good grades at school from those that do not [32]. For future studies, we recommend obtaining objective information on school performance in terms of students passing on to the next year or obtaining a diploma; for that, a study with a longer follow-up time is required. Thirdly, in our study, at six-month follow-up, the number of participants in the intervention condition is much lower than the number of participants in the control condition. Therefore, the results should be interpreted with caution.

Conclusion

In conclusion, our study provides some indication that the MASS intervention has positive results in decreasing both sickness absence and depressive symptoms among intermediate vocational education students. However, especially in the intervention condition and among male students, there was a high percentage of non-response to the follow-up questionnaire. The Youth Health Care professionals who provided the consultation as part of the MASS intervention considered the intervention to be useful and stated that the consultation was delivered as intended in almost all cases. Students were generally satisfied with the intervention. We recommend that future research evaluate the MASS intervention in a large randomized controlled trial with a longer follow-up period.

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SUPPLEMENTARY MATERIAL

Table S1. Lost to follow-up analyses on socio-demographic and lifestyle characteristics (N=508).

		Total (N=508)		Intervention condition (n=287)		Control condition (n=221)	
		Population for analyses n=200	Lost to follow-up n=308	Population for analyses n=81	Lost to follow-up n=206	Population for analyses n=119	Lost to follow-up n=102
Socio-demographic characteristics							
Age in years, mean (SD)	[3]	18.6 (2.0)	18.7 (2.3)	18.6 (2.1)	18.7 (2.4)	18.6 (2.0)	18.7 (2.1)
Female gender, %	[1]	**78.5****	**56.0****	**74.1****	**49.5****	**81.5***	**69.3***
Intermediate vocational education level 4, %[a]	[25]	**79.7****	**64.6****	**70.9***	**56.6***	85.8	81.7
Dutch ehtnic background, %	[9]	**77.6***	**64.7***	**77.2***	**64.4***	**77.8***	**65.3***
Living at home with caretaker, %	[3]	88.9	85.3	88.8	85.8	89.1	84.3
Primary outcomes							
Days of sickness absence in past 8 weeks, mean (SD)	[35]	6.0 (6.6)	6.8 (7.1)	7.2 (6.4)	7.3 (7.4)	5.1 (6.6)	5.9 (6.2)
Good education fit, %[b]	[22]	**87.0***	**78.6***	86.1	76.2	87.6	83.7
Above average school performance, %[c]	[23]	64.6	56.3	61.3	57.2	67.0	54.3

Note: [number of missing answers]. Bold numbers indicate statistical significance ($p<0.05$) between the population for analyses and lost to follow-up, calculated using an independent-samples t-test (continuous variables) or a chi-square test (categorical variables). Asterisks indicate significance level: * $p<0.05$, ** $p<0.001$.

[a] Intermediate vocational education consists of four levels: level 1 assistant training; level 2 basic vocational training; level 3 vocational training; level 4 middle-management training. Level 4 is considered the highest level.

[b] Measured on a 5-point Likert scale, dichotomized into 'yes' (i.e. 'yes' and 'a bit') and 'no' (i.e. 'I do not know-no').

[c] Measured on a 5-point Likert scale, dichotomized into 'good' (i.e. 'very good' and 'good') and 'not good' ('average and less').

Table S2. Differences between intervention and control condition at baseline and follow-up for secondary outcomes (N=200).

Secondary outcomes	Baseline				Follow-up			
	Total	Intervention condition	Control condition	*p*-value	Total	Intervention condition	Control condition	*p*-value
Depressive symptoms, mean (SD)[a]	15.72 (12.00)	14.08 (12.18)	16.86 (11.79)	.111	15.49 (12.81)	12.10 (11.50)	17.76 (13.18)	**.003**
Physical HRQOL, mean (SD)[b]	49.80 (10.99)	50.24 (10.19)	49.49 (11.55)	.642	50.40 (10.22)	50.57 (9.55)	50.28 (10.69)	.854
Mental HRQOL, mean (SD)[c]	44.29 (14.30)	46.39 (14.19)	42.85 (14.26)	.089	44.79 (14.01)	47.93 (13.08)	42.73 (14.26)	**.012**
No truancy in past 4 weeks, n (%)	123 (63.73)	56 (70.00)	67 (59.29)	.127	124 (71.26)	53 (74.65)	71 (68.93)	.413
No financial problems, n (%)[d]	142 (73.20)	61 (75.31)	81 (71.68)	.574	130 (72.22)	58 (78.38)	72 (67.92)	.123
No housing problems, n (%)[d]	180 (92.78)	77 (95.06)	103 (91.15)	.299	171 (95.00)	72 (97.30)	99 (93.40)	.237
No criminal behavior, n (%)[e]	175 (92.11)	71 (92.21)	104 (92.04)	.965	157 (94.01)	62 (93.04)	95 (94.06)	.975

Note: bold numbers indicate statistical significance ($p<0.05$) between the intervention condition and the control condition, calculated using an independent-samples t-test (continuous variables) or a chi-square test (categorical variables).

[a] Number of depressive symptoms as measured with the CES-D, a higher score indicates higher levels of depression symptoms (range 0-60)

[b] Physical health-related quality of life as measured with the Short Form-12 health survey, a higher score indicates a better quality of life (range 0–100).

[c] Mental health-related quality of life, as measured with the Short Form-12 health survey, a higher score indicates a better quality of life (range 0–100).

[d] As measured with the adapted Dutch version of the self-sufficiency matrix, on a five point Likert scale that was dichotomized.

[e] Small and serious criminal behaviors in the past 6 months, dichotomized into never and at least one.

Table S3. The association of study condition with secondary outcome measures.

	Crude model	Adjusted model
Secondary outcomes	**Intervention vs control condition**	**Intervention vs control condition**
	β (95% CI)	**β (95% CI)**
Depressive symptoms[a]	**-4.03 (-6.85; -1.21)**	**-4.11 (-7.06;-1.17)**
Physical HRQOL[b]	-0.21 (-2.78; 2.37)	0.23 (-2.44;2.90)
Mental HRQOL[c]	3.46 (-0.13;7.05)	2.69 (-0.93;6.32)
	OR (95% CI)	**OR (95% CI)**
No truancy in past 4 weeks	1.36 (0.67; 2.77)	1.33 (0.64; 2.78)
No financial problems[d]	1.81 (0.84; 3.93)	2.20 (0.98; 4.94)
No housing problems[d]	1.79 (0.30; 10.57)	1.96 (0.32; 11.98)
No criminal behavior[e]	1.16 (0.27; 5.07)	1.29 (0.29; 5.82)

Note: bold numbers indicate a statistical significance (p<0.05) between the intervention condition and the control condition, calculated using linear or logistic regression models with the control condition as reference.

Crude model: follow-up score with correction for corresponding baseline score, without correction for confounders.

Adjusted model: follow-up score corrected for corresponding baseline score, intermediate vocational education level and gender.

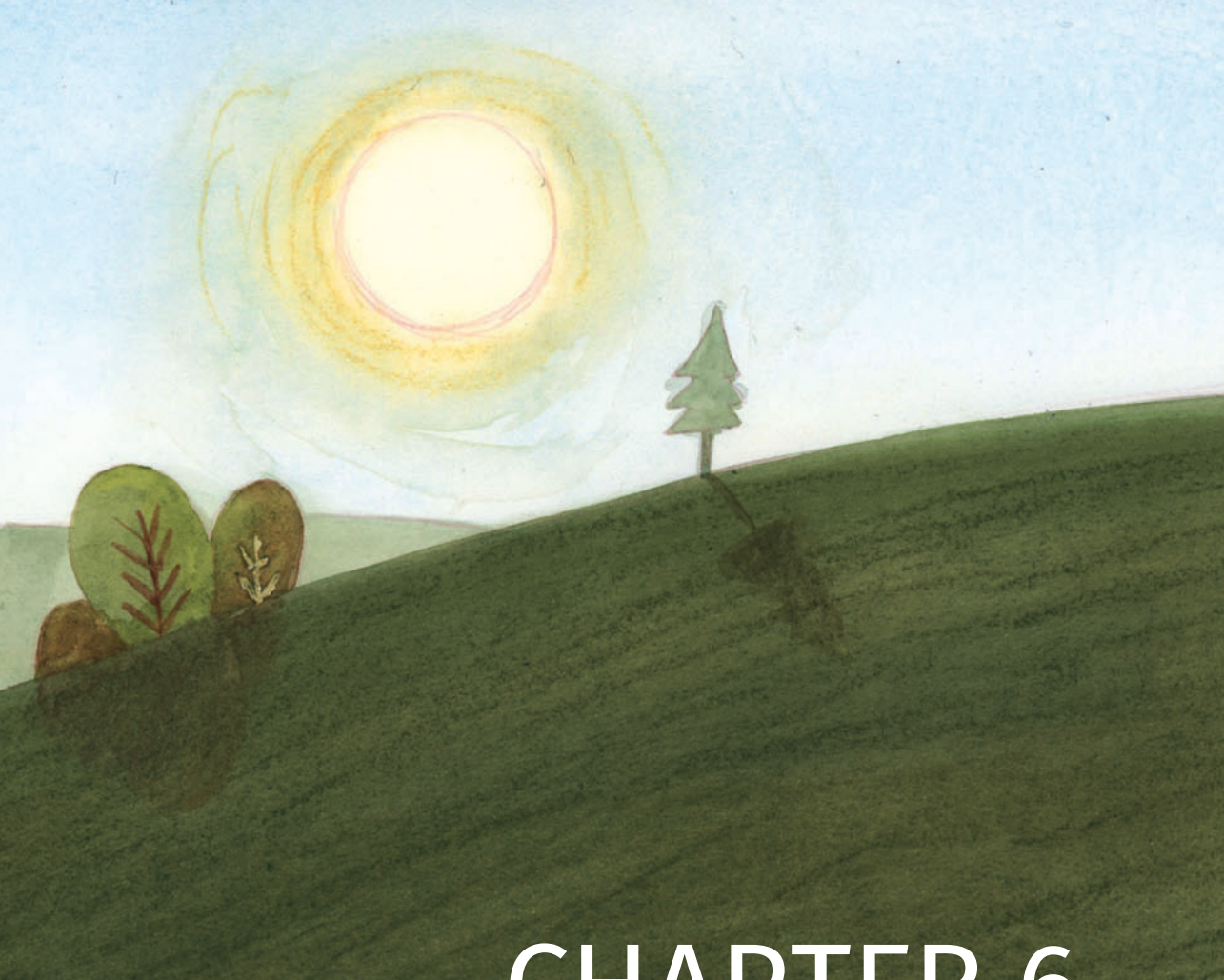
[a] Number of depressive symptoms as measured with the CES-D, a higher score indicates higher levels of depression symptoms (range 0-60).

[b] Physical health-related quality of life as measured with the Short Form-12 health survey, a higher score indicates a better quality of life (range 0–100).

[c] Mental health-related quality of life, as measured with the Short Form-12 health survey, a higher score indicates a better quality of life (range 0–100).

[d] As measured with the adapted Dutch version of the self-sufficiency matrix, on a five point Likert scale that was dichotomized.

[e] Small and serious criminal behaviors in the past 6 months, dichotomized into never and at least one.



CHAPTER 6

Adolescents' views on seeking help for emotional and behavioral problems: a focus group study

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ABSTRACT

Purpose

This study aimed to get insight into adolescents' views on help-seeking for emotional and behavioral problems.

Methods

Fourteen focus groups were conducted. Two vignettes, depicting one healthy adolescent with few issues and one adolescent with severe psychosocial problems, were used to structure the focus groups. The focus groups were framed within a youth help-seeking model.

Results

Adolescents (mean age of 15.0 years) generally reported seeking help from friends or the internet for mild issues and from a person they trust like a parent or school mentor, for more severe problems. Adolescents correctly recognized the issues in vignette one as surmountable and the problems in vignette two as severe.

Conclusion

A bond of trust with a help source was regarded as the main facilitator for the decision to seek help. Adolescents reported a preference for help sources who clearly displayed their expertise for the issue at hand and they reported a preference for informal help-sources, particularly friends.

INTRODUCTION

Adolescents aged 13–18 years demonstrate an increase in health risk behaviors such as drug use and unsafe sex, which may persist into adulthood [1-3]. Furthermore, adolescence is characterized worldwide by a decrease in psychosocial well-being, for example, a rise in mood disorders [4 5]. At the same time, adolescents are less likely to seek help for their concerns compared to adults [6] and compared to adolescents who do not experience these concerns [7]. Help-seeking behavior is considered important as it may reduce the persistence and severity of the issues for which help is sought [8-12]. To illustrate, a significantly lower prevalence of behavioral disorders was found for children and adolescents who consulted with their mother or friends about their issues [8]. In a study on the perceived benefits of seeking help for mental health problems among university students, the top three perceived benefits as reported by students were reduced feelings of stress, improved mental functioning, and the resolution of one's problem [9].

Help-seeking is defined as the behavior of actively seeking help by communicating with informal (e.g. family and friends) and formal (e.g. professionals with a recognized role and appropriate training in providing help and advice) sources, to obtain help in terms of understanding, advice, information, treatment, and general support in response to problems or distressing experiences [13]. Srebnik et al. developed a model for youth help-seeking and service utilization [14]. According to this model, there are three stages in the help-seeking pathway. The first stage is problem recognition. The second stage is the decision to seek help. In the third stage, the help source that youth turn to for help is considered.

When looking at the stage of problem recognition, the first stage of the model by Srebnik et al., thus far, research has found contrasting results. For example, in a study on mental health literacy among 1678 adolescents, less than 25% correctly recognized the problem in the displayed vignette as depression [15]. However, another study among 1002 adolescents found a correct appraisal of a clinical vignette depicting depression of more than 80% [16]. Regarding Stage 2, the decision to seek help, several studies demonstrated low intentions to seek (professional) help in adolescence [6 7 17]. Two-thirds of the adolescents did not seek professional help for their perceived difficulties with emotional and behavioral issues that were classified as abnormal [17]. Furthermore, in a survey study using clinical vignettes (i.e. a peer with a clinical disorder was portrayed)

among more than 1000 high school students, one-third of adolescents failed to recommend this fictional peer to seek help for his/her depression or social anxiety [18]. Therefore, more insight into adolescents' help-seeking for emotional and behavioral issues is of great importance to public health services.

In relation to the third stage regarding the sources that youth turn to for help, previous research identified several informal (e.g. family and friends) and formal (e.g. health professional and teachers) sources of help [19]. Besides, the internet is increasingly used as a source of help, however, little is known about the online help-seeking behavior of adolescents [20]. Best et al. [21] found a difference between informal and formal online help-seeking pathways. Informal online help-seeking pathways in adolescent males reduced stigma and increased the opportunity for social support, but simultaneously reduced anonymity and control. In contrast, formal online help-seeking pathways increased anonymity, but concurrently, they also raised concerns on the abilities of adolescents to locate and assess the quality of the information correctly [21].

Previous studies provided a breadth of knowledge on help-seeking for mental health issues or other specific issues. Furthermore, most of these studies focused on a specific help source or used a quantitative approach [6-8 10 22]. This qualitative study aims to add to previous studies by exploring in-depth interpretations of adolescents' views on help-seeking for emotional and behavioral issues. This study considered help sources and issues for help-seeking bottom-up with a broad focus on potentially all types of help sources and problems, including the internet as a relatively new and less well-studied source of help.

METHODS

Research design

The present qualitative study used focus groups to explore adolescents' views on seeking help for emotional and behavioral problems. Focus groups provided the opportunity to obtain detailed information through planned discussions; the researcher provided the focus and the data came from the group interaction. This was all performed in a non-threatening environment that facilitated the sharing of perceptions by participants [23 24].

This study was embedded within a larger study on the evaluation of the extension of preventive Youth Health Care for adolescents. The Dutch Youth Health Care system offers nationwide preventive health care through anticipatory guidance for children

and youth to promote growth, development, and health. All children and adolescents are invited by the Youth Health Care organization in their region to attend 'preventive periodic health consultations', which mostly take place at school with a physician or school nurse [25]. Previously, these consultations ended at the age of 13. Since 2013, an additional health consultation has been offered to adolescents above the age of 13 years. With implementing this additional consultation, the need arose for evaluation.

The Medical Ethics Committee of the Erasmus University Medical Centre Rotterdam declared that the Dutch Medical Research Involving Human Subjects Act (in Dutch: Wet medisch-wetenschappelijk onderzoek met mensen) did not apply to this research protocol and issued a declaration of no objection for this study. They gave permission to conduct this study and to submit the results for publication in a scientific journal in the future (MEC-2016-297).

Setting and participants

The focus groups took place between March 2017 and February 2018. To select participants, 11 of the 25 Dutch Youth Health Care regions represented by the National Office of Public Health and Safety (GGD GHOR the Netherlands) were asked to participate in the study. Six organizations that embodied a variety of regions agreed to participate in the qualitative part of the study. Each of these six organizations was asked to provide a contact person at one or two secondary schools in their region, depending on the variety of school levels that were offered. Six high schools agreed to participate in the focus groups. Other schools could not fit the participation in their schedule. The contact person at each secondary school then selected one or two classes and informed all students in these classes about the study either face-to-face or via e-mail. Adolescents could apply face-to-face or by sending an email to the contact person. An information letter about the study was then sent to interested adolescents and their parents, explaining to parents how they could object to the participation of their child. None of the parents objected to the participation of their child. We performed focus groups separately for (1) boys/girls and (2) pre-vocational education/senior secondary education. These education levels were both secondary education types. Pre-vocational education takes four years and prepares students for intermediate vocational education; senior secondary education takes five years and prepares students for higher professional education [26]. The focus groups were held at the location of the participating school during teaching hours in a private room.

Topic guide

The topic guide included two vignettes. The first vignette depicted an adolescent with a few issues, who was insecure about intimacy-related issues with their partner. The second vignette depicted an adolescent who had many issues, at home and in school, with high levels of school absenteeism. After one vignette was read, a discussion was started using pre-defined questions on the help-seeking behavior of the participants if they were to be in a similar situation, such as facilitating factors or barriers to seek help and the chosen help source (see supplement 1 and 2) [27 28]. Vignettes provided practical scenarios in an accessible form to the research population [27]. The method of using vignettes enabled the exploration of participants' subjective belief systems: "Participants are typically asked to respond to these stories with what they would do in a particular situation or how they think a third person would respond" [28]. A vignette gave the opportunity to comment on other people's situations in a less threatening manner compared to commenting on one's personal situation. Also, it encourages participation and allows for exploration of actions in context [29].

Before the start of the focus groups, the topic guide was reviewed by two experienced health care professionals to see if the vignettes were a realistic rendition of adolescents and if the probes suited the purpose of this study. Adjustments were made accordingly. A trial focus group was held with five youth health researchers. The topic guide was adjusted following the recommendations from this trial focus group, for example, by providing more opportunities to ask questions and by including a broader explanation of the study.

Focus groups

The first author (ST) moderated all focus groups, and on four occasions, a research assistant was present. The moderator introduced the study and the purpose of the focus groups and informed the participants that the focus group would be recorded, that their names would remain confidential, and that they could stop their participation at any time. Adolescents provided written, informed consent for participation in the study. At the end of the focus groups, participants were asked to fill out a short questionnaire to acquire data on their age, sex, and education level, for which they also provided their written consent. If desired, participants received a coupon of 7,50 euros for their participation. The focus groups lasted between 20 and 49 min (35 min on average).

Data analyses

Recordings of the focus groups were transcribed and coded using NVivo software version 12 (QSR International Pty Ltd. Version 12, 2018, Victoria, Australia) [30]. The three phases of open, axial, and selective coding were followed according to the inductive approach in grounded theory [31]. In the first phase, three focus groups were openly coded by two authors (S.T. and M.B.) independently. This resulted in a preliminary coding scheme in which similar codes were clustered, and an initial hierarchy was applied. S.T. and M.B. reviewed and discussed this coding scheme until a full consensus was reached. Next, all 14 focus groups were divided between the same two researchers to complete the axial coding phase. New codes were added to the coding scheme if necessary and after consensus was reached. Finally, overarching themes were developed in the last phase to draw conclusions and to discover new information on help-seeking behavior patterns. The researchers agreed that data saturation was reached and that it was not necessary to perform additional focus groups. The three stages of the youth help-seeking and service utilization model of Srebnik et al. was used as a guiding theory to interpret the results (see Figure 1). This model consisted of three stages of youth's help-seeking. It states that the decision to seek help and to turn to certain help sources is a result of (A) recognizing the problem, (B) predisposing, characteristics such as age and religion and, (C) barriers and facilitators.

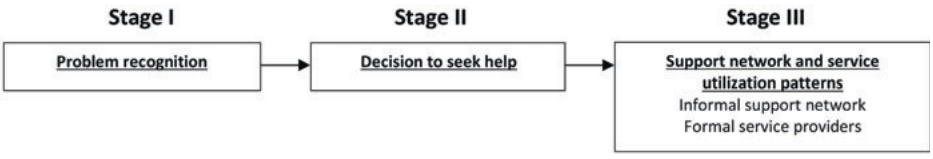

Figure 1. The three Stages of the help-seeking pathway from the model for youth help-seeking and service utilization adapted from Srebnik et al. [14].

RESULTS

Participant characteristics

A total of 14 focus groups were held with 71 participants. Adolescents had a mean age of 15.0 years (SD = 1.0). Table 1 provides an overview of the composition of the focus groups.

Table 1. Structure of the 14 focus groups with adolescents aged 13–18 years.

Focus Group	Number of Participants	Gender [a]	Age Range	Educational Level [b]
A	6	F	13–15	PVE
B	6	M	13–15	PVE
C	6	F	14–15	PVE
D	5	M	14–15	PVE
E	6	F	15–17	SSE
F	6	M	15–18	SSE
G	6	M	15–16	PVE
H	6	F	14–17	PVE
I	5	F	15–16	SSE
J	3	M	16	SSE
K	6	F	14–16	PVE
L	3	M	14–15	PVE
M	4	F	15–16	SSE
N	3	M	15–16	SSE
Total	71 (32M, 39F)	7M, 7F	Mean = 15.0 (SD = 1.0) range 13–18	8 PVE, 6 SSE

Note: [a] M = males, F = females. [b] PVE = Pre-vocational education, SSE = Senior secondary education.

The results are structured within the three stages of the above mentioned help-seeking pathway [14].

Stage I: problem recognition

In general, the participants correctly recognized Loek (vignette 1) to have questions about intimacy and about feeling insecure but did not consider these issues as severe. On the contrary, the participants noticed the problems of Quin (vignette 2) to be severe:

"Yes, and Loek (vignette 1) might think he has a big problem with his questions about his relationship and that he cannot go to his parents, while Quin (vignette 2) has way bigger problems" (Female).

The way they weighed the severity of the problem seemed to influence their help-seeking behavior since the severity of the problems in vignette 2 made it more difficult for adolescents to decide what kind of help-seeking behavior to display. For this severe vignette, some adolescents mentioned to seek out one person they confided in, whereas others did not know what the person in this vignette should do or suggested more evasive behavior such as running away, seeking a way out by using drugs or transferring to a different school.

"With Loek (vignette 1) it was something that every general teenager could handle, that is something for which, if necessary, you could go to a website and talk to someone and then you could address how you should deal with this. But with Quin (vignette 2) that is something more serious, because if your home environment and your school environment are both disrupted, in those cases a person could seriously think about suicide because that person is fed up with it. That is far more serious than someone who is in doubt about whether they should have sex with someone" (Female).

Stage II: decision to seek help

Several factors that contributed to the decision to seek help were mentioned by adolescents. In all focus groups, the importance of a bond of trust with a help source was reported as a facilitator for seeking help:

"Everyone has this person who they trust, I think, where you can certainly go to. A friend, perhaps a mother or father, somebody you definitely trust" (Female).

"No, of course not in school, are you crazy, I trust no one in school" (Male).

Also, adolescents indicated it was important for a source to be experienced in the area for which they were seeking help and that the source would have expertise on the matter, for example, with intimacy issues. In this respect, some adolescents reported to prefer sources of help being older, as they would be more experienced:

"No, primarily to my sister. I think it is easier when someone is older than you are because they have more experience. They know better how to handle some situations" (Female).

"For me, my friends would not be an option because we have the same age, and they are in the same boat. So, you can talk about your problems, that can be very nice, but I don't think you will find solutions" (Male).

However, some adolescents indicated to prefer little age difference with their source of help (i.e. peers).

The unfamiliarity of help sources was both mentioned as a possible facilitator and a barrier for seeking help. It was a facilitator when adolescents wanted to be sure their issues would not get back to family or friends because they did not want to be judged by them. For these help sources, the feeling of privacy played an important role in the process of opening up:

"I think it is nice that it is not with people who are close because they might judge about your problem" (Female).

"With friends, you are scared that other people in your environment hear about it" (Female).

Unfamiliarity was a barrier when adolescents preferred a bond of trust with the source of help, someone who is more familiar with the situation or character of the person who seeks help:

"Yeah, but she (unfamiliar help source) does not know you personally" (Male).

The topic of the issue was another factor contributing to their decision to seek help. It could create feelings of embarrassment, which would form a barrier to seek help for that issue, for example, the topic of intimacy specifically with parents:

"But if you really want to do that (kissing) then your parents might find you too young for it and then you hear about that" (Female).

"I would find that (intimacy) a bit inconvenient to discuss (with parents)" (Male).

Some participants indicated they would not start a conversation about relationships or intimacy. Instead, they reported to expect help sources such as their parents to start this conversation and ask the adolescent about it:

"I would just discuss it with my parents. I think I would not bring it up myself, but if they ask how my relationship is going, then I would tell them" (Female).

"I think it should partly come from parents. If your parents do not start the conversation with you or do not talk about it with you, then you won't initiate the conversations yourself" (Male).

Stage III: support network and service utilization

Adolescents mentioned a variety of possible help sources within their support network or when utilizing more formal services; relatives (i.e. parents, siblings, grandmothers and grandfathers, aunts and uncles, cousins), internet, school environment (i.e., teachers and mentors), partners, friends, parents of friends, self-reliance, and other sources such as phone helplines, general practitioner, and Youth Health Care professionals. The latter two were more often mentioned in the focus groups where only girls participated, whereas internet was more often mentioned by boys as a possible help source to find solutions:

"I would go to my boyfriend" (Female)

"Friends or the internet" (Male).

"No, and sometimes you don't want help and you want to take care of it yourself" (Female).

"If I were Loek (vignette 1), I would go to the general practitioner myself, I really would" (Female).

"Then you go to the general practitioner because I don't expect them to give bad advice" (Female).

A preference for informal help sources was visible in all focus groups. They indicated friends as their number one source of help, followed by parents, siblings, reliance on oneself, members from the extended family, and parents of friends.

The topic of the issue would direct adolescents to a certain help source, such as school issues that were discussed with a mentor or parents. For the "mild" issues in vignette 1, participants often mentioned they would go to friends or search for answers on the internet. For the "severe" problems depicted in vignette 2, participants would seek out one person they confide in, for example, a mentor from school or a family member.

"Yes, for me, when it is about school, then you can discuss it with your parents or mentor. And if it's about relationships, then you can discuss it with friends or a brother or sister, not really with parents" (Female).

Varying views were found on using the internet as a source of help. Some adolescents indicated one might use the internet as an easily accessible source of help when you do not feel comfortable talking to someone about it, and when you have a specific or small question:

"Internet is helpful when you have one particular question….Yes, or when you don't like to talk" (Females).

"Internet, I think you can really find something there. Just google" (Male).

Internet was seen as especially useful when the topic for which help is sought caused feelings of embarrassment:

"Yeah, I think, for example, that if you have a problem, for instance, that you are pregnant or something like that, then I would first go to my best friend. But let's say you find out that you have an STD, then I would google first, that is something for which you are ashamed of" (Female).

Adolescents also mentioned the dangers of the internet, such as non-anonymous registrations of online data by Youth Health Care. They stated that it would be hard to remove something from the internet once it is placed there, and they emphasized that you never know who the person was that you were communicating with. That was the reason for some adolescents not to use websites or online help sources like group chats that are offered by health care providers. Some participants also would not use the internet for their questions because their parents could check their internet search history. The Internet was seen as impersonal and the participants stated you do not know whether the information you receive or find is correct.

"On the internet, you hear that frequently, you never know who is behind it. What if there is some creep behind it… yeah, you never know who it is" (Female).

"I think the internet is less reliable compared to someone's own experiences. I have more trust in my family than what some random person placed on the internet" (Male).

"Internet stays, it stays on the internet, and everybody can search for it on the internet and on the internet, you will find out for sure who it was who sent it, and that goes very quickly" (Female).

"You also have those group apps, or what's it called, the Youth Health Care also has a special forum. I would never do that" (Female).

DISCUSSION

In this qualitative study, 14 focus groups (N=71 adolescents) were conducted to explore adolescents' help-seeking for emotional and behavioral issues. In all focus groups, the issues in vignette one were correctly identified as surmountable, while the participants indicated that the person in vignette two required serious help. Several contributing factors for seeking help were a bond of trust with a help source, the experience of a help source with the issue at hand, and the ability of a help source to start a conversation about intimate topics. A preference for informal help sources, as opposed to formal help sources, was clearly expressed by adolescents. When a mild issue would arise, adolescents mentioned friends and the internet as their first choice of help sources. When the problem would be more severe, the chosen help source was often a confided person, such as a mentor at school or a parent.

The main facilitator identified in this study to seek help from a certain help source was trust. This implies that a specific focus should be given to establishing a bond of trust between health care professionals and adolescents to stimulate help-seeking behavior among formal help services.

Adolescents stated they would not start the conversation about relationships and intimacy themselves, but they would discuss it when help sources, like parents, initiated this conversation, and also expect this from them. This highlights the importance of proactive and open communication by help sources about sensitive topics, like intimacy. Previous literature also demonstrated this since parent-adolescent sexual communication is associated with safer sex behavior among youth [32]. Interventions promoting help-seeking in adolescents should focus on the ability of parents and friends to open the discussion about sensitive issues.

The clear preference for informal help sources, especially friends, resonates with previous research where the majority of the studied youth do not seek professional help, but do seek help from their informal network, most commonly from peers [33]. Therefore, we recommend interventions that aim to promote help-seeking behavior in adolescents to focus on peers as gateway providers to formal health care services. Peers should be aided in their ability to do so since research revealed adolescents' health knowledge was often lacking, and they were not always aware of their role as gatekeepers to adult health providers [34]. Furthermore, a preference for seeking help with a confided person like parents or a school mentor was mentioned when

severe problems would arise. This indicates that formal health services may be able to aid adolescents with severe problems through collaboration with parents or school mentors.

Adolescents mentioned using the internet as either an easily accessible help source where answers to small issues and questions about health could effortlessly be found or as a help source for bigger issues that cause feelings of shame. Many participants stated the dangers of using the internet for seeking help, mostly with respect to privacy matters and not knowing who you were in contact with. This was in line with a review on internet use in youth where online privacy was a key issue for youth [35]. Our finding highlights the importance of Youth Health Care professionals to make sure that adolescents are aware of accurate online help sources when finding answers to delicate questions. In general, it seems the internet must be seen as a source for information that is inquired additional to real-life informal help sources. Future research should further explore the use of the internet as a help source in adolescence since this help source was used for varying purposes.

More similarities than differences were found between the focus groups with boys and girls. However, several remarkable differences were identified. Female participants mentioned formal service utilization (e.g., general practitioner and Youth Health Care) more often, compared to male participants. This in accordance with earlier research [36-38], where, for example, boys were less likely to consult and recommend professional help and more likely to recommend a self-help strategy compared to girls [37 38]. The finding that girls mentioned the use of the internet as a source of help less often was in contrast with previous research, where either no gender differences in health-related internet use were found or girls were found as more frequent users [35 39]. Gender differences in internet use need to be further explored in terms of gender-specific desires in internet use and ways to improve access to health information for both sexes.

The strengths and limitations of this study should be considered when interpreting the results. By conducting a large-scale and thorough qualitative focus group study among six high schools, within different school levels and separate for boys and girls, an in-depth understanding of adolescents' views towards help-seeking behavior was gained. Several methodological considerations should be mentioned. To include participants within the high schools, a convenience sample was taken. The fact that classes were informed about the study, and adolescents could apply when they were interested may

have hampered the generalizability of our results. For example, when the non-response was particularly high among vulnerable adolescents due to emotional or behavioral issues. Second, certain adolescents may have dominated the focus group discussions, and adolescents may have expressed socially desirable answers. The researcher conducting the study, however, was trained to minimize these risks.

Another strength of this research was that it discussed daily life issues and more serious issues from the point of view of adolescents in the form of two vignettes. The use of the vignettes gave the ability to discuss sensitive topics in a structured and non-threatening manner, compared to discussing personal experiences of the participants. However, the use of vignettes may have elicited different views than real-life situations would have [27]. Another strength of the study was the use of gender-neutral names in the vignettes, thus that gender bias could be prevented. All focus groups took place during teaching hours at the school in which the participants were enrolled. This was facilitating for the participants, as it took minimal effort in terms of traveling and time. However, the location could have influenced the sense of privacy the participants had. To minimize this possibility, an effort was taken to carefully select a secluded room where no one could look inside, and teachers were asked beforehand not to enter the room. Furthermore, the focus groups were held separately for boys and girls. Besides exploring the possible differences in help-seeking behavior between boys and girls, this was done to create an environment in which all participants felt comfortable to speak their mind. It could be interesting also to include mixed focus groups in future studies, to look at the influence of mixed groups in discussing certain topics.

Conclusion

In conclusion, this large focus group study demonstrated that adolescents preferred to seek help with a person they can confide in when the issue is experienced as severe. A bond of trust with the help source as well as a help source demonstrating his/her expertise was regarded as the main facilitators for seeking help among adolescents. Our findings support the importance for help sources, in particular, formal service providers, to be trained to invest in a bond of trust with adolescents, in communicating their expertise, and in starting a conversation about topics that could evoke feelings of embarrassment for adolescents, such as intimacy-related topics. Furthermore, this study highlights the importance of collaboration between peers, parents, school mentors, and Youth Health Care providers in dealing with adolescents' emotional and behavioral problems, particularly when it concerns severe issues.

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SUPPLEMENTARY MATERIAL

Supplement 1

Vignette 1

Loek* is in the fourth year of senior secondary education at a school in Amsterdam. Loek feels well, has fun at school and obtains high grades. There is a good atmosphere in class, for example no one is being bullied. Also in the weekend, Loek has enough to do, like working at the supermarket or playing sports at the athletics club. At home it is also fine, but Loek is increasingly feeling like keeping everything to one's self and sharing very little with for example parents. Recently, Loek started dating, which is all very new and is accompanied by a lot of insecure feelings. Loek has many questions about this relationship about, among other things, kissing and sex and how to deal with that in a relationship. Loek does not dare to discuss this with parents, because of the shame Loek feels, because how do you go about discussing something like that and how do you deal with the insecure feelings?

*Loek is a unisex name in the Netherlands, which enabled both sexes to identify with the vignette

Vignette 2

Quin* does not feel well, because school is not going well and a number of students are behaving annoyingly towards Quin. There have been times when Quin truanted and did not feel like going to school. It is also not going well at home, because there are a lot of arguments. Quin is getting sick more and more often, Quin does not know what to do.

*Quin is a unisex name in the Netherlands, which enabled both sexes to identify with the vignette

Supplement 2

All questions used as prompts during the focus groups

1. Is this a good description of a peer?

    Why/why not?

2. Do you think Loek/Quin needs help for specific questions?

    (prompt: for example about feeling insecure)

3. If Loek/Quin would want help, where would you seek help if you were Loek/Quin?

4. How would you prefer to receive help?

    On the internet

    i. (how would the internet help?)

    In books

    i. (how would books help?)

    At school

    i. (how would school help?)

    ii. Who would you go to in school?

    Family

    i. (how would family help?)

    ii. Who would you go to in your family?

    Peers

    i. (how would peers help?)

    From an unknown professional who regularly visits school

    i. (how would this person help?)

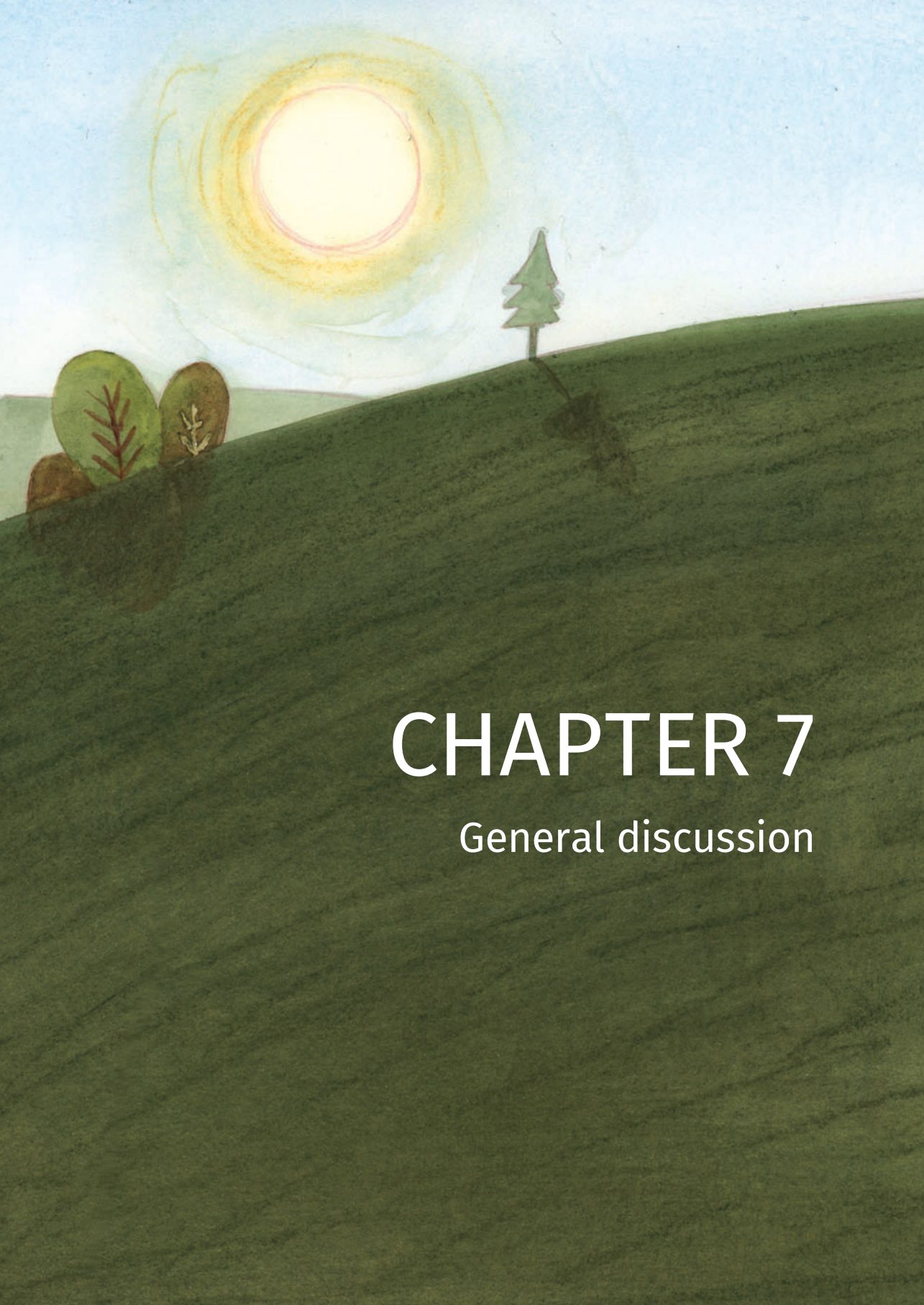
    From a certain organization

    i. (how would this organization help?)

    From the Youth Health Care?

    i. (how would the Youth Health Care help?)

5. What do you think you peers have many questions about?



CHAPTER 7

General discussion

The aim of this thesis was to contribute to promoting physical, mental, and social well-being of adolescents and young adults. The research questions were:

Part I: Well-being and risk behaviors of adolescents and young adults

- What is the association of absence from school with health-related quality of life (HRQOL) and happiness among young adults aged 16-26 years? (chapter 2)
- To what extent are contextual factors and indicators of health status associated with self-sufficiency of young adults aged 16-26 years? (chapter 3)
- Which factors are associated with recreational nitrous oxide use among adolescents? (chapter 4)

Part II: Promotion of health behaviors among adolescents and young adults

- What are the effects of a school-based intervention, primarily on addressing sickness absence, education fit, school performance, and secondarily on addressing seven health indicators among young adults aged 16-26 years? (chapter 5)
- What are adolescents' views on seeking help for emotional and behavioral problems? (chapter 6)

In this general discussion, the main findings of the studies presented in this thesis are summarized and interpreted alongside existing literature. Methodological considerations that arose from the presented studies are discussed. Also, recommendations for future research and implications for policy and practice are presented. Lastly, an overall conclusion is given.

MAIN FINDINGS AND INTERPRETATION

Part I: Well-being and risk behaviors of adolescents and young adults

The first part of this thesis concerned an evaluation of health, quality of life, self-sufficient functioning, and risk behaviors among adolescents and young adults. **Chapter 2** evaluated whether and how school absenteeism is associated with mental and physical HRQOL and happiness among young adults (16-26 years) attending intermediate vocational education.

The results indicated that young adults who reported higher levels of sickness absence and truancy scored lower on their self-reported mental HRQOL. This was partly in accordance with previous research. Previous studies reviewed the association between school absenteeism and mental health (i.e. depression and anxiety). They observed mixed results from a limited amount of studies on the association between sickness absence and mental health, while the negative association between truancy and mental health was clearly demonstrated [1 2]. We further showed that young adults who reported more sickness absence also scored lower on their physical HRQOL. This concurs with previous research that found a link between physical conditions and school absenteeism [3 4].

Young adults who reported more truancy had higher physical HRQOL on average. Nelson and Gastic reported the highest levels of truanting among a group of students characterized by unstructured leisure time activities (i.e. activities such as playing non-school sports and hanging out with friends) [5]. This finding by Nelson and Gastic suggests that truanting students were physically fit to participate in these unstructured leisure activities, which might partly explain a higher physical HRQOL.

We did not observe an association between school absenteeism and happiness. Although descriptive statistics showed that happiness decreased with increasing sick days, the association was not established in the regression analyses.

Chapter 3 explored to what extent contextual factors (i.e. socio-demographics and context, and risk behaviors) and indicators of health status (i.e. sickness absence and depressive symptoms) were associated with young adults' (16-26 years) self-sufficiency to function in daily life. Self-sufficiency is defined as the ability of individuals to attain an acceptable level of functioning regarding specific life-domains, such as finances and mental health [6]. This ability can either be achieved by the person him/herself or by adequately organizing help from formal or informal care providers [6].

In our study, the life-domains 'finances', 'mental health', and 'physical health' were the three domains that young adults scored lowest at with regard to self-sufficiency. This was partly in line with a previous study where the same eleven self-sufficiency life-domains were studied among a comparable sample of intermediate vocational education students aged 18.3 years on average [7]. In this previous study, the life-domains of 'finances', 'mental health', and 'domestic relations' were the three domains that young adults scored worse at [7]. As such, a difference was observed for the life-domain

of 'physical health' as one of the worst domains in our study and the life-domain of 'domestic relations' as one of the worst domains in their study. Furthermore, their study showed overall fewer problems in being self-sufficient for all life-domains [7]. These differences could be explained by our sample selection in which we purposely aimed to select more students with extensive sickness absence, resulting in an overrepresentation of young adults who reported extensive sickness absence [8].

Especially sickness absence and depressive symptoms were related to diminished overall self-sufficiency and self-sufficiency on specific life-domains, for instance daytime activities, housing, and social network. These findings are in line with previous research showing that depressive symptom levels among adolescents negatively predicted academic and emotional self-efficacy (i.e. believing in one's own ability to deal with academic and emotional challenges) [9].

In **chapter 4**, we explored whether socio-demographic factors, mental health, school absenteeism, and substance use were associated with the recreational lifetime use of nitrous oxide (i.e. laughing gas, N_2O) among adolescents with an average age of 15.6 years. This risk behavior is rapidly increasing among populations in western countries and has not received much research attention so far [10-13].

The results of our study indicated that having a non-Dutch ethnic background was associated with increased lifetime nitrous oxide use. Differences in ethnic background regarding the use of nitrous oxide were also demonstrated in the Health Behaviour in School-aged Children study among 12-16-year-olds. That is, participants with a non-western migration background had a significantly higher prevalence of lifetime nitrous oxide use than participants who had no migration background [13]. Nabben et al., based on information from experts, distinguishes a group of beginning nitrous oxide users that is typically formed by underaged secondary school students. These users are relatively often from urban areas and often have a migration background. For this group, nitrous oxide does not have the status of being a drug and is seen as more innocent than alcohol or cannabis. Moreover, using alcohol or cannabis is considered a taboo, for example for religious reasons [14].

Our results indicated that participants who attended pre-vocational education had higher odds of lifetime nitrous oxide use compared with participants that attained a higher educational level. This finding is confirmed by previous studies showing that a lower Grade Point Average was associated with alcohol and illicit drug use [15 16]. The

association we observed between externalizing problems and increased lifetime use of nitrous oxide concurs with previous research indicating associations between externalizing behavior problems and the use of alcohol and drugs among adolescents [17 18]. Externalizing behavior consists of outward behavior, such as impulsive and deviant behavior that are closely linked to risky health behaviors, for instance, drug use [17]. Further, our findings suggest an association of frequent binge drinking and cannabis use with increased lifetime nitrous oxide use. Co-occurrence of risk behaviors have been reported in other studies where clustering of alcohol misuse, smoking, and illicit drug use was observed among young adults [19]. The combination of heavy alcohol drinking and nitrous oxide use is found to be a dangerous combination because heavy alcohol drinking disrupts the stimulus to breathe, which could lead to a deficit in oxygen if nitrous oxide is inhaled [20].

Part II: Promotion of health behaviors among adolescents and young adults

The second part of this thesis concerned an evaluation of an intervention that addresses sickness absence from school and explores adolescents' views on help-seeking behavior. In **chapter 5**, the MASS intervention was evaluated among students attending intermediate vocational education (aged 16-26 years) with extensive sickness absence [8]. The MASS intervention is a proactive school-based intervention focused primarily on early identification and reduction of sickness absence [21-24]. The framework for program evaluation in public health from the Centers for Disease Control and Prevention [25] was used to guide this evaluation. As such, outcome and process indicators were evaluated. First, we evaluated whether, at follow-up, students in the intervention condition have less sickness absence, a higher education fit, and higher school performance than students who receive care as usual. In this regard, we further explored health indicators and hypothesize that students in the intervention condition will score better on these outcomes. Second, the dose of the intervention delivered and received, and the satisfaction and experience of the intervention among students in the intervention condition and Youth Health Care professionals who delivered the intervention were evaluated. The study provided some indication that the MASS intervention has positive results on decreasing sickness absence and depressive symptoms among intermediate vocational education students. However, especially in the intervention condition and among male students there was a high percentage of non-response to the follow-up questionnaire, which should be considered when interpreting the results.

The finding of reduced sickness absence was in line with a previous study that evaluated the MASS intervention at pre-vocational education, which is the school-level that precedes intermediate vocational education [26]. A meta-analysis by Tanner-Smith et al. also reported that vocational oriented programs are promising in reducing school absenteeism [27]. Several reasons can be given for this reduction in sickness absence. First, it may be attributed to the increased monitoring of sickness absence and the use of a systematic approach in tackling sickness absence in the intervention [3]. Second, factors such as an anonymous sickness reporting procedure at school, or the lack of a reaction to the sickness report by the school might make it 'easier' for students to report sick [28]. The MASS intervention actively monitors and handles sickness absence from the first day onward. Third, adolescents with a large amount of school absenteeism may not have timely contact with health care professionals [29]. For these adolescents, the MASS intervention could be the initiation of contact with a health care professional who can help with the underlying reasons for their sickness absence.

Explorative analyses showed that the decrease in sickness absence was only visible in males. This was in accordance with the meta-analysis by Tanner-Smith et al. that showed that positive effects of interventions on school absenteeism were predominantly visible in males [27]. An explanation might be that males are less likely to seek help, for example for depression [30] and delays are demonstrated for medical and psychological help-seeking among males [31]. In the MASS intervention, the help may be offered to them timely.

Another result of the MASS intervention was the reduction on the scale of depressive symptoms. This might be a result of the specific attention given by school personnel or the Youth Health Care professional to students' mental and physical health. Depression has been found to be associated with sickness absence [3 32]. It may, therefore, be important to address depressive symptoms and mental health when addressing sickness absence.

No significant effects of the MASS intervention were found for the other two primary and six secondary outcomes, such as criminal behaviors, housing, or HRQOL. These outcomes may also be more indirectly affected by the intervention and it could take more time to change than the six months follow-up time in our study.

According to the Youth Health Care professionals, the consultation (step 4 of the MASS intervention) was delivered as intended in almost all cases, as was the intervention

in general. The Youth Health Care professionals generally experienced the application of the MASS intervention to be useful. Students were generally satisfied with the intervention and felt taken seriously by the Youth Health Care professional in almost all cases, which has been shown to be an important aspect of preventing sickness reporting according to students in a previous study [28].

Chapter 6 described adolescents' views on seeking help for emotional and behavioral problems. A focus group study was conducted with 14 groups of adolescents with an average age of 15.0 years [33 34]. The focus groups were framed within a youth help-seeking model [35]. Two vignettes, describing one healthy adolescent with few issues and one adolescent with severe psychosocial problems, were used to structure the focus groups and functioned as probes to uncover adolescents' views [36]. The issues of the adolescent depicted in vignette one were in all focus groups correctly identified as surmountable, whereas the adolescent in the second vignette required serious help, according to the adolescents.

Adolescents mentioned the importance of a bond of trust with a help source when seeking help. This was also underlined by previous research where, for example, adolescents tended not to trust adult professionals to help them with emotional difficulties [37 38]. Also, the ability of a help source to start a conversation about intimate topics was regarded as a main facilitator. This highlights the importance of proactive and open communication by help sources about sensitive topics, like intimacy. The importance of proactive and open communication was visible in a previous meta-analysis, where parent-adolescent sexual communication was associated with safer sex behavior among youth [39]. The general preference for informal help sources was in line with a review in which was demonstrated that the majority of youth seek help from their informal network, especially their peers, whereas the professional network is not often consulted [40]. This chapter also demonstrated a preference for seeking help with a confided person like parents or a school mentor when severe problems would arise. Adolescents mentioned using the internet as either an easily accessible help source where answers to small issues and questions about health could effortlessly be found or as a help source for bigger issues that cause feelings of shame. The dangers of, for example, privacy matters and not knowing the person you are in contact with were also mentioned by the participants. This concurs with a review on internet use in youth where online privacy was a key issue for youth [41].

METHODOLOGICAL CONSIDERATIONS

There are some methodological considerations that need to be taken into account when interpreting the findings of the presented studies. First, methodological considerations regarding the design of the presented studies will be discussed. Second, considerations regarding the study settings are discussed. Third, considerations regarding the participants are discussed and fourth, the measurements are considered. Lastly, the non-response to the follow-up questionnaire in the MASS evaluation study are discussed, as well as confounding and moderation.

Study design

A part of the studies presented in this thesis used a cross-sectional design to study associations between, for example, school absenteeism and HRQOL. Cross-sectional studies are useful in identifying associations between behavior and possible associated risk factors. However, this type of design limits the possibility to draw conclusion on the causality of the relationship between the predictors and the outcome variables [42 43]. The study described in chapter 3 on self-sufficient functioning used both a cross-sectional and longitudinal design by including baseline and follow-up data. Adding results of the follow-up data could confirm the cross-sectional results, which was demonstrated for depressive symptoms in chapter 3.

The MASS intervention evaluation made use of a controlled before-and-after design to study the outcome indicators of the MASS intervention [8]. This design allowed for comparison of the outcome indicators between an intervention condition and a control condition overtime. However, the participants were not randomly allocated to a study condition as the allocation was based on the sickness absence policy at participating schools. This could, in general, result in differences between the intervention and control condition. Analyses showed that students in the intervention condition reported a higher amount of sickness absence at baseline than students in the control condition. This may be the result of a better selection of high-risk students in the intervention schools compared with control schools, despite communicating the selection criteria of the study to all schools. For this reason, adjustments for the baseline value of each corresponding outcome were done in the models analyzing the outcomes of the intervention on health behavior.

For the studies in this thesis that used data from the MASS intervention evaluation, we checked whether multilevel analyses had to be applied. For multilevel data (i.e. clustered data), observations of individuals in one school cluster tend to be correlated and are therefore non-independent [42]. The need to apply multilevel analyses depends on the degree of correlation within the clusters. This is called the intra-cluster correlation coefficient (ICC) and is calculated as the ratio of group-level error variance over the total error variance. The calculated ICC's within this thesis all suggested low degrees of correlation within the clusters. For example, the ICC for sickness absence in the MASS intervention evaluation was equal to zero (ICC<0.001); therefore, we did not apply multilevel modeling.

Adolescents' views on seeking help were explored using a qualitative design with focus groups. Focus groups provided the opportunity to obtain detailed information through planned discussions; the researcher provided the focus and the data came from the group interaction. This was all performed in a non-threatening environment that facilitated the sharing of perceptions by participants [33 34].

Study setting

The study on nitrous oxide use among adolescents was performed among multiple secondary schools from different areas in the Netherlands. Besides, several education levels were included as well. This could support the generalizability of the results. However, we recommend replicating the study in large and varied populations.

The evaluation of the MASS intervention was performed among multiple intermediate vocational education school locations. This may support the generalizability of the results to students at other intermediate vocational education schools. Intermediate vocational education is a relatively low level of education; therefore, the results cannot be generalized to higher school levels. In general, it is recommended to repeat the studies originating from the MASS evaluation in large varied samples in other countries and settings, to confirm the findings.

Participants

All studies presented in this thesis used non-probability samples (e.g. convenience samples or purposive samples) of adolescents and young adults. It is possible that specific subgroups did not participate in the studies, for example due to being less motivated to participate. This might have led to non-response bias, which in turn might

have affected the generalizability of the findings [44 45]. For the prevalence of lifetime nitrous oxide use (15,6%) in chapter 4, we compared our finding with the Dutch findings in the HBSC study of 2017, where 13,9% of 15-year-olds and 16,9% of 16-year-olds reported lifetime nitrous oxide use [13]. This shows that the prevalence we found was similar to that of a national representative sample.

More females were included in the MASS intervention evaluation study than males. This issue was also found in a review on health behavior change research, with an average female participation rate of >80% [46] and a previous study found that males were more likely to be lost to follow-up [47].

To include participants for the focus group study, a convenience sample was taken. The fact that classes were informed about the study, and adolescents could apply if they were interested may have resulted in non-response of specific subgroups of adolescents. For example, the response among vulnerable adolescents with emotional or behavioral issues might have been relatively low, which may have hampered the generalizability of our results.

Also, non-response bias may have occurred when young adults did not respond to the questionnaire due to their school absenteeism within the MASS intervention evaluation study. The impact may, however, be limited as previous research showed that non-response in school-based health surveys is mainly linked to lifestyle factors, whereas physical or chronic health problems were less related to non-participation [48].

Measurements

All data in the MASS evaluation study were collected through self-reported questionnaires. The reliance on self-report instead of relying on multiple informants or more objective data may have led to response bias. However, a study on the validity and test-retest reliability of subjective health measures among adolescents supported the validity and test-retest reliability of the measures [49], as did a study on classmate and teacher support among adolescents [50].

When looking at sickness absence, we received objective school registry data on a small group of participants included in the program evaluation of the MASS intervention (n=44). The objective school registry on sickness absence in the past eight weeks and the self-reported sickness absence in the past eight weeks by students rendered a correlation of r=0.71 (p<0.001).

Also, there might have been social desirability bias in the answers of the participants. Social desirability bias is a part of response bias that occurs when participants underreport socially undesirable attitudes and behaviors and over report desirable ones. Previous research on drug use found underreporting of depressive symptoms and recent drug use [51]. Filling out the questionnaires at the schools that participants attended might also increase this type of bias.

Non-response to the follow-up questionnaire

In the MASS evaluation study, the number of participants that did not respond to the follow-up questionnaire was relatively large, especially in the intervention condition. Analyses showed that participants who did not respond to the follow-up questionnaire were more often male, were lower educated, were more often classified as non-Dutch, and had a lower education fit. Although we included education level and gender as confounders and adjusted for corresponding baseline values in our analyses, it is possible that this selective non-response to the follow-up questionnaire led to an underestimation or overestimation of the effects. This is especially the case when more motivated students participated in the follow-up measurement, which may have led to more positive effects.

Confounding and moderation

The quantitative studies presented in this thesis controlled for confounding variables. However, there might have been confounders that were not taken into account. For instance, income of the participants as a possible factor affecting (financial) self-sufficiency or dietary and sedentary behaviors as possible factors affecting (mental) health [52-54].

In most of the studies presented in this thesis, moderation was tested using interaction terms in the statistical models. Moderation occurs when the effect of a predictor on the outcome varies according to a third variable [42]. When the interaction term was significant, stratified analyses were applied.

RECOMMENDATIONS FOR FUTURE RESEARCH

Study design, setting, and question

- Longitudinal designs, preferably with more than two time-points at which data is collected, could give more insight with regard to the direction of the associations measured.
- It is recommended to further explore the association between truancy and physical HRQOL to determine what underlies this association.
- The association between school absenteeism and happiness should be further explored on a long-term basis to establish the possible strength and causal pathway of the association.
- It is recommended to study whether different reasons for school absenteeism relate to different levels of HRQOL, i.e., whether there are specific absence reasons that render worse HRQOL scores.
- The use of self-sufficiency matrices among the general population is relatively new [7]. We recommend to replicate our study on self-sufficiency to gain more insight in this instrument for supporting adolescents.
- The recreational use of laughing gas is a relatively recent development among adolescents and it has not received much research attention so far. We recommend studying this extensively and internationally, especially among adolescents, as the risks remain largely unknown, while it could be especially dangerous for the developing brains of adolescents.
- Future studies are recommended to explore the association between drug use, in particular nitrous oxide, and ethnic background.
- It is recommended to evaluate the effect of the MASS intervention using a randomized controlled trial (RCT). In an RCT, the participants are randomly allocated to a study condition; therefore, it limits contamination of the control condition.
- We recommend replicating the MASS intervention evaluation study in large populations with varied socio-demographic backgrounds, to confirm our findings.
- Future research should explore the use of the internet as a help source. Adolescents reported its use for varying purposes, such as seeking information on topics that caused feeling of shame among adolescents.

IMPLICATIONS FOR POLICY AND PRACTICE

- Professionals working with young adults who have school attendance problems should focus on improving the mental HRQOL.
- It is recommended that Youth Health Care professionals, school staff, and young adults communicate and collaborate to improve policy regarding school attendance and the HRQOL of young adults attending intermediate vocational education.
- Youth Health Care professionals, school staff, and parents can support promoting self-sufficiency. This preferably starts in early adolescence, as this may aid in a more smooth transition to adulthood [55 56].
- The finding that young adults who do not live with a caretaker are less self-sufficient on the life-domains 'finances' and 'housing' suggests that specific attention should be given to young adults' financial situation and future housing situation, especially for those who are on the verge of moving out of their caretakers' house. Parents, school staff, and Youth Health Care professionals should be encouraged to address this, for example in the form of parental role-modeling or parental teaching and by communication between parents and their child about work [57 58].
- Youth Health Care professionals should be aware of nitrous oxide use in adolescents, especially among adolescents with a non-Dutch ethnic background, lower education levels, externalizing problems, frequent binge drinking, and cannabis use.
- Interventions focusing on reducing school absenteeism should be developed, implemented, and improved regularly to establish maximal attendance rates for school-attending young adults. This may contribute to improvement of the HRQOL of these young adults.
- It is recommended for professionals to gain insight into reasons behind truanting in order to support better school attendance.
- A proactive school-based intervention with a focus on addressing sickness absence and associated indicators of health could be a promising way of reducing sickness absence from school. Also, a collaboration between the school and the Youth Health Care in reducing sickness absence is promising herein.

- School staff and Youth Health Care professionals can contribute to preventing sickness absence from school by monitoring sickness absence from the first sickness report and offering counseling when needed.
- Suggestions to further improve the MASS intervention entail the use of digital tailored messages to students with extensive sickness absence or to develop a MASS app to meet the growing need for online support [59]. Phone apps are found to improve physical and mental health outcomes [60].
- Help-seeking in adolescence may be promoted by open and proactive communication of help sources since a bond of trust and the ability of a help source to start the conversation about intimate topics were considered important facilitators for help-seeking.
- For interventions that aim to promote help-seeking behavior in adolescents, it is recommended to focus on peers as gateway providers to formal health care services. Peers should be aided in their ability to do so since research revealed adolescents' health knowledge was often lacking, and they were not always aware of their role as gatekeepers to health providers [61]. Also, interventions could focus on a collaboration between health care professionals and parents or school mentors when severe issues need to be tackled. This is of great importance because adolescents often do not seek help for their issues and therefore their issues might stay unnoticed and untreated [62 63].

GENERAL CONCLUSION

The aim of this thesis was to contribute to promoting physical, mental, and social well-being of adolescents and young adults.

First, our findings support the relevance of psychosocial factors in predicting HRQOL, self-sufficiency and risk behaviors of adolescents and young adults. In this regard, sickness absence from school was associated with both diminished mental and physical HRQOL. Therefore, schools, policymakers, and Youth Health Care professionals are recommended to address the HRQOL of students who are regularly absent from school. Furthermore, sickness absence and depressive symptoms were main factors associated with diminished self-sufficiency. The importance of early promotion of self-sufficiency, preferably before the transition from adolescence to young adulthood has begun, is

underlined. Also, the findings on factors associated with nitrous oxide use, for example externalizing problems, give implications for policy and practice to address nitrous oxide use as an increasingly popular drug among adolescents and to promote healthy adolescent' lifestyles from an early age onwards.

Second, the studies in this thesis evaluated the MASS intervention and explored adolescents' views on seeking help for emotional and behavioral problems. School-based intervention strategies that make use of a collaboration between schools and Youth Health Care professionals with a proactive stepwise approach towards students might be promising in addressing sickness absence from school and therefore possibly in reducing school drop-out on the long term. In addition, well-being of adolescents and young adults can be supported by incorporating their help-seeking preferences into health promotion efforts.

In conclusion, the findings of this thesis can be used to strengthen the activities of Youth Health Care professionals, policy makers, and schools focused on promoting physical, mental, and social well-being of adolescents and young adults.

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APPENDICES

Summary
Samenvatting
List of publications
About the author
PhD portfolio
Dankwoord

SUMMARY

This thesis aimed to contribute to promoting physical, mental, and social well-being of adolescents and young adults. The following research questions were addressed:

Part I: Well-being and risk behaviors of adolescents and young adults

- What is the association of absence from school with health-related quality of life (HRQOL) and happiness among young adults aged 16-26 years? (chapter 2)
- To what extent are contextual factors and indicators of health status associated with self-sufficiency of young adults aged 16-26 years? (chapter 3)
- Which factors are associated with recreational nitrous oxide use among adolescents? (chapter 4)

Part II: Promotion of health behaviors among adolescents and young adults

- What are the effects of a school-based intervention, primarily on addressing sickness absence, education fit, school performance, and secondarily on addressing seven health indicators among young adults aged 16-26 years? (chapter 5)
- What are adolescents' views on seeking help for emotional and behavioral problems? (chapter 6)

Data were used from the Medical-Advice for Sick-reported Students (MASS) intervention study and the additional preventive health consultation for adolescents study.

The MASS intervention is a proactive school-based intervention with a focus on addressing sickness absence and associated health indicators among students. The MASS intervention study was conducted among adolescents and young adults aged 16-26 years attending intermediate vocational education (in Dutch: middelbaar beroepsonderwijs, mbo). Students in both control and intervention schools filled out a questionnaire at baseline and six months post-baseline. They answered questions regarding socio-demographic characteristics, health and health behavior.

The study on the additional preventive health consultation for adolescents was conducted among adolescents in the third and fourth year of secondary school (age of these adolescents: circa 15-16 years). The study consisted of several components, such as administering a questionnaire and conducting focus groups among participating

adolescents. The questionnaire contained questions about socio-demographic characteristics, health and health behavior. Focus groups were conducted to explore adolescents' perspectives on the additional consultation and adolescents' views on seeking help for emotional and behavioral problems.

Part I of this thesis focused on well-being and risk behaviors of adolescents and young adults.

Chapter 2 evaluates whether and how school absenteeism is associated with mental and physical HRQOL and happiness among young adults (16-26 years) attending intermediate vocational education. The results indicated that sickness absence and truancy were negatively associated with mental HRQOL. Also, a negative association between sickness absence and physical HRQOL was observed. A positive association between truancy and physical HRQOL was observed. No association between school absenteeism and happiness was observed.

Chapter 3 focusses on young adults' (16-26 years) self-sufficiency and potentially related contextual factors and indicators of health status. Self-sufficiency is defined as the ability of individuals to attain an acceptable level of functioning regarding specific life-domains, such as finances and mental health. This could either be achieved by the person him/herself or by adequately organizing help from formal or informal care. Of the studied potentially related factors, especially depressive symptoms and sickness absence were associated with diminished overall self-sufficiency, as well as to less self-sufficiency on specific life-domains.

Chapter 4 describes the recreational use of nitrous oxide (i.e. laughing gas, N_2O) and potentially associated factors (socio-demographic factors, mental health, sickness absence from school, truancy, and substance use) among adolescents. The results showed that a non-Dutch ethnic background, a pre-vocational education school level, externalizing problems, frequent binge drinking, and cannabis use were associated with the recreational use of nitrous oxide among adolescents.

Part II of this thesis focused on the promotion of health behaviors among adolescents and young adults, by evaluating the MASS intervention and by exploring adolescents' help-seeking behavior.

Results of the MASS intervention evaluation are presented in **chapter 5**. Some indications were observed for the effect of the MASS intervention on reducing sickness

absence from school and decreasing the scale of depressive symptoms among young adults attending intermediate vocational education. Youth Health Care professionals and students were generally satisfied with the MASS intervention. The limitations of the large number of participants that did not respond to the follow-up questionnaire were highlighted and implications for future research were given.

Chapter 6 describes main facilitators for seeking help among adolescents: a bond of trust with the help source, experience of the help source, and the ability of a help source to start a conversation about intimate issues. A preference for informal help sources, mainly peers, was demonstrated.

All findings are summarized and interpreted alongside existing literature in **chapter 7.** Also, methodological considerations and recommendations for research, policy, and practice are presented. For future research, it is recommended to focus on the association of school absenteeism and HRQOL, especially the association of truancy and physical HRQOL. Also, it is recommended that future research studies determinants of self-sufficiency and nitrous oxide use among adolescents and young adults as these are relatively new concepts to study, preferably using longitudinal designs to establish the direction of the associations. School-based interventions with a proactive, stepwise approach towards students might be a promising strategy in addressing sickness absence from school, especially if the school collaborates with the Youth Health Care. These interventions should be evaluated and developed further, incorporating adolescents' and young adults' help-seeking preferences.

In conclusion, the findings of this thesis can be used to strengthen the activities of Youth Health Care professionals, policy makers, and schools focused on promoting physical, mental, and social well-being of adolescents and young adults.

SAMENVATTING

Het doel van dit proefschrift was bij te dragen aan het bevorderen van het fysieke, mentale en sociale welzijn van adolescenten en jongvolwassenen. De volgende onderzoeksvragen werden gesteld:

Deel I: Welzijn en risicogedragingen van adolescenten en jongvolwassenen

- Wat is de associatie van schoolverzuim met gezondheidsgerelateerde kwaliteit van leven en geluk onder jongvolwassen in de leeftijd van 16-26 jaar? (hoofdstuk 2)
- In hoeverre zijn contextuele factoren en indicatoren van gezondheidsstatus geassocieerd met zelfredzaamheid van jongvolwassenen in de leeftijd van 16-26 jaar? (hoofdstuk 3)
- Welke factoren zijn geassocieerd met het recreatieve gebruik van lachgas onder adolescenten? (hoofdstuk 4)

Deel II: Bevordering van gezond gedrag onder adolescenten en jongvolwassenen

- Wat zijn de effecten van een methodiek die zich ten eerste richt op het aanpakken van ziekteverzuim, een passende opleiding en schoolprestatie en ten tweede op het aanpakken van zeven gezondheidsindicatoren onder jongvolwassenen in de leeftijd van 16-26 jaar? (hoofdstuk 5)
- Wat zijn de opvattingen van adolescenten over het zoeken van hulp bij emotionele problemen en gedragsproblemen? (hoofdstuk 6)

De gebruikte data was afkomstig van onderzoeken naar de M@ZL-methodiek (Medische Advisering van de Ziekgemelde Leerling) en het extra contactmoment voor adolescenten. M@ZL is een methodiek waarbij op school- en leerlingniveau wordt ingezet op het verminderen van ziekteverzuim onder leerlingen.

Het onderzoek naar M@ZL is uitgevoerd onder adolescenten en jongvolwassenen in de leeftijd van 16-26 jaar die deelnamen aan het middelbaar beroepsonderwijs (mbo). Leerlingen in zowel een interventieconditie als een controleconditie vulden tweemaal een vragenlijst in, namelijk tijdens een nulmeting en zes maanden later. De vragen gingen over sociaal-demografische kenmerken, gezondheid en gezondheidsgedragingen.

Het onderzoek naar het extra contactmoment voor adolescenten is uitgevoerd onder adolescenten in de derde en vierde klas van het voortgezet onderwijs (de gemiddelde leeftijd van deze groep is circa 15-16 jaar). Dit onderzoek bevatte verschillende onderdelen, zoals het afnemen van een vragenlijst en het organiseren van focusgroepen onder deelnemende adolescenten. De vragenlijst bevatte vragen over sociaal-demografische kenmerken, gezondheid en gezondheidsgedragingen. De focusgroepen werden georganiseerd om het extra contactmoment te evalueren en om de opvattingen van adolescenten te onderzoeken over het zoeken van hulp bij emotionele problemen en gedragsproblemen.

Deel I van dit proefschrift richtte zich op het welzijn en risicogedragingen van adolescenten en jongvolwassenen.

Hoofdstuk 2 beschrijft of en hoe schoolverzuim samenhangt met mentale en fysieke gezondheidsgerelateerde kwaliteit van leven en geluk onder jongvolwassenen (16-26 jaar) van het mbo. De resultaten lieten zien dat ziekteverzuim en spijbelen negatief samenhingen met mentale gezondheidsgerelateerde kwaliteit van leven. Ook werd een negatieve samenhang gevonden tussen ziekteverzuim en fysieke gezondheidsgerelateerde kwaliteit van leven. Een positieve samenhang werd gevonden tussen spijbelen en fysieke gezondheidsgerelateerde kwaliteit van leven. Er werd geen samenhang gevonden tussen schoolverzuim en geluk.

Hoofdstuk 3 beschrijft de evaluatie van zelfredzaamheid onder jongvolwassenen (16-26 jaar) van het mbo en mogelijk gerelateerde contextuele factoren en indicatoren van gezondheidsstatus. Zelfredzaamheid is gedefinieerd als het vermogen van individuen om een acceptabel functioneringsniveau te bereiken, bijvoorbeeld op financieel gebied of op het gebied van de mentale gezondheid. Dit kan bereikt worden door de persoon zelf of door adequate hulp te organiseren van formele of informele zorg. Van de potentiële gerelateerde factoren waren met name depressieve symptomen en ziekteverzuim gerelateerd aan verminderde zelfredzaamheid, zowel in het algemeen als ook op specifieke levensdomeinen.

Hoofdstuk 4 beschrijft het recreatieve gebruik van lachgas (distikstofmonoxide, N_2O) door adolescenten en evalueert factoren die mogelijk samenhangen met lachgasgebruik (sociaal-demografische factoren, mentale gezondheid, ziekteverzuim van school, spijbelen en middelengebruik). De resultaten lieten zien dat een niet-Nederlandse

migratie-achtergrond, een vmbo-niveau, externaliserende problemen, binge drinken en wietgebruik gerelateerd zijn aan recreatief lachgasgebruik onder adolescenten.

Deel II van dit proefschrift richtte zich op het bevorderen van gezond gedrag onder adolescenten en jongvolwassenen, door het evalueren van de M@ZL-methodiek en door het verkennen van hulpzoekgedrag van adolescenten.

Resultaten van de evaluatie van de M@ZL-methodiek zijn weergegeven in **hoofdstuk 5**. Er werden enige aanwijzingen gevonden voor de effectiviteit van de M@ZL-methodiek op het verminderen van ziekteverzuim en het verminderen van de omvang van depressieve symptomen onder mbo-leerlingen. Jeugdgezondheidszorgprofessionals en leerlingen waren tevreden over de M@ZL-methodiek. We benadrukten de beperkingen die in deze studie zijn veroorzaakt door het grote aantal participanten dat niet reageerde op de nameting en gaven implicaties voor toekomstig onderzoek.

Hoofdstuk 6 beschrijft de belangrijkste faciliterende factoren voor het zoeken van hulp door adolescenten, namelijk een vertrouwensband met de hulpbron, ervaring van de hulpbron en de vaardigheid van de hulpbron om een gesprek te beginnen over lastige onderwerpen. Een voorkeur voor informele hulpbronnen, voornamelijk vrienden, werd benoemd.

Tot slot zijn de bevindingen van dit proefschrift samengevat en geïnterpreteerd in het licht van bestaande literatuur in **hoofdstuk 7**. In dit hoofdstuk zijn ook methodologische overwegingen en aanbevelingen voor toekomstig onderzoek, beleid en praktijk beschreven. Voor toekomstig onderzoek wordt het aanbevolen om zich te richten op de samenhang tussen schoolverzuim enerzijds en gezondheidsgerelateerde kwaliteit van leven anderzijds, in het bijzonder de samenhang tussen spijbelen en fysieke gezondheidsgerelateerde kwaliteit van leven.

Ook wordt aanbevolen dat toekomstig onderzoek de determinanten van zelfredzaamheid en lachgasgebruik onder adolescenten en jongvolwassenen bestudeert, aangezien dit relatief nieuwe concepten zijn om te bestuderen, waarbij bij voorkeur een longitudinale onderzoeksopzet wordt gebruikt om de richting van de associaties vast te stellen. Schoolinterventies die gebruikmaken van een proactieve, stapsgewijze aanpak bij leerlingen kunnen een veelbelovende strategie zijn om ziekteverzuim van school aan te pakken, voornamelijk wanneer de school samenwerkt met de jeugdgezondheidszorg. Deze interventies zouden geëvalueerd en doorontwikkeld moeten worden, met

inachtneming van de voorkeuren van adolescenten en jongvolwassenen met betrekking tot hulpzoekgedrag.

Concluderend kunnen de bevindingen van dit proefschrift worden gebruikt om de activiteiten van jeugdgezondheidszorgprofessionals, beleidsmakers en scholen te versterken die gericht zijn op het bevorderen van het fysieke, mentale en sociale welzijn van adolescenten en jongvolwassenen.

LIST OF PUBLICATIONS

Chapter 2

van den Toren SJ, van Grieken A, Mulder WC, Vanneste YTM, Lugtenberg M, de Kroon MLA, Tan SS, Raat H. School Absenteeism, Health-Related Quality of Life [HRQOL] and Happiness among Young Adults Aged 16-26 Years. Int J Env Res Pub He 2019;16(18).

Chapter 3

van den Toren SJ, van Grieken A, de Kroon MLA, Mulder WC, Vanneste YTM, Raat H. Young adults' self-sufficiency in daily life: the relationship with contextual factors and health indicators. BMC Psychol 2020;8(1).

Chapter 4

van den Toren SJ, van Grieken A, Raat H. Associations of socio-demographic characteristics, well-being, school absenteeism, and substance use with recreational nitrous oxide use among adolescents: a cross-sectional study. *Submitted*.

Chapter 5

van den Toren SJ, Franse CB, Vanneste YTM, Bannink R, Lugtenberg M, Mulder WC, de Kroon MLA, van Grieken A, Raat H. Addressing sickness absence among adolescents and young adults: an evaluation of the Medical Advice for Sick-reported Students intervention. BMC Pub He 2020; 20(1851).

Chapter 6

van den Toren SJ, van Grieken A, Lugtenberg M, Boelens M, Raat H. Adolescents' Views on Seeking Help for Emotional and Behavioral Problems: A Focus Group Study. Int J Env Res Pub He 2020;17(1).

Other

van den Toren SJ, de Haas S, Dalmijn E, Feenstra H, van Berlo W. A mixed methods evaluation of Girls' Talk+: a sexuality education program for girls with mild intellectual disabilities. *Submitted*.

van den Toren SJ, van Grieken A, Mulder WC, Vanneste YTM, Lugtenberg M, de Kroon MLA, Tan SS, Raat H. Schoolverzuim, gezondheid gerelateerde kwaliteit van leven en algemeen geluk onder jongvolwassenen in de leeftijd van 16-26 jaar. Tijdschr JGZ 2019;51(5).

van den Toren SJ, Franse CB, Vanneste YTM, Bannink R, Lugtenberg M, Mulder CW, de Kroon MLA, van Grieken A, Raat H. Het aanpakken van ziekteverzuim bij mbo-leerlingen: Een evaluatie van de M@ZL-methodiek. *Submitted.*

ABOUT THE AUTHOR

Suzanne J. van den Toren was born on October 4th 1990 in Alblasserdam, the Netherlands. In 2009 she completed secondary school at De Lage Waard in Papendrecht. After that, she started the bachelor Pedagogical Sciences (in Dutch: Pedagogische Wetenschappen) at Utrecht University where she completed both the minors Youth & Criminality and Cultural Diversity. During her bachelor, she followed courses in Sociology and Criminology at Southampton University as an Erasmus exchange student. Hereafter, she started the master Youth, Education and Society at Utrecht University. As part of this master, she did a research internship at Rutgers (i.e. international center of expertise on Sexual and Reproductive Health and Rights) where she worked on a mixed-methods evaluation of the Girls' Talk+ programme; a sexuality education programme for girls with Mild Intellectual Disabilities. She wrote a journal article on this study, which was later submitted to a peer-reviewed journal. She completed her master cum laude. She started working as a PhD student at the department of Public Health of Erasmus MC in November 2016 under the supervision of prof. dr. Hein Raat (promotor) and dr. Amy van Grieken (copromotor). Her three main projects were the MASS intervention evaluation study, the additional preventive health consultation for adolescents study, and the guideline on eye screening for the Dutch Youth Health Care. The results of the first two projects are presented in this thesis. Finally, she was a project leader for the pilot project on modular Youth Health Care guidelines (guideline on overweight).

PHD PORTFOLIO

Name PhD student:	Suzanne J. van den Toren
Erasmus MC department:	Public Health
Research School:	Netherlands Institute for Health Sciences (NIHES)
PhD period:	2016-2020
Promotor:	Prof. dr. H. Raat,
Copromotor:	Dr. A. van Grieken

	Year	Workload (ECTS)
1. PhD training		
Courses		
- Principles of research in medicine and epidemiology	2017	0.7
- Introduction to global public health	2017	0.7
- Methods of public health research	2017	0.7
- Methods of health services research	2017	0.7
- Primary and secondary prevention research	2017	0.7
- Social epidemiology	2017	0.7
- Introduction to limesurvey	2017	0.1
- From problem to solution in public health	2018	1.1
- Quality of life measurement	2018	0.9
- Scientific integrity	2018	0.3
- Grant proposal writing	2018	0.1
- Biostatistical methods	2018	5.7
- Introduction to NVivo 12	2019	0.3
- Personal effectiveness	2019	1.0
- English biomedical writing and communication	2019	3.0
- Two year PhD-curriculum 'Training Upcoming Leaders in Paediatric Science' (TULIPS)	2018 - 2020	4.0
Presentations, conferences, meetings, and seminars		
- Oral presentation at stakeholder meeting on MASS project, Rotterdam	2017	0.5
- Oral presentation at expert meeting on the MASS project, Utrecht	2017	0.5
- Oral presentation at stakeholder meeting on the ECA project, Utrecht	2017	0.5
- Oral presentation at a meeting on ZonMw pledges, Utrecht	2017	0.5
- Oral presentation at a ZonMw meeting on empowerment, Utrecht	2017	0.5
- Oral presentation at a stakeholder meeting on the ECA project, Utrecht	2018	0.5
- Oral presentation at the 10th international network for research on inequalities in child health (INRICH) conference, Bradford	2018	0.5
- Oral presentation at the European Union for School and University Health and Medicine (EUSUHM) conference, Rotterdam	2019	0.5

- Poster presentations at the EUSUHM conference, Rotterdam	2019	0.3
- Poster presentation at the EUSUHM conference, Rotterdam	2019	0.3
- Oral presentation at a research meeting for the department of public health, Rotterdam	2020	0.5
Seminars and meetings		
- Seminars at the department of public health	2016 - 2020	2
- Section meetings of the Youth Health Care section	2016 - 2020	2
- Research colloquium meetings of Youth Health Care section	2018 - 2020	0.5
- The young researchers day from TULIPS	2018	0.6
2. Other activities		
- Project management for the guideline on eye screening for the Dutch Youth Health Care	2017 - 2019	6.0
- Member and organizer of events for the junior representatives at the department of public health	2018	1.0
- Volunteering at the EUSUHM conference	2019	1.0
- Project leader for transferring Dutch Youth Health Care guideline overweight into modules (pilot)	2020	2.0
3. Teaching		
- Supervision of Erasmus MC medical students in a community project with writing assignment about 'dog biting incidents in children'	2018	1.0
- Supervision of Erasmus MC medical students in a community project with writing assignment about 'participation in the labour market; influences of mental health issues'	2019	1.0
- Supervision of Erasmus MC medical students in a community project with writing assignment about 'young women's views on help-seeking for sexual problems'	2020	1.0
- Supervision of fellow junior researchers from the youth section of Erasmus MC	2020	1.0

Note: 1 ECTS (European Credit Transfer System) is equal to a workload of 28 hours

DANKWOORD

Mijn grote dank gaat uit naar alle GGD'en, jeugdgezondheidszorgprofessionals en jongeren voor jullie deelname aan de M@ZL-evaluatie en de evaluatie van het extra contactmoment voor adolescenten. Van Limburg tot Amsterdam en van Arnhem tot Den Haag, jullie deelname aan de focusgroepen en vragenlijsten hebben dit proefschrift mogelijk gemaakt.

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Carmen, ik ben je erg dankbaar voor je hulp bij het artikel over de evaluatie van M@ZL. Je frisse blik en doortastende handelen gaven me de energie om dit artikel af te schrijven.

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